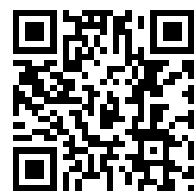

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

HEARINGS

BEFORE THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
UNITED STATES SENATE

EIGHTY-FIRST CONGRESS

FIRST SESSION

ON

S. 75

A BILL AUTHORIZING THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF A DAM AND INCIDENTAL WORKS IN THE MAIN STREAM OF THE COLORADO RIVER AT BRIDGE CANYON, TOGETHER WITH CERTAIN APPURTENANT DAMS AND CANALS, AND FOR OTHER PURPOSES

AND

S. J. Res. 4

A JOINT RESOLUTION GRANTING THE CONSENT OF CONGRESS TO JOINDER OF THE UNITED STATES IN SUIT IN THE U. S. SUPREME COURT FOR ADJUDICATION OF CLAIMS TO WATERS OF THE COLORADO RIVER SYSTEM

MARCH 21, 22, 23, 24, 26, 28, 29, 30, AND 31, APRIL 2, 9, 11, 12, 13, 14, 26, 27, 28, AND 30, AND MAY 2, 1949

Printed for the use of the Committee on Interior and Insular Affairs

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CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER PROJECT

MONDAY, MARCH 21, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to call, at 11:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney, Murray, Downey, McFarland, Anderson, Kerr, Butler, Millikin, Cordon, Ecton, and Malone.

Also present: Senator Knowland.

The CHAIRMAN. The committee is assembled this morning to hear summary statements with respect to the utilization of water and the distribution of water in the lower Colorado Basin; problems arising out of the fact that there has been introduced, and is now pending before this committee, S. 75, introduced by Senator McFarland, for himself and Senator Hayden, which authorizes the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes.

The other, Senate Joint Resolution 4, was introduced by Senator McCarran for himself, Senator Downey, Senator Knowland, and Senator Malone. It is a joint resolution granting the consent of Congress to joinder of the United States in suit in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

The text of both these measures will be made a part of the record, together with the respective reports which have been received by the committee.

(S. 75 and S. J. Res. 4, referred to above, are as follows:)

[S. 75, 81st Cong., 1st sess.]

A BILL Authorizing the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of controlling floods, improving navigation, and regulating the flow of the Colorado River, providing for storage and for the delivery of the stored waters to provide essential supplementary supply of water to irrigated lands, for municipal and domestic uses, and for the irrigation of public and other lands within the United States, and for the generation, use, and sale of electrical energy as a means of making the project herein authorized a self-supporting and financially solvent undertaking, and other beneficial purposes, the Secretary of the Interior, hereinafter referred to as the Secretary, subject to the terms of the Colorado

River compact and the water delivery contract between the United States and the State of Arizona, executed February 9, 1944, is hereby authorized to construct, operate, and maintain (1) a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, which dam shall be constructed to an elevation of not less than one thousand eight hundred and seventy-seven feet above sea level; (2) a related system of main conduits and canals, including a tunnel and main canal from the reservoir above the dam at Bridge Canyon to the Salt River above Granite Reef Dam, a canal from the Salt River to the Gila River above the town of Florence, Arizona, and thence a canal to Picacho Reservoir, and thence a canal to the Santa Cruz River flood plain; (3) such other canals, canal improvements, laterals, pumping plants, and drainage works as may be required to effectuate the purposes of this Act; (4) complete plants, transmission lines, and incidental structures suitable for the fullest economic development of electrical energy generated from water at the works constructed hereunder for use in the operation thereof and for sale in accordance with Federal reclamation laws (Act of June 17, 1902, 32 Stat. 388, and acts amendatory thereof or supplementary thereto); and (5) such appurtenant dams and incidental works, including interconnecting lines to effectuate coordination with other Federal projects, flood-protection works, desilting dams, or works above Bridge Canyon and a dam on the Gila River in New Mexico and such dams on the Gila River and its tributaries in Arizona as may be necessary in the opinion of the Secretary for the successful operation of the undertaking herein authorized and to effect exchanges of water to insure an adequate supplemental supply to lands presently or heretofore irrigated from the Gila River including and below Cliff Valley in New Mexico and from the tributaries of the Gila River by supplying water from the main stream of the Colorado River to lower lands now receiving water from the Gila River or its tributaries, thus releasing Gila River and tributary water for use and exchange on other lands served by the Gila River and tributaries and other exchanges of water which may be agreed upon by the users affected: *Provided, however*, That construction of the tunnel and that portion of the canal hereinabove described from the reservoir above the dam at Bridge Canyon to a junction with the aqueduct hereinafter authorized shall be deferred until Congress by making appropriation expressly therefor has determined that economic conditions justify its construction, and in order to provide a means of diversion of water from the Colorado River to the main canal pending the construction of said tunnel and said portion of the canal and for use thereafter as supplemental and stand-by works the Secretary is authorized to construct, maintain, and operate from appropriations authorized by this Act an aqueduct from Lake Havasu to and connecting with the main canal in the vicinity of Cunningham Wash, and pumping plants to raise water from Lake Havasu to such elevation as may be required to provide gravity flow of such water to the main canal.

SEC. 2. The Secretary shall have the authority to acquire, by purchase, exchange, condemnation, or otherwise, all lands, rights-of-way, and other property necessary for said purposes: *Provided*, That, anything herein contained to the contrary notwithstanding, the Secretary shall not have the authority to condemn established water rights or the water to the use of which such rights are established, or works used or necessary for the storage and delivery of such water to the use of which rights are established, or the right to substitute or exchange water without the consent of the holders of rights or those entitled to the beneficial use of such waters as may be involved in the proposed exchange.

SEC. 3. The estimated cost of the construction of the said works shall be determined by the Secretary. The Secretary shall also determine (a) the parts of said estimated cost that can be properly allocated to flood control, silt control, navigation, river regulation, recreation, fish and wildlife conservation, general salinity control, respectively, and any other purposes served by the project which may hereafter be made nonreimbursable by law, the sums so allocated, together with the expenses of operation and maintenance attributed by him to such purposes, to be nonreimbursable, and (b) (1) the part of the estimated cost which can properly be allocated to irrigation and probably be returned to the United States in net revenues from the delivery of water for irrigation purposes; (2) the part of the estimated cost which can properly be allocated to irrigation and probably be returned to the United States by revenues derived from sources other than the delivery of water for irrigation purposes; (3) the part of the estimated cost which can properly be allocated to power and probably be returned to the United States in net power revenues;

and (4) the part of the estimated cost which can properly be allocated to municipal water supply or other miscellaneous purposes; and probably be returned to the United States.

Before any construction work is done or contracted for, the Secretary shall first determine that costs allocated to power, municipal water supply, irrigation, or other miscellaneous purposes as herein provided will probably be returned to the United States: *Provided*, That the repayment period for costs so allocated shall be such reasonable period of years, not to exceed the useful life of the project, as may be determined by the Secretary.

SEC. 4. Electric energy developed at any of the generating plants herein authorized shall be used first for the operation of pumping plants and other facilities herein authorized, and for replacement purposes, and the remainder thereof sold or exchanged to effectuate the purposes of this Act. In the production, sale, exchange, and distribution of electric energy generated by any of the works herein authorized in excess of that required for the operation of said pumping plants and other facilities, the Secretary shall be governed by the Federal reclamation laws. The Secretary is authorized to supply water for municipal and domestic purposes in accordance with the provisions of said laws.

SEC. 5. Contracts for the delivery of water for irrigation purposes shall provide for the delivery of such water at an identical price per acre-foot at the several points of delivery of water from the main canals and conduits herein authorized, and from such other points of delivery as the Secretary may designate. Such contracts shall be made with the State of Arizona or the State of New Mexico, or with persons, firms, public or private corporations, irrigation or other districts, municipal or other political subdivisions thereof, in accordance with the reclamation law. No person shall have or be entitled to have the use for any purpose of any water delivered hereunder except by contract made as herein stated.

SEC. 6. The works provided for by the first section of this Act shall be used: First, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of present perfected water rights; and third, for power. The title to all works herein authorized shall forever remain in the United States and the United States shall until otherwise provided by law control, manage, and operate the same: *Provided*, That the Secretary may in his discretion enter into arrangements for the operation or use of a unit or units of said works with the States of Arizona or New Mexico use any irrigation district, reclamation project, or other subdivision or agency thereof.

SEC. 7. The rights of the United States in and to the waters of the Colorado River and its tributaries for the use of which the works herein authorized are incidental, convenient, or necessary as well as the rights of those claiming under the United States shall be subject to and controlled by the Colorado River compact.

SEC. 8. The United States in constructing, managing, and operating the works herein authorized, including the appropriation, delivery, and use of water for the generation of power, irrigation, or other uses, and all users of water thus delivered and all users and appropriators of water stored by said reservoirs or carried by said canals, including all pemitees, licensees, and contractees of the United States, or any of its agencies, shall observe and be subject to and controlled, anything to the contrary herein notwithstanding, by the terms of the Colorado River compact and the water delivery contract between the United States and the State of Arizona dated February 9, 1944, and by the laws of the State of Arizona or the State of New Mexico governing water rights wherever the same may be applicable.

SEC. 9. Nothing herein shall be construed as modifying or affecting any of the provisions of the treaty between the United States of America and the United Mexican States signed at Washington, District of Columbia, February 3, 1944, relating to the utilization of the waters of the Colorado River and other rivers as amended and supplemented by the protocol dated November 14, 1944, and the understanding recited in the Senate resolution of April 18, 1945, advising and consenting to ratification thereof.

SEC. 10. This Act shall be deemed a supplement to the reclamation law, which said reclamation law shall govern the construction, operation, and management of the works herein authorized except as otherwise herein provided.

SEC. 11. Nothing herein shall be construed as interfering with such rights as the State of Arizona or any other State now has either to the waters within

its borders or to adopt such policies and enact such laws as it may deem necessary with respect to the appropriation, control, and use of waters within its borders, except as modified by the Colorado River compact or any other interstate agreement.

SEC. 12. There are hereby authorized to be appropriated out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary to carry out the provisions of this Act.

[S. J. Res. 4, 81st Cong., 1st sess.]

JOINT RESOLUTION Granting the consent of Congress to joinder of the United States in suit in the United States Supreme Court for adjudication of claims to waters of the Colorado River system

Whereas there are controversies of long standing, among the States of the lower Colorado River Basin, over the rights of those States to the use of water under certain provisions of the Colorado River compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and the California Limitation Act (Stats. Cal. 1929, ch. 16); and

Whereas those controversies now adversely affect and limit the development of various projects in that basin for impounding, regulating, and using the waters of the Colorado River and its tributaries, the construction of which the Congress has heretofore authorized or may hereafter authorize, in the exercise of its constitutional powers; and

Whereas the Secretary of the Interior, on behalf of the United States, has entered into various agreements with States, public agencies, and other parties in the lower Colorado River Basin relating to the storage and delivery of Colorado River water, and the rights of said parties to the delivery and use of water under those agreements are involved in the controversies hereinbefore referred to; and

Whereas said States, after many years of negotiation, have been unable to settle such controversies by compact; and

Whereas the Supreme Court of the United States in Arizona versus California (298 U. S. 558) held in effect that there can be no final adjudication of rights to the use of the waters of the Colorado River system without the presence, as a party, of the United States: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That consent is hereby given to the joinder of the United States of America as a party in any suit or suits, commenced within two years from the effective date of this resolution in the Supreme Court of the United States by any State of the lower basin of the Colorado River, as that basin is defined in the Colorado River compact, for the adjudication of claims of right asserted by such State, by any other State, or by the United States, with respect to the waters of the Colorado River system as defined in said compact available for use in that basin. Process in any such suit may be served upon the Attorney General.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington 25, D. C., March 18, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate.

MY DEAR SENATOR O'MAHONEY: This Department has been requested by the Senate Committee on Interior and Insular Affairs to report on S. 75, a bill authorizing the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes.

Some time ago this Department submitted to the President and the Congress its report on the central Arizona project. That report was, subject to certain conditions precedent therein enumerated, favorable. By letter dated February 4, the Director of the Bureau of the Budget advised me that he had been instructed by the President "to advise you * * * that he again recommends that measures be taken to bring about prompt settlement of the water-rights controversy." In a subsequent letter to you, dated February 11, Mr. Pace ex-

plained that this advice was not to be taken as meaning that "the President * * * at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him" and that "if the Congress, as a matter of national policy, makes a determination that there is a water supply available for the central Arizona project, the President will consider all factors involved in any legislation to authorize the project and will inform the Congress of his views respecting the specific provisions of this legislation." Mr. Pace's letter of February 4 was published in the Congressional Record for February 7 at page A595. A copy of his letter of February 11 is attached.

Should the Congress, in the light of the very real need that exists in certain areas of Arizona for supplemental water for irrigation and of the urgent need for more power in the Southwest, determine upon the enactment of legislation along the lines of S. 75, then your committee may wish to consider the recommendations contained in paragraph 49 (8) of the report dated December 19, 1947, by the Bureau of Reclamation's regional director, region III. I urge your committee to consider also including, at an appropriate point in the bill, a provision affecting the Indians and reading along the following lines:

"(a) In aid of the construction, operation, and maintenance of the works authorized by this Act, there is hereby granted to the United States, subject to the provisions of this section, (i) all the right, title, and interest of the Indians in and to such tribal and allotted lands, including sites of agency and school buildings and related structures, as may be designated from time to time by the Secretary in order to provide for the construction, operation, or maintenance of said works and any facilities incidental thereto, or for the relocation or reconstruction of highways, railroads, and other properties affected by said works; and (ii) such easements, rights-of-way, or other interests in and to tribal and allotted Indian lands as may be designated from time to time by the Secretary in order to provide for the construction, operation, maintenance, relocation, or reconstruction of said works, facilities, and properties.

"(b) As lands or interests in lands are designated from time to time under this section, the Secretary shall determine the just and equitable compensation to be made therefor. Such compensation may be in money, property, or other assets, including rights to electric energy developed at any of the generating plants herein authorized. In fixing such rights to electric energy, including the rates and other incidents thereof, the Secretary shall not be bound by section 4 of this Act. The amounts of money determined as compensation hereunder for tribal lands shall be transferred in the Treasury of the United States from funds made available for the purposes of this Act to the credit of the appropriate tribe pursuant to the provisions of the Act of May 17, 1926 (44 Stat. 560). The amounts due individual allottees or their heirs or devisees shall be paid from funds made available for the purposes of this Act to the superintendent of the appropriate Indian agency, or such other officer as shall be designated by the Secretary, for credit on the books of such agency to the accounts of the individuals concerned.

"(c) Funds deposited to the credit of allottees, their heirs or devisees, may be used, in the discretion of the Secretary, for the acquisition of other lands and improvements, or the relocation of existing improvements or the construction of new improvements on the lands so acquired for the individuals whose lands and improvements are acquired under the provisions of this section. Lands so acquired shall be held in the same status as those from which the funds were derived, and shall be nontaxable until otherwise provided by Congress.

"(d) Whenever any Indian cemetery lands are required for the purposes of this Act, the Secretary is authorized, in his discretion, in lieu of requiring payment therefor, to establish cemeteries on other lands that he may select and acquire for the purpose, and to remove bodies, markers and appurtenances to the new sites. All costs incurred in connection with any such relocation shall be paid from moneys appropriated for the purposes of this Act. All right, title, and interest of the Indians in the lands within any cemetery so relocated shall terminate and the grant of title under this section take effect as of the date the Secretary authorizes the relocation. Sites of the relocated cemeteries shall be held in trust by the United States for the appropriate tribe, or family, as the case may be, and shall be nontaxable.

"(e) The Secretary is hereby authorized to perform any and all acts and to prescribe such regulations as he may deem appropriate to carry out the provisions of this section.

"(f) Nothing in this Act shall be construed as, or have the effect of, subjecting Indian water rights to the laws of any State."

The Bureau of the Budget has advised that there is no objection to the presentation of this report to your committee. A copy of Director Pace's letter of March 17 transmitting this advice is enclosed for your information.

Sincerely yours,

OSCAR L. CHAPMAN,
Acting Secretary of the Interior.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
February 11, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate, Washington 25, D. C.

MY DEAR SENATOR O'MAHONEY: Members of the Congress have raised a question as to the interpretation to be placed upon the last clause of the last sentence of my letter of February 4, 1949, addressed to the Secretary of the Interior advising him of the relationship to the program of the President of the central Arizona project. The clause referred to reads as follows: "* * * and that he [the President] again recommends that measures be taken to bring about prompt settlement of the water-rights controversy."

During the last Congress in connection with consideration of Senate Joint Resolution 145 and House Joint Resolution 227, this Office advised the Attorney General that it would be in accord with the program of the President to resolve the water-rights controversy by waiving immunity of the United States to suit and by granting permission to the States to bring such actions as they might desire, if the Congress felt it to be necessary to take such action. This advice was transmitted to the Congress by the Attorney General. Similar advice was also transmitted by the Secretary of the Interior, together with specific suggestions as to a form of a resolution which the Congress might consider.

In order that there may be no misunderstanding of the President's position, I shall be grateful if you will advise the members of your committee that the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him. On the contrary, the letters addressed to the Congress last year, as indicated above, stated specifically that enactment of the resolution authorizing suit would be acceptable to the President "* * * if the Congress feels that it is necessary to take such action in order to compose differences among the States with reference to the waters of the Colorado River * * *."

The project report and materials relating to the positions of the several States affected are now before your committee for consideration. If the Congress, as a matter of national policy, makes a determination that there is a water supply available for the central Arizona project, the President will consider all factors involved in any legislation to authorize the project and will inform the Congress of his views respecting the specific provisions of this legislation.

Sincerely yours,

FRANK PACE, JR., *Director.*

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D. C., March 17, 1949.

The honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: On February 19, 1949, you transmitted to me the report which the Department of the Interior proposes to make to the chairman of the Senate Committee on Interior and Insular Affairs on S. 75, a bill "Authorizing the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes."

The President has authorized me to inform you that there is no objection to the presentation of this report to Senator O'Mahoney. It will be appreciated if you will attach a copy of this letter when you forward your report to the committee.

Sincerely yours,

FRANK PACE, JR., *Director.*

DEPARTMENT OF JUSTICE,
OFFICE OF THE ASSISTANT TO THE ATTORNEY GENERAL,
Washington, March 17, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Interior and Insular Affairs Committee,
United States Senate, Washington, D. C.

MY DEAR SENATOR: This is in response to your request for the views of the Department of Justice concerning Senate Joint Resolution 4 which would grant the consent of Congress to joinder of the United States in a suit or suits in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

The proposed measure would give the consent of the United States to joinder as party in any suit or suits commenced in the Supreme Court of the United States by any State of the lower basin of the Colorado River, as that basin is defined in the Colorado River Compact, namely, California, Arizona, Nevada, Utah, or New Mexico, for adjudication of claims of right asserted by such State, by any other State, or by the United States with respect to the waters of the Colorado River system available for use in the lower basin as defined in the Colorado River Compact. The resolution would also provide that such suit or suits must be commenced within 2 years from the date of enactment.

It is fair to assume that the legislation has been proposed for the purpose of removing the cause of dismissal in the case of *Arizona* v. *California* (298 U. S. 558 (1935)), and of affording at least some of the States an opportunity to present their differences and conflicting claims to the Supreme Court for settlement. *Arizona* v. *California* was instituted by Arizona to have adjudicated certain rights to the unappropriated waters of the Colorado River. In that suit five other basin States were named as parties defendant. The Supreme Court dismissed that action on the grounds that since the United States, which was not named as a defendant, was an indispensable party and had not consented to be sued, the suit could not be maintained. The Court made it clear that the type of relief desired by the States in a suit between them cannot be had in the absence of legislation such as here proposed.

In the Eightieth Congress measures were introduced which had for their purpose the institution of a suit in the Supreme Court for the adjudication of the rights of the States of the lower basin of the Colorado River. These measures would have directed the Attorney General of the United States to commence the suit or action in the nature of interpleader in the Supreme Court of the United States against the States of Arizona, California, Nevada, New Mexico, and Utah. In the report of this Department on measures pending in the House, the Department was unable to recommend their enactment and suggested that, in the event Congress felt it was necessary that differences with reference to the waters of the Colorado River in the lower basin thereof be composed through litigation, the resolution should be amended so as to waive the immunity of the United States to be sued and to permit the States to bring such actions as they might desire. It was further suggested that the time limitation for commencing the action be reduced to 1 year.

The first above-mentioned suggestion is incorporated in the present measure. However, as presently proposed, it would contemplate an adjudication of the rights in the lower basin only. Representatives of the Department of the Interior and this Department have recently conferred with regard to this proposed legislation and a proposed draft of substitute wording has been prepared which, among other things, would permit of a complete adjudication of all rights on the Colorado River, including the rights of the United States. In the absence of such provision in the act, a complete adjudication of the rights of all interested parties could not be had.

While enactment of the proposed legislation is a matter of legislative policy concerning which this Department has no recommendation, if the Congress gives the proposed measure favorable consideration it is suggested that after the enacting clause the following language be substituted:

"That consent is hereby given to the joinder of the United States of America as a party in any suit or suits commenced in the Supreme Court of the United States within 1 year from the effective date of this joint resolution by any State or States of the Colorado River Basin, as that basin is defined in the Colorado River Compact, for an adjudication of claims of right asserted against any other State or States of the Colorado River Basin or against the United States with respect to the waters of the Colorado River system available under the Colorado River Compact, the Boulder Canyon Project Act, the California

Self-Limitation Act, and the Boulder Canyon Project Adjustment Act to any State or States of the lower basin of the Colorado River, as that basin is defined in the Colorado River Compact, and of any claims of right affecting such availability which are asserted by the defendant States or by the United States. Any State of the Colorado River basin may intervene in said suit or suits or may be impleaded by any defendant State or by the United States."

The Director of the Bureau of the Budget has advised that there is no objection to the submission of this report. As requested by him in his letter of this date, I enclose a copy of that letter together with a copy of my report to the House Judiciary Committee on the counterpart resolutions being considered by that committee.

Yours sincerely,

PEYTON FORD,
The Assistant to the Attorney General.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., March 17, 1949.

The honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: On February 19, you transmitted to me the report which the Department of the Interior proposes to make to the chairman of the Senate Committee on Interior and Insular Affairs on Senate Joint Resolution 4, a joint resolution granting the consent of Congress to joinder of the United States in suit in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

The President has authorized me to advise you that while there is no objection to the presentation of your report as submitted to me, he has also authorized me to advise the Attorney General that there is no objection to his report on House Joint Resolution 3 and similar measures pending before the House Committee on the Judiciary. This report of the Attorney General, which I understand was developed in collaboration with your representatives, suggests certain amendatory language for the consideration of the committee if the Congress proceeds to take up the proposed measure.

I attach a copy of my letter to the Attorney General. You will note that I have requested him also to send a copy of his report on House Joint Resolution 3 to Senator O'Mahoney in view of the fact that House Joint Resolution 3 is the counterpart of Senate Joint Resolution 4

It will be appreciated if you will attach a copy of this letter when you forward your report to the committee.

Sincerely yours,

FRANK PACE, JR., *Director.*

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C. March 17, 1949.

The honorable the ATTORNEY GENERAL.

MY DEAR MR. ATTORNEY GENERAL: On March 4, you transmitted to me the report which the Department of Justice proposes to make to the House Committee on the Judiciary relative to House Joint Resolution 3, and other similar resolutions, granting the consent of Congress to joinder of the United States in a suit or suits in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

The President has authorized me to inform you that there is no objection to the transmittal of this report to the House Committee on the Judiciary.

In view of the fact that your report is equally pertinent with respect to Senate Joint Resolution 4, the counterpart resolution in the Senate, upon which a hearing is to be held by the Senate Committee on Interior and Insular Affairs on Monday, March 21, it will be appreciated if you will also send a copy of your report on the House resolution to Senator O'Mahoney. It will be appreciated if you will send a copy of this letter to both Representative Celler and Senator O'Mahoney when you transmit your report. A copy of my letter to the Secretary of the Interior with respect to his report on Senate Joint Resolution 4 is attached.

Sincerely yours,

FRANK PACE, JR., *Director.*

UNITED STATES DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, March 18, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate.

MY DEAR SENATOR O'MAHONEY: An expression of the views of this Department on Senate Joint Resolution 4 has been requested. This resolution, which is similar to a number of joint resolutions which are now pending in the House of Representatives, would, if enacted, grant the consent of the United States to its joinder "as a party in any suit or suits, commenced within 2 years from the effective date of this resolution in the Supreme Court of the United States by any State of the lower basin of the Colorado River * * * for the adjudication of claims of right asserted by such State, by any other State, or by the United States, with respect to the waters of the Colorado River system * * * available for use in that basin."

The resolutions now before your Committee are similar in purpose to, though different in language from, a number of resolutions which were introduced in the Eightieth Congress. A report of this Department upon those resolutions was presented to your committee in a letter dated May 13, 1948. In that letter it was pointed out that the United States is an indispensable party to any litigation that may be brought to decide the dispute which now exists among the States of the lower basin of the Colorado River and that that dispute appears to have the elements of a justiciable controversy. There is, therefore, no need for me to elaborate on these matters here. Our hope that the dispute will be settled—by amicable means if possible, by the Congress if an amicable settlement is impossible and if it be the judgment of the Congress that the dispute can be effectively disposed of by it, and by litigation only as a last resort—was also made clear in that report. The importance that the Supreme Court attaches to settlement of disputes of this character by negotiation rather than litigation is evident from its opinion in *Colorado* v. *Kansas* (320 U. S. 383, 392 (1943)):

"The reason for judicial caution in adjudicating the relative rights of States in such cases is that, while we have jurisdiction of such disputes, they involve the interests of quasi-sovereigns, present complicated and delicate questions, and, due to the possibility of future change of conditions, necessitate expert administration rather than judicial imposition of a hard and fast rule. Such controversies may appropriately be composed by negotiation and agreement, pursuant to the compact clause of the Federal Constitution. We say of this case, as the court has said of interstate differences of like nature, that such mutual accommodation and agreement should, if possible, be the medium of settlement, instead of invocation of our adjudicatory power."

Both the executive and legislative branches of our Government might well consider to what extent they can contribute toward lending new impetus to negotiations among the States. In a letter addressed to you on February 11, Budget Director Pace has made it clear that "the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him."

This Department is convinced that the proposal that the lower-basin controversy be settled by litigation is but part of a larger picture. Of immediate importance is the question whether the institution of such litigation would hinder or expedite the development of the resources of the Colorado River Basin. Although it is not certain that lower-basin litigation would inevitably have the effect of delaying progress in the authorization and construction of badly needed works in the upper basin, we are so convinced that it might well have that effect that I cannot say, to repeat a comment made by this Department on the Eightieth Congress resolutions, that there would be no objection to the enactment of legislation along the lines of these resolutions that are now before your committee unless we were fully assured that progress in the development of the basin and in the use of its waters would not be halted or seriously impeded by the litigation. More specific recommendations as to the means by which this assurance could best be evidenced are contained in the report of May 13, 1948, to which I have already referred. I may add that, in view of the fact that a compact apportioning the use of the waters of the upper basin has now been negotiated and ratified by all of the States of that basin, there is less reason now than it may have been thought there was last year for hesitating to give this assurance with respect to, at least, works in the upper-basin States.

The Congress will, no doubt, wish to consider the relation which exists between the proposed legislation upon which this report is written and the proposals for

authorization of the central Arizona project, which are now pending before the Congress. The central Arizona project, nearly the last great new work that can be undertaken in the lower basin, is a very important element in the over-all picture of Colorado River development. This Department's views with respect to that project have been made available. In his comments on this Department's report of February 5, 1948, on the central Arizona project, the Governor of California, in a letter to this office, dated December 29, 1948, wrote:

"Until there is a final settlement of the water rights by some method, the aggregate of Arizona and California claims to Colorado River water will exceed the amount of water available to the lower-basin States under the Colorado River compact and relevant statutes and decisions. It is only because a determination of the respective rights of the lower-basin States to the waters of the Colorado River system has not been made, that California submits any criticism of your proposed report. Whenever it is finally determined what water belongs legally to Arizona, it should be permitted to use that water in any manner or by any method considered best by Arizona, so long as that use does not conflict with the right of California to the use of its water from the Colorado River system. However, as long as the present unsettled situation exists, it is my opinion that each State in the lower basin must of necessity interest itself in the others' projects which would overlap its claims."

This being the bone of contention between Arizona and California, it would seem that the States concerned should not be encouraged, and the United States should be very hesitant, to incur the heavy expense necessarily attendant upon litigation of this magnitude, at least unless it is reasonably clear that upon its outcome, and upon its outcome alone, depends the construction of the project which gives it meaning.

The Bureau of the Budget has advised that there is no objection to the presentation of this report to your committee. A copy of Director Pace's letter of March 17, transmitting this advice, is enclosed for your information.

Sincerely yours,

OSCAR L. CHAPMAN,
Acting Secretary of the Interior.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., March 17, 1949.

The honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: On February 19, you transmitted to me the report which the Department of the Interior proposes to make to the chairman of the Senate Committee on Interior and Insular Affairs on Senate Joint Resolution 4, a joint resolution "Granting the consent of Congress to joinder of the United States in suit in the United States Supreme Court for adjudication of claims to waters of the Colorado River System."

The President has authorized me to advise you that while there is no objection to the presentation of your report as submitted to me, he has also authorized me to advise the Attorney General that there is no objection to his report on House Joint Resolution 3 and similar measures pending before the House Committee on the Judiciary. This report of the Attorney General, which I understand was developed in collaboration with your representatives, suggests certain amendatory language for the consideration of the Committee if the Congress proceeds to take up the proposed measure.

I attach a copy of my letter to the Attorney General. You will note that I have requested him also to send a copy of his report on House Joint Resolution 3 to Senator O'Mahoney in view of the fact that House Joint Resolution 3 is the counterpart of Senate Joint Resolution 4.

It will be appreciated if you will attach a copy of this letter when you forward your report to the committee.

Sincerely yours,

FRANK PACE, Jr., *Director.*

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., March 17, 1949.

The honorable the ATTORNEY GENERAL.

MY DEAR MR. ATTORNEY GENERAL: On March 4, you transmitted to me the report which the Department of Justice proposes to make to the House Com-

mittee on the Judiciary relative to House Joint Resolution 3, and other similar resolutions, granting the consent of Congress to joinder of the United States in a suit or suits in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

The President has authorized me to inform you that there is no objection to the transmittal of this report to the House Committee on the Judiciary.

In view of the fact that your report is equally pertinent with respect to Senate Joint Resolution 4, the conuterpart resolution in the Senate, upon which a hearing is to be held by the Senate Committee on Interior and Insular Affairs on Monday, March 21, it will be appreciated if you will also send a copy of your report on the House Resolution to Senator O'Mahoney. It will be appreciated if you will send a copy of this letter to both Representative Celler and Senator O'Mahoney when you transmit your report. A copy of my letter to the Secretary of the Interior with respect to his report on Senate Joint Resolution 4 is attached.

Sincerely yours,

FRANK PACE, Jr., *Director.*

The CHAIRMAN. The Chair thinks it may be appropriate to remark that inasmuch as this controversy involves the shortage of water to serve the interests of all prospective water users, attention should be called to S. 1300 which was introduced in the Senate at the last session by the chairman, to make fresh water out of sea water. This is a bill intended to authorize the Secretary of the Interior to undertake scientific research and construction of a demonstration plant to determine whether or not salt water can be so treated as to make it do the work of fresh water. If that enterprise should be a success, perhaps many of the controversies which are likely to come before this committee might be settled in advance.

Senator DOWNEY. I might suggest to the chairman we might put these controversies over, then, until we get the report as to whether fresh water can be made out of salt water.

The CHAIRMAN. Well, the research will have to take place first, otherwise the controversies would not be settled.

Senator MALONE. Mr. Chairman, I ask permission to make my statement for the State of Nevada at the end of the hearing—since we do not have all of the data assembled at this time.

The first presentation will be made by the Senator from Arizona, Mr. McFarland.

STATEMENT OF HON. ERNEST W. McFARLAND, UNITED STATES SENATOR, STATE OF ARIZONA

Senator MCFARLAND. Mr. Chairman, in conformity with the request of the chairman and the committee, as I have understood it, I will attempt to summarize the evidence which has already been presented supporting S. 75, and the report which has been made by the Secretary of the Interior on the Central Arizona project.

Last year a hearing was held and evidence was presented on Senate Joint Resolution 145. As far as that evidence is applicable to Senate Joint Resolution 4, it may be considered at the present hearing. Mr. Howell of Utah was in charge of those hearings for the Colorado River Basin States Committee.

I will leave the summarizing of the evidence, then, on Senate Joint Resolution 4 for the Basin States Committee, after the presentation of the evidence in behalf of Senate Joint Resolution 4.

I think Mr. Howell, on account of the illness of his wife, is going to have to return to Utah and would like to make just a brief statement at this time, if it is agreeable with the chairman.

The CHAIRMAN. Without objection, it may be made.

STATEMENT OF J. D. HOWELL, OGDEN, UTAH

Mr. HOWELL. Mr. Chairman and members of the committee, my name is J. D. Howell, and I reside at Ogden, Utah. When this resolution which is now before the committee was presented to the Basin States Committee, the following resolution was adopted, which I desire to read into the record.

Senator KERR. What is the date of the resolution?

Mr. HOWELL. It is February 17, 1949:

Be it resolved by the Colorado River Basin States Committee, representing the States of Wyoming, Utah, New Mexico, Colorado, and Arizona, and open to the States of Nevada and California, in meeting assembled in Salt Lake City, Utah, this 17th day of February, 1949, That said committee is opposed to the proposed Senate Joint Resolution 4 by Senator McCarran in the present session of Congress, and companion resolutions introduced in the House of Representatives, because in the opinion of the committee, the resolution if adopted as proposed would have a tendency to delay the development of projects on the Colorado River.

Resolved further, That a committee consisting of one member from each State be appointed to confer with the Senators and Congressmen from the member basin States for the purpose of determining the best means of presenting the views of this committee to Congress and protecting the interests of the member basin States in the Colorado River.

That resolution was unanimously adopted by the committee and the subcommittee that was apointed to present the matter to this committee, which consists of Judge Clifford H. Stone of Colorado, Mr. Charles A. Carson of Arizona, Judge Fred E. Wilson of New Mexico, Mr. L. C. Bishop of Wyoming, and myself, who was subsequently appointed as chairman.

The committee, following the mandate of this resolution, has arrived at the conclusion that although this resolution contemplates a different type of litigation for the adjudication of the differences between the lower States of the Colorado River than that which was contemplated by Senate Joint Resolution 145, which has been referred to here this morning, nevertheless the principal arguments which the committee made against that resolution are applicable to this resolution now before the committee.

At that hearing, the views of the upper basin States were presented fully, both by written briefs, and by oral testimony. The committee therefore has determined that those arguments which are applicable to this resolution, as well as to the former resolution, can be presented in this way: Namely, by a summary of the arguments which were made at that time in opposition to Senate Joint Resolution 145.

Accordingly, the committee has asked Mr. J. H. Mouer to make such a summary, and with the permission of the committee at the appropriate time that summary will be presented to the committee and upon that the upper basin States, as represented by the Basin States Committee, and by the subcommittee of that committee, will be presented, if that be agreeable to the committee.

The CHAIRMAN. Without objection, that will be done.

Senator MALONE. Mr. Chairman.

Mr. Howell, you represent Utah?

Mr. HOWELL. I do.

Senator MALONE. Appointed by the Governor, I presume?

Mr. HOWELL. Appointed by the Governor, and also as assistant to the attorney general of the State.

Senator MALONE. Is the State of Nevada represented in your meeting?

Mr. HOWELL. The State of Nevada was not represented in the meeting of the Basin States Committee, as I have indicated, nor was the State of California. While they were members of this committee originally, they withdrew from the committee prior to this time, and were not present when this resolution was adopted.

Senator MALONE. That is all.

The CHAIRMAN. Very well, Senator McFarland.

STATEMENT OF SENATOR McFARLAND—Resumed

Senator MCFARLAND. Mr. Chairman, I wish now to summarize first the provisions and the purposes of S. 75——

Senator DOWNEY. Mr. Chairman, if I may interrupt. Does the Senator wish not to be interrupted for questions during the reading of his manuscript, or shall we wait until he is through?

Senator MCFARLAND. Mr. Chairman, I would prefer to wait until we are through in order that we could have an orderly presentation of this.

Senator DOWNEY. That is highly agreeable.

Senator MCFARLAND. Some of the questions in my statement will need to be answered by engineers and members of the Bureau of Reclamation.

The CHAIRMAN. Very well.

Mr. MCFARLAND. I would like first to state to the committee what the Central Arizona project is, and to give a brief summary of the provisions of S. 75, in order that we will know what we are talking about, both in regard to S. 75 and in regard to Senate Joint Resolution 4.

Mr. Chairman, Arizona has placed in cultivation in Central Arizona approximately 725,000 acres of land. Mostly, those lands are in Maricopa County, in what is known as the Salt River Valley, and down below under the Gillespie project; and over in Pinal County [indicating on map].

In Maricopa County we have approximately 445,000 acres in cultivation altogether, of which 242,000 is within the Salt River Valley Water Users Association project.

In Maricopa County these lands are irrigated, some of them both by pumped water and by gravity water, from the Salt River, and there are some lands irrigated entirely by pumped water.

Over in Pinal County we have what is known as the San Carlos project, which comprises some 100,000 acres. Half of this land belongs to the Indians, and half belongs to white owners. Those lands are irrigated by both gravity water and by pumped water. There are other lands, over 100,000 acres in Pinal County, probably 140,000 altogether, which are irrigated mostly by pumped water.

Now, up in the Safford Valley, and the Duncan Valley, we have some 40,000 acres of land; then this project reaches up into New Mexico and provides for irrigation for some lands up there [indicating].

This is principally a rescue project. No new lands are to be brought in, but we are to irrigate with this supplemental water the lands which are already in cultivation, or which have been in cultivation.

The project provides for the building of a dam at Bridge Canyon and a couple of silt control dams, one up at Bluff Dam site and one at Coconino Dam site [indicating].

The CHAIRMAN. For the record, you might state on what streams those respective dams are.

Senator MCFARLAND. The Coconino Dam site is on the Little Colorado, and the Bluff Dam site is on the San Juan River.

The CHAIRMAN. And the Bridge Canyon?

Senator MCFARLAND. That is on the main stream of the Colorado River. I thank you, Mr. Chairman.

Now, the Bridge Canyon Dam would provide power for the project and power to be sold to users who are in need of power in that area.

The bill provides for the building of a tunnel from the Bridge Canyon down to the area easterly of Lake Havasu.

But it further provides that the building of that tunnel be delayed until Congress by making appropriation expressly therefor determines that economic conditions would justify it. Under present conditions the cost of construction is so high that the Bureau of Reclamation does not feel there would be justification for constructing that tunnel at this time.

So the water is to be taken from Lake Havasu, behind Parker Dam, and lifted by four lifts to an elevation of approximately 985 feet, then taken by gravity over to Granite Reef on the Salt River, then by another aqueduct over to Pinal County, along to the Ashurst-Hayden Dam, which is a diversion dam; then on down to the reservoir in the Santa Cruz country for the irrigation of lands down around Eloy and Picacho, and in that area [indicating].

Then by the trading of water, giving Colorado River water to users in the lower areas in exchange for waters on the Gila, it is the intent of the bill to provide supplemental water for the Duncan and Safford Valleys, and for lands in New Mexico which are now, or have been, under cultivation.

That, in brief, Mr. Chairman, covers the provisions and objects of the bill. The arguments and reasons for the project could be divided into three subheads:

First, the need of the water by central Arizona.

However, before proceeding on the question of need, I would also like to call attention to one thing that I overlooked, and that is that the lands in the Salt River Valley, in Maricopa County, and some of the other projects, are irrigated by gravity from a series of dams. The first one is the Roosevelt Dam, the construction of which I believe was begun in 1903. That dam has a storage capacity of approximately 1,637,000 acre-feet. Here is the Roosevelt Dam [indicating].

Senator MILLIKIN. Mr. Chairman, may I ask the Senator to state how many acre-feet of water are customarily used for water irrigation of the crops?

Senator MCFARLAND. I am going to come to that in just a minute, if I may, Senator.

Senator MILLIKIN. Go ahead.

Senator MCFARLAND. Below that dam there are three other dams on the Salt River which, as you will note here, are the Horse Mesa Dam, the Mormon Flat Dam, and the Stewart Mountain Dam; and also two dams on the Verde River.

The total storage capacity of all those dams is approximately 2,000,000 acre-feet.

The San Carlos project is irrigated, so far as gravity water is concerned, from the storage of water behind the Coolidge Dam, which has a storage capacity of 1,200,000 acre-feet.

Now, Mr. Chairman, it will be noted that the storage capacity on the Gila and Salt Rivers is sufficient to meet the needs of our State, but the water itself simply isn't there.

Senator Millikin asked me the question as to how much water was needed. In the early days of the Bureau of Reclamation when this project was first started, Senator, it was estimated that 3 acre-feet was sufficient. At that time the crops were principally grain and alfalfa. It takes a relatively small quantity of water for grains. It—that is, 3 acre-feet of water per acre—was sufficient to meet the needs back in those early days.

But with the development of irrigation in the West, it was found advisable to produce crops during seasons when they are not grown in other parts of the United States, for two reasons: One, it is more profitable; and second, they are needed by the other localities. And then multiple cropping developed. Until now it is estimated by the Bureau of Reclamation and by everyone, practically, who is experienced in irrigation, that the duty of water should be 4 acre-feet at the headgate.

Now, this was one of the causes for the shortage of water in Arizona. I would not say it was a mistake, because that was the duty of water that was actually used there in the earlier days. I can remember the time, for instance, when it was thought that 2 acre-feet was sufficient water to produce a cotton crop. Now they use much more than that.

Changes have been made in irrigation and in farming in our State. As I state, that is one of the causes for the shortage of the water.

Secondly, we began to pump water in Arizona originally because the lands were becoming waterlogged. Then it was found that because of the increased efficiency gained through the development of machinery for pumping, and with cheaper power, pumping became very profitable. So, we have overpumped our underground water supply.

Our present water supply consists of 1,676,600 acre-feet of gravity water which is obtained by use and reuse. We haven't that much gravity water, but we use it and divert it at every opportunity we can when it returns to the river.

We start up here at Granite Reef; we go on down here and divert all we can at Granite Reef; then there is a return flow and we divert all of it again down at Buckeye for that project, both from the Gila and the Salt. Then when we get down to Arlington, why, we again divert all of it. Then down in the Gillespie project they pick up the remaining water which returns to the river.

It is by that use and reuse that we have been able to keep in cultivation such a large area of land, together with the fact that we

use pumped water. It is estimated we are pumping about 1,116,300 acre-feet of water from our underground water supply.

The Reclamation Service estimates that 468,000 acre-feet of this pumped water is overpumped. In other words, we are lowering the underground water level from year to year until it will soon be exhausted or soon be so low that it will no longer be profitable to pump.

Mr. Chairman, I want my transcript printed in full in these hearings, but I am summarizing the summary, if you may call it that.

The CHAIRMAN. Without objection, it is so ordered.

Senator MCFARLAND. The Bureau of Reclamation estimates that we need to divert from the Colorado River 1,200,000 acre-feet to supplement our present water supply which will, according to their figures, deplete the main flow of the Colorado River by 1,077,000 acre-feet.

The tables showing the need of the water are found on pages 14 and 15 of my summary, which you have before you. I will not read them, but you, of course, will have the figures for reference.

The Bureau of Reclamation estimates that between the years 1940 to 1944, there were out of cultivation on account of lack of water 105,790 acres of land, which had been previously irrigated. Since that date it has been even worse.

I would call your attention to the testimony of K. K. Henness, of Pinal County, he being county agricultural agent, given in the spring of 1947, where he pointed out there had been apportioned only eighty-five one-hundredths of an acre-foot of water for that project. With a duty of water of 4 acre-feet, it meant this: That the farmers in that project were compelled to let three-fourths of their land lie idle, or inadequately to irrigate all of it, which means the same thing.

Mr. Corbell, for the Salt River Valley project, pointed out that at that time (that is, 1947) there were only 2 acre-feet of water available, which meant that the Salt River Valley Water Users Association was compelled to let half of their lands lie out, or inadequately irrigate it, which amounts to practically the same thing.

He also pointed out that during the last 25 years there were only 2 years when they had an adequate water supply.

I feel, Mr. Chairman, that this sufficiently describes the need of this project for the State of Arizona.

The Bureau of Reclamation reports show that if this project is not built there will have to be about 230,000 acres of land go idle or be put out of cultivation, land which has been previously under cultivation. Part of that land is already out.

That is what this project will mean to the State. The population of the State of Arizona in the agricultural areas is approximately 504,000. Taking it on a comparative percentage basis between the land that will be removed from cultivation permanently, and the lands that will stay in cultivation, it will mean that about 150,000 people will have to find homes elsewhere; that the banks will fail; that business houses will fail; and the economic conditions of the State will break down.

That is the reason, in brief, why we are urging an early authorization of this project. If there are long delays, then it will be too late.

The second feature we must consider is the feasibility of the project. Turning to page 17 of my summary you will find the cost of the project is estimated to be $738,408,000.

On page 18 you will find the allocations by which those costs will be paid.

The report definitely shows that the central Arizona project has engineering feasibility in that there are no physical obstructions that would be encountered during its construction that could not be overcome.

The project is also financially feasible under the provisions of S. 75 in that it could reasonably be expected to repay the reimbursable portions of its construction costs well within the useful life of the project. It has been found that $4.75 per acre-foot, which local interests have indicated they are willing and able to pay, would more than——

Senator MILLIKIN. Would you mind stating that again, Senator?

Senator MCFARLAND. It has been found that $4.75 per acre-foot is the amount we estimate we could reasonably pay for this water, and that we would be willing to pay, if that were to be found the amount that we should pay.

It has also been found that a charge of 15 cents per thousand gallons for municipal water would fully repay all costs allocated to that purpose and would be equally advantageous to the municipal water users.

I forgot to point out that this project would also benefit the city of Tucson by a dam on the San Pedro, as well as benefit the water users on the San Pedro by making exchanges of water possible. This would have to be done by agreement with the lower users now having rights to the use of the water.

The project represents a sound investment for the Nation in that the tangible benefits of the project would exceed the total cost to the Nation in the ratio of 1.63 to 1.

In addition, there would be innumerable intangible benefits accruing to the State of Arizona and to the Nation as a whole as a result of the central Arizona project.

Now, Mr. Chairman, I would like to turn to the availability of water for the project, which was a contention made here this morning in executive session.

The CHAIRMAN. May I ask you, Senator, with respect to this table on page 18, which column indicates the allocation of the reimbursable items under the present bill?

Senator MCFARLAND. I might point out that S. 75 is practically the same as S. 1175, and it would be under that column.

When speaking, Mr. Chairman, of the availability of water, one must remember that there is the separate item of the physical quantities which may be available, and the distinct but related item of legal entitlement to the use of water.

I say with positive assurance that there is adequate water in the Colorado River fully to supply the central Arizona project, and that Arizona is clearly entitled as a matter of right and justice to the exclusive use of that water. Moreover, such use will not interfere with or burden any other right of use existing in law.

The long term (1897–1943) average annual flow of the Colorado River under virgin conditions at Lee Ferry was 16,270,000 acre-feet; at the international boundary it was 17,720,000 acre-feet. The average annual flow under virgin conditions for the years 1931 to 1940.

a period of low flow, at Lee Ferry was 12,214,000 acre-feet; at the international boundary it was 13,001,000 acre-feet (statements of V. E. Larson, pp. 46, 47 of hearings, and E. B. Debler, pp. 301–303 of the hearings.)

Mr. Debler pointed out that in low run-off period, and allowing for evaporation and other losses, the over-all or total availability for depletion to all users of the Colorado River water may be a bit less than the maximum quantities apportioned in the Colorado River compact and by the water treaty with Mexico. Even so, there would be available for diversion to Arizona for its central Arizona project 1,200,000 acre-feet, which is the amount required. (See Mr. Larson, p. 54; Mr. Debler, p. 303.) Mr. R. J. Tipton took occasion to note his concurrence with Mr. Debler (pp. 535–539). Mr. Debler estimated that the net annual depletion of the Colorado River water by the central Arizona project will be 1,067,000 acre-feet (p. 303).

I have condensed my statement concerning the physical availability of water to the foregoing ultimate factual assertions, but the other and more extensive evidence will supply both detail and corroboration. That evidence is to be found, Mr. Chairman, in the testimony references I have given at the bottom of this summary.

Now we come to the question of the availability of water, or Arizona's right to water, as a matter of law.

This phase of the case may be much more readily presented and grasped by a review of matters leading to our present situation.

In the year 1922 the States of the geographical area described in the testimony as the Colorado River Basin were striving among themselves to arrive at an agreement leading to the beneficial use of the waters of the Colorado River for irrigation and the generation of electric power. The delegates from those States proposed the now renowned Colorado River Compact. A controversy arose over the inclusion of the waters of the Gila River within the Colorado River system, and hence with those to be apportioned by the compact, a move unalterably resisted by the Arizona delegation because the waters of the Gila had long been put to beneficial use by the citizens of that State, and because the waters of the Gila enter the Colorado at a point so southerly as to prevent the enjoyment thereof by any of the basin States other than Arizona. In fine, the Gila was no part of the Colorado waters which were the proper subject of apportionment. The Arizona delegates were agreeable, however, to the provisions of article III (a) of the compact, which proposed the annual apportionment to the upper basin, and a like apportionment to the lower basin, of 7,500,000 acre-feet of water from the Colorado River if the waters of the Gila were reserved for Arizona. As a consequence, and in order to compensate Arizona for the inclusion of the Gila waters in the Colorado River system, the delegates agreed upon acticle III (b) of the compact, which reads as follows:

(b) In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum.

This quantity of 1,000,000 acre-feet per annum corresponds to the then estimated annual flow of the Gila River at its mouth where it empties into the Colorado.

The history of the meaning and purpose of article III (b) of the compact is related in the testimony of Mr. Ralph Meeker, who was, during the negotiation of the Colorado River compact at Santa Fe, the engineer adviser for the State of Colorado. He was present at the compact sessions and of his own personal knowledge is familiar with the background of the compact. His testimony is found from page 473 to page 481 of the record of the hearing on S. 1175. I call particular attention to pages 475 through 476 thereof, where Mr. Meeker makes it plain that it was understood by all the negotiators that 1,000,000 additional acre-feet were apportioned to the lower basin to be used in Arizona, because the Gila River was included in the compact. He also quoted (p. 475) from the report of Frank C. Emerson, commissioner for the State of Wyoming for the Colorado River compact, and from a citation from the Colorado River Compact, by Reuel Leslie Olson, showing that this was understood by L. Ward Bannister, special representative for Colorado at the negotiations.

Likewise in support of the identical history and meaning of this article III (b), I refer to the testimony of Mr. Charles A. Carson, now chief counsel for the Interstate Stream Commission of Arizona, wherein he incorporates testimony of Hon. Thomas E. Campbell, former Governor of Arizona(p. 225 et seq. of said hearings), of Mr. W. S. Norviel, Arizona's commissioner at the compact sessions (p. 227 et seq. of said hearings), and of Mr. C. C. Lewis, another of Arizona's representatives at such sessions (p. 229 et seq. of said hearings). The testimony of the three individuals last named is based upon personal participation and direct knowledge of these matters.

Hon. Herbert Hoover, then Secretary of Commerce, who represented the Federal Government and presided at the compact sessions, most certainly knew and recognized that Arizona had succeeded in gaining the apportionment made in article III (b) to compensate for the inclusion of the Gila within the Colorado River system (note Mr. Carson's testimony, pp. 222–224 of said hearings).

Mr. E. B. Debler, who has had intimate personal connection with the problems of the Colorado River continuously since a date prior to the compact, who from 1921 to 1943 was in charge of most of the project planning for the Bureau of Reclamation, and who from 1944 to April of 1947 was regional director of the Bureau's region 7, is entirely clear that an additional million acre-feet was apportioned by article III (b). (See, for example, his statement at pp. 292–294 of said hearings.)

When the Arizona delegate signed the compact in November of 1922, he did so with a clear understanding and agreement that the States of Nevada, California, and Arizona would enter a tri-State agreement which among other things would apportion to Arizona the exclusive beneficial use of all water of the Gila River, the equivalent of the 1,000,000 acre-feet of water apportioned in article III (b) of the compact (see pp. 222, 225–226, 228–229). Thereafter, California would not agree to a just division of the water of the Colorado River which had been apportioned to the lower basin; so, the people of Arizona would not ratify the compact at that time.

The Colorado's uncontrolled flow proved increasingly harmful as well as wasteful of potential benefit. California's anxiety to avoid floods along the neighboring California lowlands and to procure

water and electric energy for her coastal communities made her especially anxious to harness and utilize the Colorado. Further interstate negotiations having proved unavailing, congressional action for the construction of Boulder Dam was inaugurated. This led to the passage of the Boulder Canyon Project Act—45 Statutes 1057, Public Law 642, Seventieth Congress—on December 21, 1928.

As to the course of that bill in the Senate, I have set out in my written statement the quotation in detail of testimony given by Senator Hayden, who was in the Senate at that time, and who very carefully points out that the Boulder Canyon Project Act was the result of a compromise after one filibuster and the threat of another filibuster. It was only when this compromise was made that Arizona agreed that the Boulder Canyon Project Act could be passed.

I would like to call attention to the fact that the act by its own terms, section 4 (a), was to become effective upon either of two conditions. The first of these was ratification of the Colorado River compact within 6 months by all seven of the States affected. The second was ratification of the compact by six of the interested States, including California, and the irrevocable and unconditional enactment by the legislature of the latter State of a statute which—and I now quote the exact language of said section 4 (a):

> shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph (a) of article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said contract.

California promptly enacted a statute—(Act 1492, California Statutes 1929, page 38—sometimes spoken of as the Self-Limitation Act, the pertinent part of which is verbatim with the language just quoted from the Boulder Canyon Project Act. In view of the extremely liberal quantity of water specified as a maximum, and in view of her need for flood control, water, and electrical energy, California's willingness to adopt her Self-Limitation Act is quite understandable.

Section 4 (a) of the Boulder Canyon Project Act also unequivocally voiced the permanent intention of the Congress to define and limit California's maximum rights, and California irrevocably and unconditionally agreed to that limitation.

Having limited California to 4,400,000 acre-feet per annum of the 7,500,000 acre-feet apportioned by article III (a) of the Colorado River compact, as I have already shown, and having further limited California to half of any excess or surplus waters unapportioned by that compact, Congress further provided that—

> The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the seven million, five hundred thousand acre-feet annually apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada three hundred thousand acre-feet and to the State of Arizona two million, eight hundred thousand acre-feet for exclusive beneficial consump-

tive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico— * * *.

The foregoing factors plainly define the congressional purpose. Congress manifestly intended that of the 7,500,000 acre-feet of Colorado River water apportioned by article III (a) of the compact, Nevada is to receive 300,000; Arizona not less than 2,800,000; and California not to exceed 4,400,000. It is also clear that Arizona should receive, in addition, all the waters of the Gila River, both because of the previously mentioned insertion in the compact of its article III (b)—which apportions 1,000,000 acre-feet per annum to the lower basin to compensate Arizona for inclusion of the Gila in the Colorado River system—and because of the specific authorization, in section 4 (a) of the Boulder Canyon Project Act, of the agreement whereby Arizona is to receive all the water of the Gila and its tributaries within Arizona's boundaries.

From the mere reading of the language of the Boulder Canyon Project Act it is evident that Congress proposed to California the terms of a contract for the explicit benefit of Arizona, Nevada, and the other interested States. The contract thus proposed was as follows: Of the 7,500,000 acre-feet of Colorado River water apportioned to the lower basin by article III (a) of the compact, California should have not to exceed 4,400,000 and that California could use not more than one-half of any water in excess of or surplus to the water apportioned by the compact, which might be available in the lower basin.

Senator DOWNEY. Mr. Chairman, if I may interrupt?

The CHAIRMAN. Senator Downey.

Senator DOWNEY. I am bound to be on the Senate floor at its opening this morning.

The CHAIRMAN. Off the record.

(Discussion off the record)

The CHAIRMAN. Let us proceed, then.

Senator MCFARLAND. California, by adopting its Self-Limitation Act, unequivocally and unconditionally accepted this proposal and thereby completed a binding contract. As California may not have more than 4,400,000 acre-feet of the water apportioned by article III (a) of the compact, the balance is for Nevada and Arizona; and Congress has in terms indicated its intent that Nevada have 300,000 acre-feet and Arizona not less than 2,800,000 acre-feet. This intent has been executed. The water involved in article III (b) of the compact not only is "apportioned" water, but is in effect apportioned to Arizona for the reasons shown. The Colorado River water which is available in the lower basin in excess of or surplus to that apportioned by articles III (a) and III (b) of the compact is to be equally divided between California and Arizona.

This contract between the State of California and the United States—for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming—just as completely settled California's rights as any compact could do. Congress, by approving in

advance a compact between Arizona, California, and Nevada, definitely gave its interpretation of the California Self-Limitation Act, which is the one Arizona now relies upon; and California by adopting the act accepted and agreed to this interpretation.

Arizona, relying on the protection thus afforded her, adopted and ratified the Colorado River compact. A large number of the people of Arizona believed that Congress had not required California to limit herself to a small enough quantity of the water of the Colorado River. However, Arizona had little choice, as the rights of the States were well defined in the Boulder Canyon Project Act by the Congress of the United States. She has entered into a contract with the Secretary of the Interior, which contract calls for delivery of 2,800,000 acre-feet of Colorado River main stream water per year, plus one-half of the excess or surplus water unapportioned by the compact which may be available in the lower basin, less one twenty-fifth of such surplus water, to be used by Nevada. The contract appears at pages 240–243 of said hearings on S. 1175.

It is significant that the Department of the Interior in a regulation promulgated by it under date of February 7, 1933, authorized the proffer to Arizona of a water-delivery contract which contained this provision.

I will not read that in detail, Mr. Chairman, but I would like to point out that at that time Secretary of the Interior Wilbur authorized Arizona to receive 2,800,000 acre-feet of water of the Colorado River and all of the waters of the Gila River. That showed the interpretation of the then Secretary of the Interior toward the Boulder Canyon Project Act.

The change in administration shortly thereafter terminated negotiations for this contract; but the noted language is most illuminating as an administrative determination by the Bureau of Reclamation of Arizona's right to all the water of the Gila, as well as 2,800,000 acre-feet annually of the main-stream waters of the Colorado stored at Hoover Dam Reservoir. See page 238 of said hearings.

California admits that she is bound by the California Self-Limitation Act and is not entitled to more than 4,400,000 acre-feet of article III (a) water and one-half of any excess or surplus water unapportioned by the compact. However, in an effort to procure more so-called surplus waters for herself, thereby in actuality reducing the quantity of apportioned water to which Arizona is rightfully entitled, California has elected to pursue a stratagem based largely upon two patently strained and inequitable constructions of the wording of the Colorado River compact. In a general way, these false constructions may be stated as follows:

(*a*) The water described in article III (b) of the compact is water unapportioned by the compact.

(*b*) A definition of "beneficial consumptive use," which would charge Arizona with the total water reaching the Gila watershed rather than with the amount by which she depletes the waters of the Colorado River at the mouth of the Gila.

Neither of these contentions is supported by the intentions of the framers of the compact or by those of the Congress of the United States when they passed the Boulder Canyon Project Act.

As to the contention that the water embraced in article III (b) of the compact is not apportioned, and therefore falls within the class of

"surplus or unapportioned" water of which California may have half under the provisions of the Boulder Canyon Project Act, enough has been said above to demonstrate its utter fallacy. Congress in effect has indicated its intention as to the division of the waters apportioned by article III (a) of the compact—that is, California, not more than 4,400,000; Nevada, 300,000; Arizona, not less than 2,800,000; total, 7,500,000. As shown, the ultimate purpose of article III (b) was to apportion the waters of the Gila to the lower basin for use by Arizona, and Congress explicitly recognized this apportionment by express language in the Boulder Canyon Project Act. It is therefore clear to anyone who cares to see, that the waters upon which article III (a) of the compact is effective, that is, 7,500,000 acre-feet of Colorado River water, and those upon which article III (b) is operative, that is, in final effect, the 1,000,000 acre-feet of the Gila which was thought to be substantially all thereof, are "apportioned water." The excess or surplus waters above such apportioned water are for equal division between California and Arizona, with the small reservation for Nevada previously noted.

The record abounds with proof, both within the context of the compact and of the project act, as well as in collateral circumstances, that this is the true and just situation.

I invite attention to the testimony of Judge Clifford H. Stone, director, Colorado Water Conservation Board and commissioner for Colorado for the Upper Colorado River Basin Compact Commission, whose ability, impartiality, and knowledge of these problems are generally recognized. His testimony appears on pages 513 through 521 of said hearings on S. 1175. Judge Stone demonstrated that the water embraced in article III (b) of the compact is definitely "apportioned water," page 513, and that the Supreme Court of the United States has so held in the case of *Arizona* v. *California*, 292 U. S. 341 et seq, page 517. He points out that the compact is clear and unambiguous, within its own four corners, as to the apportionment of water, page 513; that the will of the legislatures which ratified the compact is paramount, page 514, and that such will cannot in law be now thwarted through collateral efforts and documents, pages 516–517. At page 517, Judge Stone quotes the following language from a letter from the Honorable Herbert Hoover, who was the chairman of the Colorado River Compact Commission:

> Due consideration is given to the needs of each basin, and there is apportioned to each 7½ million acre-feet annually from the flow of the Colorado River in perpetuity, and to the lower basin an additional million feet of annual flow, giving it a total of 8½ million acre-feet annually in perpetuity.

I also wish to call attention to page 395 of the book entitled "The Hoover Dam Contracts," which contains the following question to Mr. Hoover in a letter of Mr. Clarence C. Stetson, and Mr. Hoover's answer:

> Why is the basis of division changed from the "Colorado River system" to the "river at Lee Ferry" in paragraph (d) of article III, the period of time extended to 10 years and the number of acre-feet multiplied by 10?
>
> I do not think there is any change in the basis of division as the result of the difference in language in articles III (a) and III (b). The two mean the same thing. By reference to article II (f) it will be seen that Lee Ferry, referred to in III (d), is the determining point in the creation of the two basins specified in III (a).

Mr. Carson ably and fully establishes the accuracy of the foregoing outline of historical and legal matters, as well as other cogent factors leading to the inescapable conclusion that Arizona is entitled to all the waters of the Gila within Arizona and not less than 2,800,000 acre-feet annually of water of and from the main stream of the Colorado, pages 221–291; 481–495. In noting that the Supreme Court had held the III (b) waters to be apportioned, Mr. Carson added that the Court also pointed out that that article is without ambiguity, pages 235, 481 of said hearings.

The second of the devices by which California hopes to gain additional water involves its own definition, highly beneficial to that State, of "consumptive use." The question is whether the quantity of water put to "beneficial consumptive use" along the course of a tributary to the Colorado River is equivalent to the amount of depletion of the virgin flow of such tributary at the confluence thereof with the Colorado River. California applies its definition of "consumptive use" to Arizona by insisting that Arizona is chargeable with all the water flowing in the Gila watershed which does not reach the Colorado. As California has no real tributary to the Colorado River and contributes practically no water to the main stream thereof, her definition is therefore peculiarly beneficial to herself and detrimental to Arizona and the upper basin States.

It is Arizona's theory that we are chargeable only with the amount of water by which we deplete the main stream of the Colorado River. That is the only amount which affects the other States. The Gila River, as has been explained, admittedly empties into the Colorado at a point which prevents use of the Gila waters by any other State. The virgin flow of the Gila at such confluence is now estimated at approximately 1,270,000 acre-feet per annum (pp. 35, 47 of said hearings), although when the compact was drawn, as above noted, the virgin flow was thought to be about 1,000,000 acre-feet and the latter was consequently the amount used in article III (b) as the additional quantity apportioned to the lower basin for use by Arizona.

As has been demonstrated, the framers of the compact, for the precise purpose of compensating Arizona for the inclusion of the waters of the Gila River within the Colorado River system, apportioned an extra million acre-feet per annum to the lower basin States, for use by Arizona. Simply stated, Arizona was to have the use of the waters of the Gila. Congress then proceeded to place an absolute and concrete interpretation upon the compact when it enacted the Boulder Canyon Project Act, wherein it specifically authorized a compact for apportionment of the 7,500,000 acre-feet of water flowing in the Colorado River below the point of delivery at Lee Ferry—the water embraced in article III (a) of the compact—and for the exclusive beneficial consumptive use by Arizona of the Gila River and its tributaries within the boundaries of that State—the equivalent quantity of water embraced in article III (b) of the compact—explicitly providing that, except as to return flow of the Gila waters after the same enter the Colorado, the Gila waters should never be subject to diminution by any allowance of water to Mexico under treaty.

As indicated, the physical, geographical fact is that water of the Gila, after entering the Colorado, can be used solely in Mexico. It follows that Congress clearly recognized and intended that any meas-

urement of Gila waters under the compact and project act must necessarily be gaged by the amount of depletion of the Colorado at the mouth of the Gila, a process inevitably involving establishment of the difference between virgin flow and actual out-flow.

Congress made its views clear to California in the Boulder Canyon Project Act; and, as California accepted the terms of that act by promulgating its own Self-Limitation Act, restricting itself to 4,400,000 acre-feet of the Colorado waters apportioned by article III (a) of the compact plus not more than one-half of any excess or surplus waters unapportioned thereby, California perforce recognized the method for determining what was "excess or surplus waters," which method among other elements gave to Arizona 2,800,000 acre-feet per annum of the Colorado River water controlled by article III (a) of the compact, as well as all the Gila waters, except return flow after the same entered the Colorado.

The foregoing is by no means the only argument or theory substantiating Arizona's contention; it is merely supplemental to other probative circumstances appearing in the testimony.

In any consideration of the term "beneficial consumptive use," it is essential that a differentiation be maintained between the chemical and physical processes which attend the consumption and use of water, and the geographical place where such use is to be measured. It seems evident that the framers of the compact had in mind the apportionment of gross quantities of water and the measurement thereof in terms of depletion of the Colorado River.

As Mr. Meeker states, the negotiators of the compact were thinking of and dealing with surface waters (p. 476); and they considered consumptive use in terms of depletion of the Colorado (p. 477), the measurement of which depletion in the case of a tributary involved the difference between the virgin flow and the actual out-flow, such difference being the consumptive use (p. 480). The negotiators' intention was that the upper basin could deplete the Colorado by 7,500,000 acre-feet per year, measurable at Lee Ferry, and that the lower basin might deplete the river by 8,500,000 acre-feet per year, measurable at the boundary between the United States and Mexico (p. 475). The depletion caused by use of the water of the Gila was to be measured at its confluence with the Colorado (p. 475).

Mr. Tipton summmarized the respective positions of California and Arizona in this language (p. 522 of said hearings):

> Beneficial consumptive use as it is used in the Colorado River compact is interpreted by California to mean the aggregate of all the individual items of consumptive use at the points of use. Arizona interprets the term to mean depletion of main-stream Colorado River waters as a result of man's activities.

He then conclusively demonstrated the propriety of the Arizona view, noting the peculiar and unique benefit which would accrue to the benefit of California alone and the harm which would fall upon all the other basin States if California's theory is sound. He states (p. 529):

> It is my conclusion that the Colorado Compact Commission did apportion the virgin flow of the Colorado River and that it considered the consumptive use to be synonymous with depletion at Lee Ferry and that it did consider consumptive use on the Gila to be synonymous with the depletion of the Gila River flow at the mouth.

He also logically pointed out that the term should be taken as intended by the commissioners, rather than by latter-day partisans, and that the commissioners used such terms as I have just outlined (p. 523–524). Mr. Hoover also held this view as to the equivalence of consumptive use and depletion (p. 525). Mr. Tipton noted that notwithstanding California's claim to a self-created "priority" of 5,362,000 acre-feet of Colorado River water per year, her actual maximum diversion up to 1945 was approximately 2,800,000 acre-feet (p. 540). Of 2,717,530 acre-feet delivered to California in 1946, 1,074,150 flowed as waste to the Salton Sea (Bureau of Reclamation chart, p. 568). Mr. Tipton noted that California is attempting to carve out her fanciful "priority" from Arizona's water and the supplies of the upper basin (pp. 541–542).

In the course of his testimony (pp. 522–548), Mr. Tipton is at pains to support his opinions by references to minutes of the meetings of the compact sessions, and the views of eminent engineers and lawyers.

I would also call attention to the testimony of Mr. Charles A. Carson, given upon this topic (pp. 481 to 490), which sustains the soundness of Arizona's position.

Particularly, I desire to reemphasize the testimony of the Honorable Clifford H. Stone on this subject (pp. 519 to 521). I call special attention to that portion where it is pointed out that the framers of the compact intended depletion to be the measure of consumptive use. I also call attention to the language of Judge Stone at the conclution of his testimony, which language I now quote:

> Then, in conclusion, the Congress, we believe, will not approve an unconscionable position in interpreting the Colorado River compact for the purpose of proposed legislation. Nor would a court give approval to any interpretation of a solemn agreement among States which would be inequitable. It cannot be assumed that the compacting States intended to apportion water between the upper and lower basins of the Colorado River by terms and conditions the interpretation of which would limit one of the States to its existing uses of water when the compact was made, with a comparatively small opportunity for future development. We submit that the States did not do so.

Patently, throughout the testimony of California, this is exactly what her witnesses are saying: The compact must be so interpreted that the Gila River is practically all of the water to which Arizona is entitled.

I will not reiterate the arguments at length, but will call attention to the fact that it is admitted by California witnesses that if Arizona did not appropriate water of the Gila and allowed such water to flow in an uncontrolled manner, the other States would not even get the benefit resulting from the supply of a million acre-feet to Mexico, under the treaty. Because of the terms of the treaty, and because the unappropriated waters would go down the river in flood periods, not nearly a million acre-feet could be used by Mexico under the circumstances. Reference is made to the testimony of Mr. C. C. Elder, hydraulic engineer, Metropolitan water district of southern California (pp. 423–424), and of Mr. James H. Howard, general counsel, Metropolitan water district of southern California (p. 332), where admissions of this point are made.

Nothing is more indicative of California's stubborn intention to gobble up much more than the lion's share of the water, than her stand upon the question of evaporation losses. She contributes nothing to

the Colorado, and she is far and away the greatest beneficiary thereof. Yet she would bear none of the loss of evaporation, and would foist that, too, upon her sister States. Arizona favors an equitable distribution of these losses in proportion to the beneficial interests—note Mr. Carson's remarks as to evaporation losses, pages 62–64; and Mr. Debler's remarks and schedules, pages 300–307.

Some point was made of the absence of an underground water code in Arizona. Such a code now exists. It is contained in chapter 5, Laws of the Sixth Special Session of the Eighteenth Legislature of Arizona.

Now, Mr. Chairman, in order to save time I will not read the balance of my statement but will ask that it be printed in the record.

The CHAIRMAN. Without objection, it may be printed in the record.

Senator MCFARLAND. But I would like to call attention to the facts set forth in the remaining part of the statement.

California, through advertisements and propaganda, continuously claims the present need of this water for California. It is not denied by the California witnesses that if she did not put in cultivation the East and West Mesas of the Imperial Valley she would have all of the water she needs. Reports have been made upon that project, Mr. Chairman, which should settle this question once and for all.

I call attention to the Bureau of Reclamation's classification of the lands which are irrigable on the East Mesa. Only about 35,900 acres (or about 16 percent) are classified as irrigable, and of these only 5,350 acres are classified as class II lands, the remaining 30,500 being classified as class III lands, the poorest class of irrigable lands. I would like to call attention to the fact that the University of California participated in the soil surveys for that classification.

I would also like to call attention, Mr. Chairman, to the recent Economic Repayment Capacity Report by the Bureau of Reclamation. References to this report are on pages 50 to 53 of my statement, where it is pointed out that only 33,872 acres in the potential units would be irrigable and could repay only a small part of the cost of the irrigation.

In other words, Mr. Chairman, according to the Bureau of Reclamation, this problem is already settled, as far as California is concerned. However, I want it plainly understood that we are not contending that water should be apportioned to the States in accordance with their respective needs. All we ask is that California not take the water that Arizona is justly entitled to in accordance with the Colorado River compact, the Boulder Canyon Project Act, and in accordance with the limitations required of California in the Self-Limitation Act which was adopted by California.

I do not have any objection to California growing. They talk about Los Angeles becoming the biggest city in the world. I have no objection to that. But, Mr. Chairman, I want to say this. We do object to California growing at the expense of Arizona. And as pointed out in the remaining pages of my statement she can well settle her own differences without trying to take more water than she was limited to under the California Self-Limitation Act.

Now, we talk about this resolution. As I stated in the beginning and as was stated by Judge Howell, that evidence will be given by the Basin States Committee. But let me say this one word in regard

to Senate Joint Resolution 4. Its predecessor Senate Joint Resolution 145 was introduced on the last day of the hearings on this project. We never heard of California wanting to litigate this until Arizona came in and wanted a little water for her use to keep 150,000 people from having to leave the State and become displaced persons. Until then, California's desire to litigate was an unheard-of thing.

We tried to litigate; but, Mr. Chairman, as was pointed out by the testimony, there is not now a justiciable issue which could be presented to the Supreme Court of the United States. That was pointed out by such eminent lawyers as Mr. Breitenstein and others in the testimony of the last hearings. There is no justiciable issue.

What would it mean if we adopted Senate Joint Resolution 4? It would mean that several years would elapse during which California would hope to come along, get this water placed upon her own lands, and then come before Congress and say, "Well, this water is already being used in California." Don't dry us up in the meantime, during which this 150,000 people in Arizona would have to leave the State.

Mr. Chairman, we are not trying to work to the detriment of any State. This issue was settled just as much as it can be settled when California entered into the Self-Limitation Act, which limited the amount of water that she should use. The Congress of the United States by its own terms, as I have pointed out, placed the interpretation upon that Self-Limitation Act. After it had placed that interpretation upon it, California adopted it; and she is bound by that limitation.

So, Mr. Chairman, if we should adopt this Senate Joint Resolution 4 before the authorization, what would it mean? It would mean just exactly what I pointed out, that the people of Arizona in the meantime would have been dried up and would have had to leave there.

We have been able to survive temporarily because of high prices and other conditions, but these things are going to change. We are exhausting our underground water supply. All we ask this committee and all we ask Congress to do is to place Arizona in the same favorable position California has been placed in.

Did you ever hear of California wanting to litigate before she appropriated water, or before she asked for appropriations? That was an unheard of thing.

If Congress will only enact this S. 75 there may or may not be a justiciable issue. If California is right in her contentions, there will be; and if Arizona is right, there will not be.

I thank the chairman and the members of the committee for this time and, as I say, the summarization of the evidence against Senate Joint Resolution 4 will be made after California presents her evidence in favor of it.

The CHAIRMAN. Are there any questions?

Senator MALONE. Yes, Mr. Chairman.

The CHAIRMAN. Senator Malone.

Senator MALONE. I do not want to delay the committee but I would at this point like to call attention to two specific things. First, a statement made by the Secretary of the Interior in his report on the project, that the State of Nevada opposes development of the project mainly

on the grounds of its contention that Arizona's claims to water of the Colorado River are invalid.

I can find no such claim made in the Governor's letter and I certainly made none. We simply say that no definite allocation or decision of the lower basin States has been made by agreement between the States of the basin, and certainly there has been no adjudication.

The next thing is, there has never been any question in my mind about the seriousness of the lack of water in Arizona or in Nevada, either. I think the Senator has made a very fine case for his State's need for water and there is no question but what every word he says is true with regard to the necessity for additional water.

I want to call this to the attention of the committee: I have made some summations here as the Senator went along. California limited themselves, according to his statement, and while they raise some question about that I remember the limitation. It was 4,400,000 acre-feet of water. The Senator claims for the State of Arizona 2,800,000 acre-feet of water, in addition to the 1,000,000 acre-feet of water that he says represents the Gila River. I think that is correct.

Now, Nevada made a claim to 900,000 acre-feet of water in 1935 and has contracts with the Secretary of the Interior for about 300,000 acre-feet of water——

Senator McFARLAND. Which, Senator, is not disputed by Arizona.

Senator MALONE. I understand that.

Senator McFARLAND. We have no quarrel with Nevada and I do not understand why Nevada is quarreling with us.

Senator MALONE. We are not quarreling with you, Senator. My contention is that the division set down, with the advance permission which the Senate of the United States gave in 1928, for the States to enter into a certain agreement, was never entered into. Furthermore, it excluded two States who are properly members of the lower basin States. In other words, it is invalid for the two reasons.

Senator McFARLAND. Senator, may I interrupt you right there?

Senator MALONE. Yes.

Senator McFARLAND. I evidently did not make myself plain, but as far as California is concerned the interpretation was accepted by California and the contract entered into in the Self-Limitation Act, which meant the same as if a compact had been entered into, so far as California is concerned.

Senator MALONE. That I am not disputing. That is a matter of wording and that is someone else's job.

But I will continue to add up the water: 4,400,000 acre-feet for California; 2,800,000 acre-feet to Arizona; in addition to 1,000,000 acre-feet from the Gila River which most agree is in the compact. I am not interpreting that; somebody will have to do that, probably the Supreme Court of the United States. Then the 300,000 acre-feet under contract to Nevada. There is 1,500,000 acre-feet of water that the Senate of the United States gave old Mexico, as to which, of course, many of us would take issue on the ground that they never had used more than one-half of that amount.

I went over that land down there when this controversy was at its height.

But, that amount, instead of adding up to 8,500,000 acre-feet as the amount allocated totally to the lower basin States, adds up to more than 10,000,000 acre-feet of water.

Now, there is a little paragraph in that contract which says that the upper basin and the lower basin shall meet equally the deficiency. That would mean there is exactly 750,000 acre-feet of water to be made up by those upper basin States. That is part of the problem we have to meet.

I will not take the time of the committee now but at the proper time I would like to make a statement.

The CHAIRMAN. Are there any other questions?

Senator DOWNEY. I will have some questions but I will probably wait until tomorrow.

Senator MCFARLAND. I would like to point out that Mexico is to be supplied over and above the other apportioned water.

The CHAIRMAN. Are there any other members who desire to ask Senator McFarland a question?

Senator ANDERSON. I assume we can ask questions at a later time?

The CHAIRMAN. Yes, certainly.

Senator MCFARLAND. We will be glad to answer them at any time.

Senator MALONE. Mr. Chairman, if the United States Congress should authorize this project it will be the first time in the history of this Nation that the Congress of the United States appropriated the taxpayer's money to utilize the water in a stream system which may belong to another State in the absence of an interstate agreement or an adjudication of such by a court of competent jurisdiction.

The CHAIRMAN. It will be impossible for the chairman to be here this afternoon, and Senator Cordon is also absent. So unless there is objection, when this meeting is adjourned the Chair will take a recess until tomorrow morning at 10 o'clock.

Senator DOWNEY. Mr. Chairman, it is unfortunate for me but it looks as though I will have a very heavy week, due to causes that the chairman may know of, that is, on the Senate floor in the afternoons. I would prefer that we do not hold the sessions in the afternoon.

The CHAIRMAN. The committee will try to accommodate all the members.

(The prepared statement of Senator McFarland reads in full as follows:)

STATEMENT OF SENATOR ERNEST W. MCFARLAND IN SUPPORT OF SENATE BILL 75

Mr. Chairman and members of the committee:

In order to save the valuable time of the committee and to furnish a perspective of the matter now in hearing, I wish to summarize, first, the provisions and purposes of S. 75 and, second, the evidence which has been introduced in previous hearings before this committee and the corresponding committee of the House in support of the objectives of this bill.

I respectfully call to your attention the fact that S. 75 is, with a very few minor changes, the same as S. 1175, upon which hearings were held during the sessions of the Eightieth Congress. During those sessions hearings were also held on the Senate side upon Senate Joint Resolution 145, which had for its underlying purpose the same as that of Senate Joint Resolution 4, the latter of which was introduced in this session of Congress and is now before the committee. Hearings were held on the House side during the preceding session upon various bills which were the companions of Senate Joint Resolution 145.

I would also call your attention to the fact that final action was not taken on S. 1175 for the reason that the report of the Department of the Interior on the

central Arizona project had not become final at the time of the hearings and did not become final until September 16, 1948. In general and fundamental support of S. 75, I wish at this time to introduce that report as an integral part of the evidence which is offered by the proponents of the bill.

I also desire now to offer in evidence, by reference, in order to avoid the undue protraction of the transcript of the present hearings, those portions of the testimony offered by the proponents of S. 1175 and by officials of the Bureau of Reclamation during the hearings thereon in June and July of 1947, as the same has been printed for the use of this committee.

S. 75, which was introduced by Senator Hayden and myself, is a bill to authorize the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with appurtenant dams and canals for the purpose of providing supplemental water for lands now being irrigated in central Arizona.

The amount of land which would receive supplemental water under this bill is estimated in the report of the Secretary of the Interior to be approximately 639,680 acres (table B–23 of report). Other persons estimate this acreage to be approximately 725,000 (see testimony of W. W. Lane, pp. 218–219 of the hearings on S. 1175).

However, as may be plainly deduced from all the testimony, the bill would attain many other desirable objectives, direct and indirect, of incalculable value.

The provisions and objectives of the bill S. 75 are best understood if considered against the background of the long and toilsome battle Arizonians have waged to reclaim desert land and to convert it through the magic of irrigation to productive abundance. To preserve and maintain the rewards of this monumental struggle, we are now in mortal necessity of a supply of water wherewith to supplement such inadequate stores as nature and terrain have made available, which stores are depleted to an extremely critical point. (Note testimony of Mr. E. A. Moritz, for example, on p. 31 of said hearings).

Our only source of self-preservation is the waters of the Colorado River, which can best be obtained for the major area of our developed lands by raising those waters to an altitude sufficient to permit them to flow naturally to points of need, whence they may be used directly or in exchange for waters now derived by inflow from higher regions, thereby releasing the latter for use in such higher regions.

S. 75 proposes to authorize a project to deliver the life-sustaining waters to the people of Arizona.

It will do so under a plan engineeringly feasible and financially self-liquidating, which will preserve a great and sturdy American community that will continue to be an invaluable fountain of strength and revenue for its own and our Nation's security.

The bill provides for a dam at Bridge Canyon on the Colorado River in northwestern Arizona, and for a tunnel and main canal to transport water from the reservoir impounded by that dam in a general southeasterly direction to the Salt River above the presently existing Granite Reef Dam. From there a canal would be built to the Gila River above the town of Florence, Ariz., whence a canal would be constructed to the Picacho Reservoir and thence to the flood plains of the Santa Cruz River. Appurtenant to these would be a related system of conduits and canals to distribute water to lands in Maricopa and Pinal Counties. The delivery of water to these areas will satisfy the demands there, consequently affording a greater supply of the waters of the Salt and Gila Rivers to higher areas along their courses and on all their tributaries within Arizona, such as Duncan and Safford. Relief will also extend to areas along the Gila in New Mexico, and will augment municipal supplies, as in the case of Tucson, Ariz.

You will note that the boring of the tunnel will be deferred until Congress determines that economic conditions so justify. In the meantime, a hydroelectric generating plant would be installed at Bridge Canyon Dam. Part of the energy there produced would operate pumps to lift water from Lake Havasu, behind the present Parker Dam, to an aqueduct which would be constructed to convey the water easterly to the main canal previously described, at a point near Cunningham Wash. The remainder, fully two-thirds, of the electricity to be produced at Bridge Canyon Dam would be sold within an area where the demand already exists and will increase.

The cost of the tunnel will not be in evidence, as construction thereof would not occur until some date in the future, when Congress by making appropriation

expressly therefor has determined that economic conditions justify its construction.

The bill also provides for a fully coordinated system for the efficient distribution and storage of water, and for the generation and transmission of electrical energy.

Revenues derived from the delivery of water and the sale of electricity would, well within the useful life of the project, repay the reimbursable costs thereof, although the costs allocated to flood control, desilting operations, recreation, and fish and wildlife control would not thus be reimbursed.

Mr. Chairman, the testimony in the previous hearing and the documentary evidence which I have introduced today in support of S. 75 may be divided into three subheads. First, the need of water for central Arizona; second, the feasibility of the central Arizona project; and third, the availability of the water for the project. I shall attempt to give a brief summary of the evidence under these three subheads.

THE NEED OF WATER FOR CENTRAL ARIZONA

We in Arizona have a high appreciation of the value of water and its proper and conservative use. Probably no State in the Union has produced more with the amount of water available than has Arizona. There are now, or have been approximately 725,000 acres of irrigated land in central Arizona. In addition Arizona has irrigated approximately 60,000 acres of the original Yuma project from the Colorado River and some other small areas of the Colorado River which would not be benefited by this legislation. (Statement of W. W. Lane, p. 218 of the hearings on S. 1175.) There remain approximately 5,000,000 additional acres of fertile land which could be irrigated if only water were available.

However, as pointed out in the report of the Bureau of Reclamation, the Central Arizona project is "essentially a 'rescue' project designed to eliminate the threat of a serious disruption of the area's economy" (p. 6 of the report).

The existing agricultural development in Arizona has made it a rich agricultural empire founded upon irrigation and playing a considerable part in the economy of the Southwest. The remains of irrigation facilities found by early settlers are evidence of an extensive prehistoric agricultural development, a development which was abandoned because of prolonged droughts. Irrigation started in Arizona as far back as the 1860's. In general, we think of our principal irrigation systems as falling within two areas traversed by the Gila and Salt Rivers and their respective tributaries.

W. W. Lane, in his statement found on pages 218 and 219 of the hearings, gives the location of the 725,000 acres of irrigated land.

Our present sources of water supply for central Arizona consist of gravity water from the Salt and Gila Rivers and their tributaries, and water pumped from underground. The first major dam for the storage of water to be built in our State was the Roosevelt Dam, on the Salt River, which dam has a storage capacity of approximately 1,637,000 acre-feet of water; its construction was begun in 1903 and completed about 1910. Since that time three other dams have been constructed on the Salt River and two dams on the Verde River, a tributary of the Salt River. The resultant total capacity of all reservoirs for the Salt River is somewhat in excess of 2,000,000 acre-feet of water. Within the borders of the Salt River Valley Water Users' Association project there are 242,000 acres of irrigated lands. Adjoining this project there are several smaller ones; part of these lands are irrigated entirely by gravity water, part by pumped water, and some both by gravity and pumped water. The total irrigated area of these smaller projects, some of which are below the confluence of the Salt and Gila Rivers, is over 200,000 acres.

On the Gila River, we have the San Carlos project. This project comprises some 100,000 acres, half of which are Pima Indian Reservation lands. It is irrigated in part by pumped water and in part from water impounded by the Coolidge Dam, which has a storage capacity of 1,200,000 acre-feet of water. There are also in Pinal County, adjoining the San Carlos project, over 100,000 acres of land irrigated entirely with pumped water. Further upstream on the Gila River, there is the upper Gila project, in Graham and Greenlee Counties, comprising some 40,000 acres, which are dependent entirely upon the normal flow of the river and upon pumped water.

It is of the essence to bear in mind that although the capacity for storage of water is commensurate to the need thereof, the quantity of actual water required to supply these areas is woefully inadequate.

The need for additional water for this area of land arises from an overdevelopment which has resulted from two causes:

(1) In the early days of the Bureau of Reclamation, it was estimated that the anual per acre requirement at the farms was 3 acre-feet, and the water supply was estimated accordingly. This was based upon general farming in practice at that time. The chief crops were grain and alfalfa. Grain requires a relatively small amount of water; but with the development of irrigation, it was found to be more profitable, due to highly fertile soils and the long growing seasons permitted by favorable climatic conditions, to grow specialized crops out of season to most of the Nation, and multiple crops pear year. This provides fresh foods to the Nation at times they are otherwise not available. However, it requires a high duty of water, and it is now found that 4 acre-feet of water per acre at the farm is required to maintain such production. (Note testimony of W. W. Lane, pp. 218–221, and of Vic Corbell, pp. 127–140, of said hearings; and to the Bureau Report, p. R–29.)

(2) Pumping first started principally because some of the lands were waterlogged; but with the increased efficiency of pumping and lower power costs, pumping increased because it was very profitable for irrigation. The net result is that pumping has overdeveloped, and the underground water supply is being exhausted. This overpumping from the basins underlying the central Arizona project area was estimated to be 468,400 acre-feet per year from the period 1940 to 1944, inclusive. (Bureau Report, p. R–6.)

Even with this water developed from overpumping, much of the land has been out of cultivation because of inadequate water supply. The Bureau of Reclamation Report—pages R–9 and R–29—states that 671,960 acres have been irrigated at some time in the past. Of this total, an annual average of 566,170 acres was irrigated between 1940 and 1944. This meant that 105,790 acres of project land was idle between the years 1940 and 1944. In some areas this condition was even worse between 1944 and 1946. Mr. K. K. Henness, farmer and county agricultural agent of Casa Grande, testified at the hearings in June 1947—page 174 of said hearings—that there was only one-fourth enough water for the irrigated land in the San Carlos project at that time, and that the allotment was only eighty-five one hundredths of an acre-foot. I understand some additional water was later made available by rains during the year, but this meant that the farmer could not adequately irrigate more than 25 percent of his land. This testimony was also corroborated by A. L. Bartlett, a farmer in that valley—said hearings, page 207—and by Leon Nowell—said hearings, pages 210–211.

While the Salt River Valley project, which has the more adequate water supply, was not in as bad a condition, they were likewise very short of water. Vic Corbell, in his statement at the earlier hearing—page 130—spoke as follows:

"The history of the project has been that the amount of water available in any given year may range from a full supply down to 2 acre-feet per acre per annum, such as has been the case in the year 1947. In only 2 years in the past 25 years has a full supply been available. Based on rainfall records, tree-ring records, and other records and data available, it can be said that the rainfall has been normal the last 25 years; therefore, the unescapable conclusion is that there is more land within the project than that for which there is an adequate supply of water."

This meant that in years like 1947 they had either to let one-half of the lands lay idle or inadequately to irrigate all of them, which amounts to about the same thing.

The need for this project development is shown by paragraph 9, page 2, of the Bureau report, which paragraph reads as follows:

"In spite of the developments now available, there is an acute water shortage in the project area. The 1940–44 average annual surface water supply was 1,676,600 acre-feet. This figure includes some reuse of surface water. To supplement the surface water supply an average of 1,163,000 acre-feet annually was pumped from the ground-water basin during the same period. This pumpage is estimated to be about 468,000 acre-feet in excess of the safe annual yield of the underlying ground-water basins. Obviously, continued pumping at the present

rate will lower the water table to such a point that many of the wells will become dry. The wells on the edge of the water basin could not be rehabilitated by deepening because the perimeter of the water-bearing strata will be constricted as this process continues."

It will be noted that the surface water supply is here estimated at 1,676,600 acre-feet per annum, including reuse, and according to the report this amount is comparable to the average over longer periods of time. For this reason, the noted periods were taken.

I would like to call your attention to the testimony of Mr. W. W. Lane, found on page 219 of the hearings, which gives an average diversion from the Gila River system, from 1930 to 1944, of 1,697,000 acre-feet. It is calculated, according to Mr. Lane's testimony, found on page 220 of the hearings, that the water so included in the total diversions is made up as follows:

	Acre-feet
Net river supply	1,135,000
Return flow from higher diversions	200,000
Salvage water, or water if permitted to flow in small flows as would if undisturbed and which would be lost to the stream by natural causes in the stream bed	362,000
Total	1,697,000

The Bureau of Reclamation estimates—page 4 of its report—that in order to obtain the needed water for the project, it will be necessary to divert 1,200,000 acre-feet of Colorado River water, which will deplete the main stream flow 1,077,000 acre-feet. The balance will be returned to the river. This, together with the small development from other dams, would make up the water supply and would, according to said report as stated in paragraph 18, page 4, thereof:

"[Studies] indicate that this new water made available for diversion at the headgates of the irrigation districts each year would be sufficient to (1) replace the overdraft on the ground-water basins; (2) permit the drainage of excess salts out of the area and maintain a salt balance; (3) provide a supplemental supply to lands now in production, but not adequately irrigated; (4) increase the water supply for the city of Tucson; and (5) maintain irrigation of 73,500 acres of land formerly irrigated but now idle for lack of water. There would not be sufficient water to permit irrigation of new land. There would, however, be sufficient water to permit stabilization and some improvement of the existing agricultural economy of the area."

Table 5, found on page R-31 of the Bureau of Reclamation report, shows the new surface water needed at the district headgates to be 1,082,000 acre-feet, which needs are set forth in the table following:

Water needed—ultimate development

	Acre-feet a year	
New surface water at district headgates		1,082,000
Pumpage in excess of safe annual yield	468,000	
Increase in safe annual yield of ground water due to Colorado River water diverted to area	400,000	
Net reduction in pumping	68,000	
Outflow to maintain salt balance	376,000	
Net reduction in pumping available for irrigation	444,000	
Reduction in water at farm headgate, assuming a 15-percent loss for pumped water	377,000	
Surface diversions required to replace 377,000 acre-feet a year, assuming losses of 30 percent for diverted water	539,000	
Supplemental water required for lands now irrigated	113,000	
Water required for municipal supply	12,000	
Subtotal		664,000
Water available for lands formerly irrigated but now idle for lack of water		418,000

The new surface water to be developed to meet these needs is set forth in table 4, page R–28, of said report as follows:

New surface water developed by central Arizona project—ultimate development

New water available	*Acre-feet a year*
Diverted from Colorado River	1,200,000
Developed by Horseshoe Dam enlargement	42,000
Developed by Buttes Reservoir	64,000
Developed by Upper Gila River developments	19,000
Channel losses conserved by Charleston Reservoir	7,000
Gross new surface water	1,332,000
Losses Granite Reef Aqueduct	200,000
Losses Salt-Gila Aqueduct	50,000
Total aqueduct losses	250,000
New surface water at district headgates	1,082,000

According to the report, if this water supply is made available for the project, 73,500 of the 105,790 acres formerly irrigated but now idle for lack of irrigation, can be irrigated. In addition to this amount, as shown in table B–5 of the report, it would be possible to sustain irrigation of an additional 152,520 acres which would otherwise have to be retired from irrigation. This would mean a total of 226,020 acres, which would otherwise be compelled to remain forever idle, could be maintained in production by this project.

If this project is not developed, what would this mean to the economy of the State? The estimated population of the agricultural communities of Arizona in 1947 was 504,000. (See first table on p. 152 of said hearings.) Figuring upon a percentage basis, the previously indicated exclusions from cultivation, which must occur if the project is not authorized, would deprive approximately 150,000 persons of their incomes or means of livelihood, and they would be "displaced persons." It would mean the failure of banks and businesses, that literally thousands of families would lose their life earnings invested in farms, homes, and business establishments. The problem of overcoming these business failures and placing these bankrupt and homeless people upon their feet would indeed be great.

I need not further dwell upon the testimony showing the need for this project, but I will call attention to the testimony of various witnesses at said hearing, all of whom portrayed this picture. They are Wayne M. Akin, pages 111–120; A. L. Bartlett, pages 204–209; Walter R. Bimson, pages 147–151; V. I. Corbell, pages 127–140; E. R. Cowden, pages 215–216; N. M. Dysart, pages 160–162; K. K. Henness, pages 172–182; Alfred Jackson, pages 200–202; J. M. Jacobs, pages 162–165; D. A. Johnson, pages 415–417; G. T. Jones, pages 196–200; W. W. Lane, pages 217–221; P. J. Martin, pages 158–160; G. W. Mickle, page 214; J. T. McChesney, pages 216–217; C. H. McKellips, pages 121–125; C. Neely, pages 212–213; L. M. Nowell, pages 209–212; D. Stanley, pages 165–169; J. A. Udall, pages 169–172; and A. Van Wagenen, pages 203–204.

FEASIBILITY OF THE CENTRAL ARIZONA PROJECT

It is estimated in the Bureau of Reclamation report that this project, leaving out the cost of the tunnel for the reasons I have already stated, would cost approximately $738,408,000, which is made up from the table of items found on page 15 of the report as follows:

Construction costs

Feature	*Total*
Bluff Dam and Reservoir	$29,628,000
Coconino Dam and Reservoir	7,487,000
Bridge Canyon Dam and Reservoir	191,939,000
Bridge Canyon power plant	73,419,000
Havasu pumping plants	25,973,000
Granite Reef aqueduct	131,716,000
McDowell Pumping Plant and Canal	3,346,000
McDowell Dam and Reservoir	16,326,000
McDowell power plant	1,012,000

Construction costs—Continued

Feature	*Total*
Horseshoe Dam (enlargement) and Reservoir	$7,078,000
Horseshoe power plant	2,628,000
Salt-Gila Aqueduct	34,585,000
Buttes Dam and Reservoir	29,037,000
Buttes power plant	1,159,000
Charleston Dam and Reservoir	9,270,000
Tucson aqueduct	6,401,000
Safford Valley improvements	4,090,000
Hooker Dam and Reservoir	15,484,000
Irrigation distribution system	54,086,000
Drainage system for salinity control	9,973,000
Power transmission system	83,771,000
Total	738,408,000

The allocation of these costs are found on page 16 of the report in table 2 as follows:

Allocations

Item	Existing reclamation law	Rockwell bill, H. R. 2873	McFarland bill, S. 1175	Combination of S. 1175 and H. R. 2873 as slightly modified by recommendations of the regional director
Power	$291,160,000	$243,744,000	$247,190,000	$243,798,000
Irrigation	420,019,000	397,488,000	404,982,000	397,693,000
Municipal	18,014,000	16,605,000	16,865,000	16,605,000
Flood control [1]	6,290,000	6,907,000	6,270,000	6,641,000
Fish and wildlife [1]	2,925,000	3,127,000	2,826,000	3,129,000
Silt control [1]		28,097,000	26,511,000	28,097,000
Recreation [1]		37,454,000	33,764,000	37,459,000
Salinity control [1]		4,986,000		4,986,000
Total	738,408,000	738,408,000	738,408,000	738,408,000

[1] Nonreimbursable items.

NOTE.—The item known as the Rockwell bill may be eliminated as the authorization would be made under S. 75 as far as the repayments provision is concerned.

The report definitely shows that the central Arizona project has engineering feasibility in that there are no physical obstructions that would be encountered during its construction that could not be overcome—paragraph 27, page 7, report.

The project is also financially feasible under the provisions of S. 75 in that it could reasonably be expected to repay the reimbursable portions of its construction costs well within the useful life of the project. It has been found that $4.75 per acre-foot, which local interests have indicated they are willing and able to pay, would more than pay the operation and maintenance costs and replacement costs allocated to irrigation. It has also been found that a charge of $0.15 per thousand gallons for municipal water would fully repay all costs allocated to that purpose and would be equally advantageous to the municipal water users. The power rate necessary to accomplish a repayment of all reimbursable costs assigned to be repaid from power revenues would be extremely reasonable. Such low-cost power would represent a distinct advantage to power users in that area—pages 7–8, report.

The project represents a sound investment for the Nation in that the tangible benefits of the project would exceed the total cost to the Nation in the ratio of 1.63 to 1.

In addition, there would be innumerable intangible benefits accruing to the State of Arizona and to the Nation as a whole as a result of the central Arizona project—pages R–73 to 77, report.

In addition to the sources which I more specifically indicated, the feasibility of the project is thoroughly supported in the testimony of the following witnesses at such hearings: Dr. G. W. Barr, pages 183–196 and 558; E. B. Debler, pages 292–307; L. G. Galland, pages 202–203; H. A. Leggett, pages 151–158; R. A. Meeker, pages 473–481; E. A. Moritz, pages 31–35; R. J. Tipton, pages 522–548; William Warne, pages 8–24 and 25–30; K. S. Wingfield, pages 552–555; V. E. Larson, pages 35–111, and 395–404.

AVAILABILITY OF WATER FOR THE PROJECT

When speaking of the availability of water, one must remember that there is the separate item of the physical quantities which may be available, and the distinct but related item of legal entitlement to the use of water.

I say wih positive assurance that there is adequate water in the Colorado River fully to supply the central Arizona project and that Arizona is clearly entitled, as a matter of right and justice, to the exclusive use of that water. Moreover, such use will not interfere with or burden any other right of use existing in law.

The long-term (1897–1943) average annual flow of the Colorado River under virgin conditions at Lee Ferry was 16,270,000 acre-feet; at the international boundary it was 17,720,000 acre-feet. The average annual flow under virgin conditions for the years 1931 to 1940, a period of low flow, at Lee Ferry was 12,214,000 acre-feet; at the international boundary it was 13,001,000 acre-feet (statements of V. E. Larson, pp. 46–47 of hearings, and E. B. Debler, pp. 301–303). Mr. Debler pointed out that in low run-off period, and allowing for evaporation and other losses, the over-all or total availability for depletion to all users of the Colorado River water may be a bit less than the maximum quantities apportioned in the Colorado River compact and by the water treaty with Mexico. Even so, there would be available for diversion to Arizona for its central Arizona project 1,200,000 acre-feet, which is the amount required (see Mr. Larson, p. 54; Mr. Debler, p. 303). Mr. R. J. Tipton took occasion to note his concurrence with Mr. Debler (pp. 535–539). Mr. Debler estimated that the net annual depletion of the Colorado River water by the central Arizona project will be 1,067,000 acre-feet (p. 303).

I have condensed my statement concerning the physical availability of water to the foregoing ultimate factual assertions, but the other and more extensive evidence will supply both detail and corroboration.

Now, we come to the question of the availability of water, or Arizona's right to water, as a matter of law.

This phase of the case may be much more readily presented and grasped by a review of matters leading to our present situation.

In the year 1922 the States of the geographical area described in the testimony as the Colorado River Basin, were striving among themselves to arrive at an agreement leading to the beneficial use of the waters of the Colorado River for irrigation and the generation of electric power. The delegates from these States proposed the now renowned Colorado River compact. A controversy arose over the inclusion of the waters of the Gila River within the Colorado River system and hence with those to be apportioned by the compact, a move unalterably resisted by the Arizona delegation because the waters of the Gila had long been put to beneficial use by the citizens of that State, and because the waters of the Gila enter the Colorado at a point so southerly as to prevent the enjoyment thereof by any of the basin States other than Arizona. In fine, the Gila was no part of the Colorado waters which were the proper subject of apportionment. The Arizona delegates were agreeable, however, to the provisions of article III (a) of the compact, which proposed the annual apportionment to the upper basin, and a like apportionment to the lower basin, of 7,500,000 acre-feet of water from the Colorado River if the waters of the Gila were reserved for Arizona. As a consequence, and in order to compensate Arizona for the inclusion of the Gila waters in the Colorado River system, the delegates agreed upon article III (b) of the compact, which reads as follows:

"(b) In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum."

This quantity of 1,000,000 acre-feet per annum corresponds to the then estimated annual flow of the Gila River at its mouth where it empties into the Colorado.

The history of the meaning and purpose of article III (b) of the compact is related in the testimony of Mr. Ralph Meeker, who was, during the negotiation of the Colorado River compact at Santa Fe, the engineer adviser for the State of Colorado. He was present at the compact sessions and of his own personal knowledge is familiar with the background of the compact. His testimony is found from page 473 to page 481 of the record of the hearing on S. 1175. I call particular attention to pages 475 through 476 thereof, where Mr. Meeker makes it plain that it was understood by all the negotiators that 1,000,000 additional acre-feet were apportioned to the lower basin to be used by Arizona, because the Gila River was included in the compact. He also quoted (p. 475) from the report of Frank C. Emerson, commissioner for the State of Wyoming for the Colorado River compact, and from a citation from The Colorado River Compact, by Reuel Leslie Olson, showing that this was understood by L. Ward Bannister, special representative for Colorado at the negotiations.

Likewise in support of the identical history and meaning of this article III (b), I refer to the testimony of Mr. Charles A. Carson, now chief counsel for the Interstate Streams Commission of Arizona, wherein he incorporates testimony of Hon. Thomas E. Campbell, former Governor of Arizona (p. 225 et seq. of said hearings), of Mr. W. S. Norviel, Arizona's commissioner at the compact sessions (p. 227 et seq. of said hearings), and of Mr. C. C. Lewis, another of Arizona's representatives at such sessions (p. 229 et. seq. of said hearings). The testimony of the three individuals last named is based upon personal participation and direct knowledge of these matters.

Hon. Herbert Hoover, then Secretary of Commerce, who represented the Federal Government and presided at the compact sessions, most certainly knew and recognized that Arizona had succeeded in gaining the apportionment made in article III (b) to compensate for the inclusion of the Gila within the Colorado River system (note Mr. Carson's testimony, pp. 222–224 of said hearings).

Mr. E. B. Debler, who has had intimate personal connection with the problems of the Colorado River continuously since a date prior to the compact, who from 1921 to 1943 was in charge of most of the project planning for the Bureau of Reclamation, and who from 1944 to April of 1947 was regional director of the Bureau's region 7, is entirely clear that an additional million acre-feet was apportioned by article III (b). (See, for example, his statement at pp. 292–294 of said hearings.)

When the Arizona delegate signed the compact in November of 1922, he did so with a clear understanding and agreement that the States of Nevada, California, and Arizona would enter a tri-State agreement which among other things would apportion to Arizona the exclusive beneficial use of all water of the Gila River, the equivalent of the 1,000,000 acre-feet of water apportioned in article III (b) of the compact (see pp. 222, 225–226, 228–229). Thereafter, California would not agree to a just division of the water of the Colorado River which had been apportioned to the lower basin; so the people of Arizona would not ratify the compact at that time.

The Colorado's uncontrolled flow proved increasingly harmful as well as wasteful of potential benefit. California's anxiety to avoid floods along the neighboring California lowlands and to procure water and electric energy for her coastal communities made her especially anxious to harness and utilize the Colorado. Further interstate negotiations having proved unavailing, congressional action for the construction of Boulder Dam was inaugurated. This led to the passage of the Boulder Canyon Project Act (45 Stat. 1057, Public Law 642, 70th Cong.) on December 21, 1928.

As to the course of that bill in the Senate, I quote from testimony given by Senator Hayden at the hearings on Senate Joint Resolution 145 of the Eightieth Congress (pp. 333–334):

"The only thing I might contribute very briefly is a little bit of history of the adoption of the Boulder Canyon Project Act which might interest this committee. It was designed to make sure that the State of Arizona obtained no water out of the Colorado River until we had adopted the Colorado River compact. Senator Ashurst and I objected to that, that we thought it should provide for the irrigation of land in Arizona as well as California.

* * * * * * *

"The bill came up in the Senate toward the end of a long session of Congress, and it was made the unfinished business, but as the situation is now, the appro-

priation bills had the right-of-way, so Senator Ashurst and I had no difficulty at all in keeping the unfinished business and preventing a vote on it even though there was a cloture petition which failed to obtain two-thirds majority. It was then made the unfinished business in the December session exclusively, and we just debated it day by day.

"In an effort to work out some method whereby the bill might pass, Senator Pittman, of Nevada, made this suggestion to Senator Ashurst and I, that inasmuch as the State of California had obligated itself not to take out of the apportioned water more than 4,400,000 acre-feet, that left the remainder of the 7,500,000 acre-feet to be apportioned in the lower basin. He said, 'Of course, Congress cannot divide water among States, but Congress can approve a compact among the States and indicate what the compact means.' 'Therefore,' he said, 'all of the water that Nevada wants is some 300,000 acre-feet,' and we could put a provision in the bill looking to an interstate agreement in the lower basin and give the advance approval that would allocate to Nevada 300,000 acre-feet and Arizona 2,800,000 acre-feet.

* * * * * * *

"So, when we came to work out what should be done about the lower basin, I insisted that we should make the Gila Basin thing perfectly clear, and so you will remember that there is in the act that provision that the State of Arizona shall have the exclusive beneficial use of all the waters of the Gila River within its boundaries, and that no part of it should be allocated to Mexico.

"As I say, we continued to filibuster until we worked out that kind of an arrangement. It was entirely satisfactory to Senator Johnson and Senator Shortridge of California, because their State was obligated to obtain so much water. So far as the Gila Basin was concerned, they agreed with us that it entered the Colorado River below any possible point of diversion into California, and, therefore, they had no interest in it, and on that basis we concluded that we would allow a vote on the bill, and it passed the Senate."

* * * * * * *

I would like to call attention to the fact that the act by its own terms (sec. 4 (a)) was to become effective upon either of two conditions. The first of these was ratification of the Colorado River compact within 6 months by all seven of the States affected. The second was ratification of the compact by six of the interested States, including California, and the irrevocable and unconditional enactment by the legislature of the latter State of a statute which (and I now quote the exact language of said section 4 (a)): "shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this act that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this act and all water necessary for the supply of any rights which may now exist, shall not exceed 4,400,000 acre-feet of the waters apportioned to the lower basin States by paragraph (a) of article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact."

California promptly enacted a statute (act 1492, Cal. Stat. 1929, p. 38), sometimes spoken of as the Self-Limitation Act, the pertinent part of which is verbatim with the language just quoted from the Boulder Canyon Project Act. In view of the extremely liberal quantity of water specified as a maximum, and in view of her need for flood control, water, and electrical energy, California's willingness to adopt her Self-Limitation Act is quite understandable.

Section 4 (a) of the Boulder Canyon Project Act also unequivocally voiced the permanent intention of the Congress to define and limit California's maximum rights, and California irrevocably and unconditionally agreed to that limitation.

Having limited California to 4,400,000 acre-feet per annum of the 7,500,000 acre-feet apportioned by article III (a) of the Colorado River compact, as I have already shown, and having further limited California to half of any excess or surplus waters unapportioned by that compact, Congress further provided that "The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-

feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico * * *."

The foregoing factors plainly define the congressional purpose. Congress manifestly intended that of the 7,500,000 acre-feet of Colorado River water apportioned by article III (a) of the compact, Nevada is to receive 300,000; Arizona not less than 2,800,000; and California not to exceed 4,400,000. It is also clear that Arizona should receive, in addition, all the waters of the Gila River, both because of the previously mentioned insertion in the compact of its article III (b)—which apportions 1,000,000 acre-feet per annum to the lower basin to compensate Arizona for inclusion of the Gila in the Colorado River system—and because of the specific authorization (in sec. 4 (a) of the Boulder Canyon Project Act) of the agreement whereby Arizona is to receive all the water of the Gila and its tributaries within Arizona's boundaries.

From the mere reading of the language of the Boulder Canyon Project Act it is evident that Congress proposed to California the terms of a contract for the explicit benefit of Arizona, Nevada, and the other interested States. The contract thus proposed was as follows: Of the 7,500,000 acre-feet of Colorado River water apportioned to the lower basin by article III (a) of the compact, California should have not to exceed 4,400,000 and that California could use not more than one-half of any water in excess of or surplus to the water apportioned by the compact, which might be available in the lower basin. California, by adopting its Self-Limitation Act, unequivocally and unconditionally accepted this proposal and thereby completed a binding contract. As California may not have more than 4,400,000 acre-feet of the water apportioned by article III (a) of the compact, the balance is for Nevada and Arizona; and Congress has in terms indicated its intent that Nevada have 300,000 acre-feet and Arizona not less than 2,800,000 acre-feet. This intent has been executed. The water involved in article III (b) of the compact not only is "apportioned" water, but is in effect apportioned to Arizona for the reasons shown. The Colorado River water which is available in the lower basin in excess of or surplus to that apportioned by articles III (a) and III (b) of the compact is to be equally divided between California and Arizona.

This contract between the State of California and the United States—for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming—just as completely settled California's rights as any compact could do. Congress, by approving in advance a compact between Arizona, California, and Nevada, definitely gave its interpretation of the California Self-Limitation Act, which is the one Arizona now relies upon; and California by adopting the act accepted and agreed to this interpretation.

Arizona, relying on the protection thus afforded her, adopted and ratified the Colorado River compact. A large number of people of Arizona believed that Congress had not required California to limit herself to a small enough quantity of the waters of the Colorado River. However, Arizona had little choice, as the rights of the States were well defined in the Boulder Canyon Project Act. She has entered into a contract with the Secretary of the Interior, which contract calls for delivery of 2,800,000 acre-feet of Colorado River main-stream water per year, plus one-half of the excess or surplus water unapportioned by the compact which may be available in the lower basin, less one twenty-fifth of such surplus water, to be used by Nevada. (The contract appears at pp. 240–243 of said hearings on S. 1175.)

It is significant that the Department of the Interior in a regulation promulgated by it under date of February 7, 1933, authorized the proffer to Arizona of a water delivery contract which contained this provision:

"Ten. From storage available in the reservoir created by Hoover Dam, the United States will deliver under this contract each year, at points of diversion hereinafter referred to on the Colorado River, so much of the available water as may be necessary to enable the beneficial consumptive use in Arizona of not to exceed 2,800,000 acre-feet annually by all diversions effected from the Colorado River and its tributaries below Lee Ferry; *but in addition to all uses of waters from the Gila River and its tributaries*——" [Italics supplied.]

Also article 15 (a) provided—

"The State of Arizona will hereafter grant no permits for, nor otherwise authorize, uses of the waters of the Colorado River and its tributaries other than the Gila River and its tributaries, except subject to the terms of this contract." (Hoover Dam Contracts, p. 373; p. 238 of said hearings.)

The change in administration shortly thereafter terminated negotiations for this contract; but the noted language is most illuminating as an administrative determination by the Bureau of Reclamation of Arizona's right to all the water of the Gila, as well as 2,800,000 acre-feet annually of the main-stream waters of the Colorado stored at Hoover Dam Reservoir. (See p. 238 of said hearings.)

California admits that she is bound by the California Self-Limitation Act and is not entitled to more than 4,400,000 acre-feet of III (a) water and one-half of any excess or surplus water unapportioned by the compact. However, in an effort to procure more so-called surplus waters for herself, thereby in actuality reducing the quantity of apportioned water to which Arizona is rightfully entitled, California has elected to pursue a stratagem based largely upon two patently strained and inequitable constructions of the wording of the Colorado River compact. In a general way, these false constructions may be stated as follows:

(*a*) The water described in article III (b) of the compact is water unapportioned by the compact.

(*b*) A definition of "beneficial consumptive use" which would charge Arizona with the total water reaching the Gila watershed rather than with the amount by which she depletes the waters of the Colorado River at the mouth of the Gila.

Neither of these contentions is supported by the intentions of the framers of the compact or by those of the Congress.

As to the contention that the water embraced in article III (b) of the compact is not apportioned, and therefore falls within the class of "surplus or unapportioned" water of which California may have half under the provisions of the Boulder Canyon Project Act, enough has been said above to demonstrate its utter fallacy. Congress in effect has indicated its intention as to the division of the waters apportioned by article III (a) of the compact (i. e., California, not more than 4,400,000; Nevada, 300,000; Arizona, not less than 2,800,000; total, 7,500,000). As shown, the ultimate purpose of article III (b) was to apportion the waters of the Gila to the lower basin for use by Arizona, and Congress explicitly recognized this apportionment by express language in the Boulder Canyon Project Act. It is therefore clear to anyone who cares to see, that the waters upon which article III (a) of the compact is effective (i. e., 7,500,000 acre-feet of Colorado River water) and those upon which article III (b) is operative (that is, in final effect, the 1,000,000 acre-feet of the Gila which was thought to be substantially all thereof) are "apportioned water." The excess or surplus waters above such apportioned water are for equal division between California and Arizona (with the small reservation for Nevada previously noted.)

The record abounds with proof, both within the context of the compact and of the project act, as well as in collateral circumstances, that this is the true and just situation.

I invite attention to the testimony of Judge Clifford H. Stone, director, Colorado Water Conservation Board and Commissioner for Colorado for the Upper Colorado River Basin Compact Commission, whose ability, impartiality, and knowledge of these problems are generally recognized. His testimony appears on pages 513 through 521 of said hearings on S. 1175. Judge Stone demonstrated that the water embraced in article III (b) of the compact is definitely "apportioned water" (p. 513), and that the Supreme Court of the United States has so held in the case of *Arizona* v. *California*, 292 U. S. 341 et seq. (p. 517). He points out that the compact is clear and unambiguous, within its own four corners, as to the apportionment of water (p. 513); that the will of the legislatures which ratified the compact is paramount (p. 514), and that such will cannot in law be now thwarted through collateral efforts and documents (pp. 516–517). At page 517 Judge Stone quotes the following language from a letter from Hon. Herbert Hoover, who was the chairman of the Colorado River Compact Commission:

"Due consideration is given to the needs of each basin, and there is apportioned to each 7½ million acre-feet annually from the flow of the Colorado River in perpetuity, and to the lower basin an additional million feet of annual flow, giving it a total of 8½ million acre-feet annually in perpetuity."

I also wish to call attention to page 395 of the book entitled "The Hoover Dam Contracts," which contains the following question to Mr. Hoover in a letter of Mr. Clarence C. Stetson, and Mr. Hoover's answer:

"Why is the basis of division changed from the 'Colorado River system' to the 'river at Lee Ferry' in paragraph (d) of article III, the period of time extended to 10 years and the number of acre-feet multiplied by 10?"

"I do not think there is any change in the basis of division as the result of the difference in language in articles III (a) and III (b). The two mean the same thing. By reference to article II (f) it will be seen that Lee Ferry, referred to in III (d), is the determining point in the creation of the two basins specified in III (a)."

Mr. Carson ably and fully establishes the accuracy of the foregoing outline of historical and legal matters, as well as other cogent factors leading to the inescapable conclusion that Arizona is entitled to all the waters of the Gila within Arizona and not less than 2,800,000 acre-feet annually of water of and from the main stream of the Colorado (pp. 221–291; 481–495). In noting that the Supreme Court had held the III (b) waters to be apportioned, Mr. Carson added that the Court also pointed out that that article is without ambiguity (pp. 235, 481 of said hearings).

The second of the devices by which California hopes to gain additional water involves its own definition, highly beneficial to the State, of "consumptive use." The question is whether the quantity of water put to "beneficial consumptive use" along the course of a tributary to the Colorado River is equivalent to the amount of depletion of the virgin flow of such tributary at the confluence thereof with the Colorado River. California applies its definition of consumptive use to Arizona by insisting that Arizona is chargeable with all the water flowing in the Gila watershed which does not reach the Colorado. As California has no real tributary to the Colorado River and contributes practically no water to the main stream thereof, her definition is therefore peculiarly beneficial to herself and detrimental to Arizona and the upper basin States.

It is Arizona's theory that we are chargeable only with the amount of water by which we deplete the main stream of the Colorado River. That is the only amount which affects the other States. The Gila River, as has been explained, admittedly empties into the Colorado at a point which prevents use of the Gila waters by any other State. The virgin flow of the Gila at such confluence is now estimated at approximately 1,270,000 acre-feet per annum (pp. 35, 47 of said hearings), although when the compact was drawn, as above noted, the virgin flow was thought to be about 1,000,000 acre-feet and the latter was consequently the amount used in article III (b) as the additional quantity apportioned to the lower basin for use by Arizona.

As has been demonstrated, the framers of the compact, for the precise purpose of compensating Arizona for the inclusion of the waters of the Gila River within the Colorado River system, apportioned an extra million acre-feet per annum to the lower basin States, for use by Arizona. Simply stated, Arizona was to have the use of the waters of the Gila. Congress then proceeded to place an absolute and concrete interpretation upon the compact when it enacted the Boulder Canyon Project Act, wherein it specifically authorized a compact for apportionment of the 7,500,000 acre-feet of water flowing in the Colorado River below the point of delivery at Lee Ferry (the water embraced in article III (a) of the compact) and for the exclusive beneficial consumptive use by Arizona of the Gila River and its tributaries within the boundaries of that State (the equivalent quantity of water embraced in article III (b) of the compact) explicitly providing that, except as to return flow of the Gila waters after the same enter the Colorado, the Gila waters should never be subject to diminution by any allowance of water to Mexico under treaty. As indicated, the physical, geographical fact is that water of the Gila, after entering the Colorado, can be used solely in Mexico. It follows that Congress clearly recognized and intended that any measurement of Gila waters under the compact and project act must necessarily be gaged by the amount of depletion of the Colorado at the mouth of the Gila, a process inevitably involving establishment of the difference between virgin flow and actual out-flow.

Congress made its views clear to California in the Boulder Canyon Project Act; and, as California accepted the terms of that act by promulgating its own Self-Limitation Act, restricting itself to 4,400,000 acre-feet of the Colorado waters apportioned by article III (a) of the compact plus not more than one-half of any excess or surplus waters unapportioned thereby, California perforce recognized the method for determining what was "excess or surplus waters," which method among other elements gave to Arizona 2,800,000 acre-feet per annum of the

Colorado River water controlled by article III (a) of the compact, as well as all the Gila waters, except return flow after the same entered the Colorado.

The foregoing is by no means the only argument or theory substantiating Arizona's contention; it is merely supplemental to other probative circumstances appearing in the testimony.

In any consideration of the term "beneficial consumptive use," it is essential that a differentiation be maintained between the chemical and physical processes which attend the consumption and use of water, and the geographical place where such use is to be measured. It seems evident that the framers of the compact had in mind the apportionment of gross quantities of water and the measurement thereof in terms of depletion of the Colorado River.

As Mr. Meeker states, the negotiators of the compact were thinking of and dealing with surface waters (p. 476); and they considered consumptive use in terms of depletion of the Colorado (p. 477), the measurement of which depletion in the case of a tributary involved the difference between the virgin flow and the actual outflow, such difference being the consumptive use (p. 480). The negotiators' intention was that the upper basin could deplete the Colorado by 7,500,000 acre-feet per year, measurable at Lee Ferry, and that the lower basin might deplete the river by 8,500,000 acre-feet per year, measurable at the boundary between the United States and Mexico (p. 475). The depletion caused by use of the water of the Gila was to be measured at its confluence with the Colorado (p. 475).

Mr. Tipton summarized the respective positions of California and Arizona in this language (p. 522 of said hearings):

"Beneficial consumptive use as it is used in the Colorado River compact is interpreted by California to mean the aggregate of all the individual items of consumptive use at the points of use. Arizona interprets the term to mean depletion of main-stream Colorado River waters as a result of man's activities."

He then conclusively demonstrated the propriety of the Arizona view, noting the peculiar and unique benefit which would accrue to the benefit of California alone and the harm which would fall upon all the other basin States if California's theory is sound. He states (p. 529):

"It is my conclusion that the Colorado Compact Commission did apportion the virgin flow of the Colorado River and that it considered consumptive use to be synonymous with depletion at Lee Ferry and that it did consider consumptive use on the Gila to be synonymous with the depletion of the Gila River flow at the mouth."

He also logically pointed out that the term should be taken as intended by the commissioners rather than by latter-day partisans, and that the commissioners used such term as I have just outlined (pp. 523–524). Mr. Hoover also held this view as to the equivalence of consumptive use and depletion (p. 525). Mr. Tipton noted that notwithstanding California's claim to a self-created "priority" of 5,362,000 acre-feet of Colorado River water per year, her actual maximum diversion up to 1945 was approximately 2,800,000 acre-feet (p. 540). Of 2,717,530 acre-feet delivered to California in 1946, 1,074,150 flowed as waste to the Salton Sea (Bureau of Reclamation chart, p. 568). Mr. Tipton noted that California is attempting to carve out her fanciful "piority" from Arizona's water and the supplies of the upper basin (pp. 541–542).

In the course of his testimony (pp. 522–548) Mr. Tipton is at pains to support his opinions by references to minutes of the meetings of the compact sessions, and the views of eminent engineers and lawyers.

I would also call attention to the testimony of Mr. Charles A. Carson, given upon this topic (pp. 481 to 490), which sustains the soundness of Arizona's position.

Particularly, I desire to reemphasize the testimony of the Honorable Clifford H. Stone on this subject (pp. 519–521). I call special attention to that portion where it is pointed out that the framers of the compact intended depletion to be the measure of consumptive use. I also call attention to the language of Judge Stone at the conclusion of his testimony, which language I now quote:

"Then, in conclusion, the Congress, we believe, will not approve an unconscionable position in interpreting the Colorado River compact for the purpose of proposed legislation. Nor would a court give approval to any interpretation of a solemn agreement among States which would be inequitable. It cannot be assumed that the compacting States intended to apportion water between the upper and lower basins of the Colorado River by terms and conditions the interpretation of which would limit one of the States to its existing uses of water when the compact was made, with a comparatively small opportunity for future development. We submit that the States did not do so."

Patently, throughout the testimony of California, this is exactly what her witnesses are saying: The compact must be so interpreted that the Gila River is practically all of the water to which Arizona is entitled.

I will not reiterate the arguments at length, but will call attention to the fact that it is admitted by California witnesses that if Arizona did not appropriate water of the Gila and allowed such water to flow in an uncontrolled manner, the other States would not even get the benefit resulting from the supply of a million acre-feet to Mexico, under the treaty. Because of the terms of the treaty, and because the unappropriated waters would go down the river in flood periods, not nearly a million acre-feet could be used by Mexico under the circumstances. Reference is made to the testimony of Mr. C. C. Elder, hydraulic engineer, metropolitan water district of southern California (pp. 423–424), and of Mr. James H. Howard, general counsel, metropolitan water district of southern California (p. 332), where admissions of this point are made.

Nothing is more indicative of California's stubborn intention to gobble up much more than the lion's share of the water, than her stand upon the question of evaporation losses. She contributes nothing to the Colorado, and she is far and away the greatest beneficiary thereof. Yet she would bear none of the loss by evaporation, and would foist that, too, upon her sister States. Arizona favors an equitable distribution of these losses in proportion to the beneficial interests (note Mr. Carson's remarks as to evaporation losses, pp. 62–64; and Mr. Debler's remarks and schedules, pp. 300–307.)

Some point was made of the absence of an underground water code in Arizona. Such a code now exists. It is contained in chapter 5, Laws of the Sixth Special Session of the Eighteenth Legislature of Arizona.

A contention which California has been at pains to make, and which is a most prolific part of the propaganda which she is spreading far and wide, including a general distribution to the Members of Congress, is that California has an overwhelming, present, imminent need for all of what it describes as "its established rights to its share of Colorado River water." As I have already noted, California has raised itself by its boot straps to the point of creating for California agencies, by agreement among themselves, so-called priorities to the use of 5,362,000 acre-feet of water per year. By her Self-Limitation Act, the State of California restricted herself and all uses in that State to 4,400,000 acre-feet per year of the apportioned waters, plus one-half of the excess or surplus waters of the river.

Arizona does not admit that California's argument based upon her alleged need has any proper place in this hearing. Assuming that there were a need, as claimed, such need alone would certainly not give California any right to water which belongs to and is needed by Arizona.

However, inasmuch as California persists in this argument, I desire to point out various facts which demonstrate that the alleged need does not in truth exist, and that the claim in this respect is not supported by the evidence.

To begin with, California herself admits that her present annual use of the Colorado River water is "something like 3,000,000 acre-feet" (see Mr. Matthews' testimony, p. 377 of said hearings on S. 1175). Her witnesses also admit in their testimony that she desires to place into cultivation an additional 300,000 acres of the areas known as the east and west mesas in the Imperial Valley. They do not deny that if this land were not placed into cultivation, California would have all the water she needs (for example, note Mr. Matthews' testimony at pp. 386–388 of said hearings).

I desire to make it clear, first, that California's asserted needs are for the future, to permit her to grow and to expand; Arizona's need is immediate, not for growth and expansion, but for the maintenance and support of the property and livelihood which our people now have and are in jeopardy of losing. Secondly, if only California does not persist in her plan to place into cultivation the additional 300,000 as yet undeveloped acres in said mesas, Los Angeles and San Diego may continue to drink, and her farmers in the areas now supplied by the Colorado River may continue to farm.

This is a topic set forth in considerable detail in the Land Classification and Development Report on the Imperial East Mesa, which has been submitted to the Commissioner of Reclamation by the regional director, Mr. E. A. Moritz. The soil surveys upon which this report is based were conducted cooperatively by California's own university and the United States Department of Agriculture. The report on the Imperial west mesa has not yet been completed. This is perhaps due to the circumstance that the lands of the west mesa, taken at their best, are no more than equal to those of the east mesa, and probably are considerably inferior. Even so, most of the west mesa could be irrigated only by pumping water to elevations ranging upward to 300 feet.

Of the 225,300 acres covered in the report above mentioned, only 35,900 acres (or about 16 percent) are classified as irrigable; and of this number of irrigable acres only 5,350 acres were classified as class II lands, the remaining 30,500 acres being classified as class III lands, the poorest class of irrigable lands. The balance of the lands on the east mesa, comprising 189,400 acres, were classified as nonirrigable lands, defined as follows:

"Lands that appear to be permanently nonagricultural under the practices of irrigation farming" (p. 49 of the noted report last mentioned).

However, even as to the lands classified as irrigable, the Bureau of Reclamation has not made its recommendations as to feasibility for irrigation. The irrigable lands are spotted over the mesa in such a manner that the cost of irrigation thereof, if not prohibitive, is so high as to render irrigation unfeasible in view of their inferior quality.

The point that I desire to repeat is, that even assuming the same percentage of irrigable lands on the west mesa as are on the east mesa—which is probably not a permissible assumption because the lands of the west mesa are not as good as those of the east mesa—there would be only about 12,000 irrigable acres of the west mesa. The result is that of the total area some 300,000 acres on both mesas, more than 250,000 thereof are nonirrigable, whereas only 48,000 are susceptible of irrigation. The amount of water estimated by the noted report as required to irrigate the irrigable area is 12 to 15 acre-feet per acre per year (see question E, p. IV of the report).

This accentuates why California cannot and does not deny that if these 300,000 acres were not subjected to cultivation, there would be plenty of the water in question for use in that State. Even if only the 48,000 acres classified as irrigable were to be placed in cultivation, the exclusion of the 252,000 nonirrigable acres would eliminate all consideration of the sufficiency of the water supply to meet California's needs.

It is interesting to note that practically all of the lands of the east and west mesas are owned by the Federal Government. It follows that no private individual would be injured by the failure to place into cultivation such federally owned lands as are classified as nonirrigable.

In the course of my testimony at the hearings upon Senate Joint Resolution 145 and at the earlier hearings on S. 1175, I had occasion to point out that if California would refrain from her proposed program to put under irrigation some 300,000 unimproved acres of the Imperial east and west mesas, there would be an abundance of Colorado River water available for her uses, present and future, well within the quantities to which she restricted herself in her Self-Limitation Act.

Since the conclusion of the hearings on S. 1175, I have received a copy of the Economic Repayment Capacity Report for the Imperial East Mesa, which report was prepared by the Department of the Interior and dated March 1948.

The report strongly etches and underlines the absolute unwisdom of an attempt to irrigate these areas. The following are self-explanatory excerpts from the summary and introduction prefacing such report:

"This report presents an analysis of the repayment capacity of lands classified as irrigable within seven potential development units on the Imperial east mesa division of the All-American Canal project in California. Irrigation water would be supplied from the Colorado River and delivered through the All-American and Coachella canals. Of the 33,872 acres in the potential units, 32,440 acres are publicly owned lands withdrawn from entry. A complete discussion of the land classification of the area and anticipated farming problems is given in the East Mesa Land Classification and Development Report, dated April 1947. This report shows that 18,612 acres of the 33,872 acres in the potential units have been classified as irrigable; 3,782 acres are class 2 lands; and 14,830 acres class 3" (p. 1).

"Project development costs are estimated to average $615 an acre, which includes $390 for a distribution system and $225 for predeveloping the lands" (p. 1).

"On the basis of a budget analysis it has been shown that class 3 lands would not be able to pay for the cost of constructing a distribution system" (p. 2).

"However, the class 2 lands are so interspersed with class 3 and 6 lands that their separate development would be physically impractical. If all 80-acre tracts of predominantly class 2 and 3 lands were developed, it is estimated that less than 20 percent of the total construction and predevelopment cost would be recoverable from the settlers" (p. 2).

"This classification shows a total of 35,900 acres of class 2 and 3 lands,

of which 18,612 acres are located within seven potential development areas. Most of the lands tentatively classified as irrigable are of marginal character and were designated as class 3. The class 2 and 3 lands not located within the development areas represent isolated tracts scattered throughout the mesa, which could not be served by a distribution system without the inclusion of a large acreage of class 6, nonirrigable land" (last paragraph, p. 3).

"It appears likely that the irrigation of any substantial acreage of the mesa lands would tend to enhance seriously the drainage difficulties in Imperial Valley unless additional drainage facilities are constructed" (last sentence of middle paragraph, p. 4).

"Most of the mesa is publicly owned land under reclamation withdrawal. Of the 33,872 acres in the potential units, 32,440 acres are publicly owned lands, withdrawn from entry. There are 1,219 acres of privately owned lands located within unit 1; 84 acres of State land; and 129 acres owned by the Southern Pacific Co." (bottom paragraph, p. 4).

As practically all of these lands are publicly owned and have been withdrawn by the Bureau of Reclamation, it is quite clear that the decision as to the development and irrigation of its own land is for the Federal Government, not California. What the decision should be is manifest; the report constitutes an answer and refutation of arguments for proceeding to develop and irrigate the mesas.

Assuming, however, that California would persist in the face of these decidedly unfavorable factors, in a program to deliver Colorado River water to the 18,612 irrigable acres scattered among the seven areas potentially susceptible of development, and assuming a similar ratio of irrigable to nonirrigable acres on the west mesa (which is a most optimistic assumption), she can deliver the required quantity of water and nevertheless remain with ease within her limitation of 4,400,000 acre-feet.

I likewise noted in my final statement in the hearings on S. 1175 that the amount of Colorado River water wasting into the Salton Sea from Imperial Valley irrigation activities, namely, some 1,074,150 acre-feet, is almost enough to supply the entire central Arizona project. I request that there be admitted as evidence in this hearing the table which I submitted as exhibit A with my final statement at the earlier hearings on S. 1175, which table was furnished by the Bureau of Reclamation at Yuma, Ariz., and which shows the number of acre-feet of water flowing into the Salton Sea from the Imperial irrigation district and from the Imperial Valley in Mexico. I also request that the two photographs which I submitted, as exhibits B and C, with my final statement at such earlier hearings on S. 1175, be admitted in conjunction with my present statement as evidence in the present hearing.

Such table is as follows:

EXHIBIT A

Year	Imperial irrigation district			Imperial Valley in Mexico, water delivered			Return flow to Salton Sea	
	Land irrigated	Water delivered	Land irrigated	Pilot Knob	Hanlon Heading	Total	From Mexico at boundary	Total, including that from Mexico
	Acres	*Acre-feet*	*Acres*	*Acre-feet*	*Acre-feet*	*Acre-feet*	*Acre-feet*	*Acre feet*
1936	424,202	2,270,550	201,282	.....	870,268	870,268	.....	.....
1937	437,017	3,026,632	226,244	.....	878,086	878,086	.....	.....
1938	416,180	2,973,593	200,619	.....	794,403	794,403	.....	.....
1939	419,826	2,757,015	172,040	.....	774,581	774,581	.....	.....
1940	416,709	2,270,550 [1] 79,200	131,808	.....	856,397	856,397	.....	.....
1941	399,287	1,491,041 [1] 1,095,958	159,668	.....	768,737	768,737	.....	875,563
1942	382,179	255,019 [1] 2,394,503	175,706	.....	734,381	744,381	64,102	709,740
1943	379,947	[1] 2,345,900	200,000	.....	1,152,106	1,152,106	58,022	1,073,004
1944	384,256	[1] 2,451,860	205,716	398,044	710,213	1,108,257	40,298	1,085,102
1945	393,699	[1] 2,494,860	221,068	681,658	383,483	1,065,141	37,902	1,068,424
1946	405,646	[1] 2,717,530	242,059	1,022,444	232,858	1,255,302	42,050	1,116,200

[1] U. S. Bureau of Reclamation figures for delivery past drop No. 1 through All-American Canal.

NOTE.—All figures are from Imperial irrigation district except as otherwise noted. Operation of All-American Canal began November 1940.

The photographs appear at pages 568 and 569 of said hearings on S. 1175. I have clipped these purely for present use, and they are attached to this statement.

I shall leave the summarization of evidence against Senate Joint Resolution 4 to the Colorado River Basin States Committee.

However, I desire to point out that Senate Joint Resolution 145, the predecessor of Senate Joint Resolution 4, was introduced in the last session on the last day of hearings on S. 1175 and was used as one of the vehicles to prevent its passage.

Under those circumstances, there surely is no question that it was introduced for the purpose of delaying or defeating the passage of the legislation to authorize the central Arizona project.

The Colorado River Basin States Committee in the hearings on Senate Joint Resolution 145 authorized the fact that there is not and cannot be a justiciable controversy until the authorization bill is passed.

I am confident that Arizona will win in the Supreme Court of the United States if and when there is presented to it a justiciable controversy within the jurisdiction of that Court and involving Arizona's right under the Colorado River compact, the Boulder Canyon Project Act, the California Self-Limitation Act, and the Arizona water-delivery contract.

The delays incident to litigation prior to authorizing legislation, and the delays after conclusion of such litigation in favor of Arizona, and the delays attendant upon the presentation and passage of authorizing legislation thereafter, would be disastrous. California will no doubt oppose the passage of such legislation on some ground whenever it may be considered.

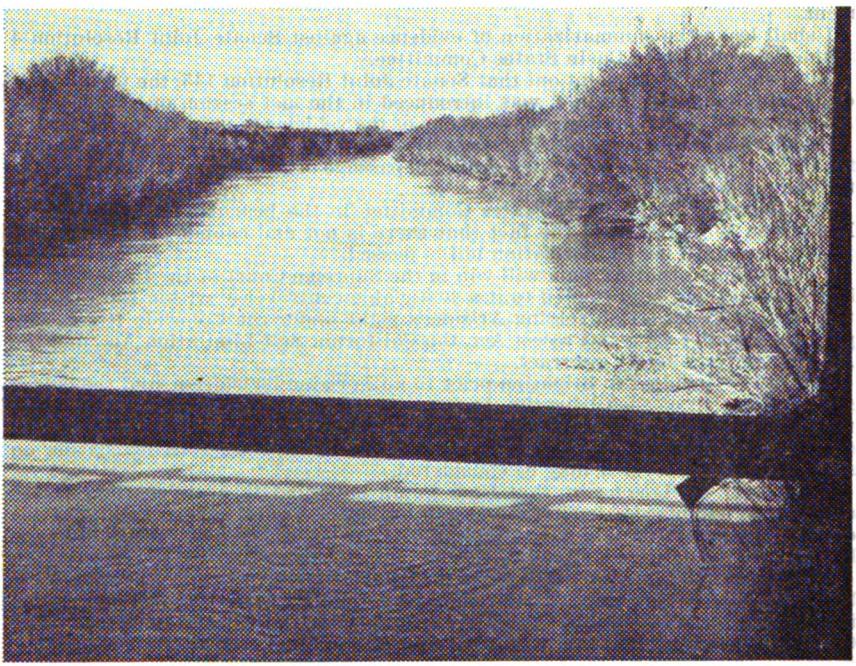
The people of Arizona by that time would have had to abandon their farms and seek other places; business houses and banks would have failed; and the economy of Arizona would have suffered to the point of disaster. It would be too late to cure the damage suffered by reason of such delays.

And then California would come in and state that they had in the meantime built up communities using Arizona's water, and that to permit Arizona to use its share of the water would dry up California communities; and in that manner California would attempt to defeat the moral, equitable, and legal rights of her neighbor and sister State.

EXHIBIT B

New River carrying Imperial Valley waste water to Salton Sea, April 1947.

EXHIBIT C



Alamo River carrying Imperial Valley waste water to Salton Sea, April 1947.

The CHAIRMAN. The Chair will now file for the record a statement of Senator McCarran with respect to S. 75, and also a telegram addressed to him by Alan Bible, attorney general for Nevada, and Alfred Merritt Smith, Nevada State engineer.

(The documents above referred to are as follows:)

STATEMENT OF SENATOR PAT MCCARRAN OF NEVADA, BEFORE THE SENATE INTERIOR AND INSULAR AFFAIRS COMMITTEE, MARCH 21, 1949, RE S. 75

The Senate Committee on Interior and Insular Affairs has under consideration S. 75, a bill to authorize the construction of the central Arizona project.

THE PROJECT

The project would consist primarily of the Bridge Canyon Dam on the Colorado River above Boulder Dam, and an aqueduct to carry Colorado River water to Central Arizona, through tunnels over 80 miles long, bypassing Boulder Dam. Initially, however, instead of building these tunnels, a branch or alternate aqueduct would be built from Parker Dam, lifting the water by pumping nearly a thousand feet, to join the ultimate Bridge Canyon aqueduct route at junction point part way to the Phoenix area, and using about a third of the Bridge Canyon power for pumping. The remaining two-thirds would be sold. The potential customers are supposed to be in California, Nevada, and Arizona.

COST

The ultimate project will cost over $1,000,000,000, about as much as has been spent in 47 years of reclamation in 17 Western States. The initial part of it, involving the Parker pumping route, will cost over $750,000,000. This latter figure is about the same as the cost of the TVA, about the same as the estimated cost of the St. Lawrence seaway, and is five times the cost of the Boulder Canyon project.

FINANCING PLAN

Under the plan set up by the bill, no part of the capital cost will be repaid by the Arizona irrigators. Either the Federal Treasury, or the power users, are expected to pay for all of it. The water will be sold to the irrigators at $4.50 per acre-foot, which, according to the Reclamation Bureau, is less than the cost of operation and maintenance alone.

IMPORTANCE OF POWER TO NEVADA

Abundant cheap power is essential to Nevada. Bridge Canyon power site, properly developed, can be an asset to Nevada and the other intermountain areas within transmission distance. But as proposed in this bill, a million and a quarter acre-feet would ultimately bypass Boulder and Davis Dams, reducing the power Nevada is entitled to at such projects. More important, Bridge Canyon power itself would be loaded over with $300,000,000 of subsidy to an Arizona irrigation project. When the Boulder Canyon Project Act was debated, Nevada insisted that power at Boulder Dam should not have to pay for any part of the All-American Canal. The power users of Nevada are entitled to have the same principle apply to Bridge Canyon.

SUBSIDIES REQUIRED: RELATION TO NATIONAL DEBT

The power users or the Federal taxpayers will have to provide not only the $750,000,000 to $1,000,000,000 of capital costs, but also several million dollars per year in operating expense.

The scheme set up in S. 75 does not contemplate that the Treasury will get out of this project any money which can be used to pay interest on the billion dollars of new national debt which it will represent. The interest collected from the power customers is all used to retire capital invested in the aqueduct, as a subsidy to Arizona's irrigators. The lost interest alone, for 80 years at 2 percent, is over a billion dollars, even if the capital is recovered; and during the same period the Federal taxpayers or the power users would also have to carry the burden of over a quarter million dollars of operating expense that the water users cannot pay.

Coming on the heels of a proposal to increase Federal income taxes 4 billions, or to reduce the current budget by a comparable figure, any project that adds over a billion to the national debt and fails to provide revenues to pay interest to the bondholders, deserves mature consideration.

THE ESSENCE OF THE PLAN

Essentially, what Arizona proposes is that the Government build her an aqueduct and get the most back, not from the Arizona irrigators (who are not going to pay even for the power required for pumping water through this aqueduct) but by building a power dam at Bridge Canyon, over 300 miles upstream, and selling this power to California, Nevada, and Arizona users for a price high enough to pay for both the aqueduct and the power dam. California is the biggest power market. In short, Arizona proposes that California shall pay for the Arizona aqueduct to take away the water that California's own projects have been built to use. Arizona invites the Government to risk the taxpayers' money on the assumption that California will cooperate in depriving her own projects of water.

RELATION OF COSTS AND VALUES

The whole area to be served is less than 600,000 acres. The best land in central Arizona is worth $300 per acre. If it were all worth that much, the whole service area would be worth $180,000,000. The project will cost over $750,000,000, or more than four times the maximum value of all the land to be benefited. But water for most of this 600,000 acres has been provided by projects already constructed. If the project is not built, perhaps 150,000 acres of war-boom land will go back to the desert state it was in before 1940. $750,000,000 divided by 150,000 is $5,000 per acre, or, if only half the project cost is allocated to irrigation, $2,500 per acre, to "rescue" land worth a tenth as much. There are no poor homesteaders living on that 150,000 acres. They are large operators who put down pumps, to "mine" an underground water supply which they knew to be limited, to cash in on high prices. Neither the Federal Treasury nor the power users of California and Nevada should be called on to "rescue" them.

EFFECT ON THE OTHER RECLAMATION STATES

If construction of the billion-dollar central Arizona project takes 10 years, it will absorb, out of the annual construction budget available in all 17 Western States, an average of $100,000,000 per year, and, during the peak years of activity, several times that amount. The whole reclamation construction budget for all the States this year is about $350,000,000, and this is the largest in history. Do the other Western States want to get along on what is left after this all-time giant devours the annual construction appropriations?

REACTION OF THE EASTERN STATES

The East has supported western reclamation because it has paid its way. The central Arizona project is the first project ever presented to Congress on which the irrigators are unable to repay any part of the investment, and are unable to pay even the operating costs and cost of power for pumping. Do the Western States who have good projects want to forfeit eastern support and endanger the whole reclamation program by identifying themselves with this promotion?

WATER

The enormous investment proposed in S. 75 is a gamble on an uncertain water supply. As the direct result of the Mexican Water Treaty, which was opposed by two of the three Lower Division States, and by most of the water users in Arizona, but which was supported by the sponsors of S. 75, the lower basin is confronted with a catastrophic water shortage. Commissioner Bashore furnished the Senate, at my request, figures published in Senate Document 39, Seventy-ninth Congress, showing that the face amount of the Government's commitments in the lower basin would exceed the supply available in a dry decade like 1931-40, after the upper basin is fully developed, by well over 2,000,000 acre-feet per year, and that even after drawing down Boulder Dam storage 1,500,000 acre-feet a year, there would be a deficit of over three-quarters of a million acre-feet annually. In the hearings on S. 1175, a bill like this in the Eightieth Congress, Arizona's expert, Mr. Debler, admitted that Boulder cannot safely be drawn down more than 900,000 acre-feet per year, and that in order to make good on the Mexican treaty, the upper basin must be called upon to increase its deliveries at Lee Ferry and reduce its own uses for periods as long as 20 years at a time.

REPORTS OF THE BUREAU OF THE BUDGET

On February 4, 1949, the Director of the Bureau of the Budget wrote the Secretary of the Interior quoting the Commissioner of Reclamation's admissions that "assurance of a water supply is an extremely important element of the plan yet to be resolved"; saying that the Department of Agriculture "questions whether the benefits actually exceed costs"; quoting the Federal Power Commission's criticism "that there is no essential physical relationship between the Bridge Canyon Power project and the central Arizona diversion project but that the two are linked together in the report because of the need for subsidies from electric power income;" quoting the State of Nevada's official comments that "studies have been made by California and Nevada engineers which show that there will be little or no water for the central Arizona project" and Nevada's reference to "the limited storage behind the dam which in a few years would fill with silt," and ending with the statement of the Director of the Bureau of the Budget that:

"From an examinaion of the report, of the comments of the affected States, and of the remarks of other interested Federal agencies, it is apparent that there are a number of important questions and unresolved issues connected with the proposed central Arizona project. The provision of adequate water supply, if found to be available, is admittedly a high-cost venture which is justified in the report essentially on the basis of an urgent need to eliminate the threat of a serious disruption of the area's economy. Even so, the life of certain major parts of the project is appreciably less than the recommended 78-year pay-out period. The work could be authorized only with a modification of existing law or as an exception thereto. Furthermore, there is no assurance that there will exist the extremely important element of a substantial quantity of Colorado River water available for diversion to central Arizona for irrigation and other purposes.

"The foregoing summary and the project report have been reviewed by the President. He has instructed me to advise you that authorization of the improve-

ment is not in accord with his program at this time and that he again recommends that measures be taken to bring about prompt settlement of the water-rights controversy."

Later, under pressure from the sponsors of the project, the Director wrote on February 11 that litigation was not the only method to settle the controversy, but that it might be determined through negotiation or by Congress. As to that, more later. But the Budget Bureau has not retracted its condemnation of the project's economics.

NECESSITY FOR ADJUDICATION

Obviously, the Government should not risk a billion dollars nor any part of it on a project dependent on an uncertain water supply. This project's supply is uncertain. It has a supply, at all, only if the Colorado River compact is construed as Arizona wants it construed. Nevada and California are not in agreement with Arizona's interpretations. Governor Warren, of California, and Governor Pittman, of Nevada, offered to Governor Osborn, of Arizona, to either negotiate, arbitrate, or join in obtaining authorization by Congress for a suit in the Supreme Court. The permission of Congress is necessary to the latter course because the United States is a necessary party. Arizona has replied, refusing to negotiate or arbitrate or litigate. She wants a political settlement in Congress. The water rights involved here are States' rights, not subject to disposition by Congress. For 75 years the Western States have denied any power in the Federal Government to determine or apportion their water rights, which are founded in State law. The Constitution provides only two methods for settling a dispute between States, by interstate compact or by original action in the Supreme Court. California and Nevada have patiently tried the former approach for a quarter century. The remaining alternative is litigation. The Western States cannot safely acquiesce in the erroneous notion that the Federal Government can constitutionally dictate and divide the uses of their water.

To put this matter at rest, the Senators from Nevada and California have joined in introducing a resolution, Senate Joint Resolution 4, Eighty-first Congress, to authorize suit. This jurisdictional bill should be speedily considered and passed. Pending its disposition, no action should be taken on any large consumptive use projects in the lower basin. No Senator would vote to build a million-dollar structure on land whose title was in dispute. This project involves a thousand times a million dollars. Nevada and California are not afraid to submit their cases to the Supreme Court. If Arizona will not risk her case in the Supreme Court, let her not ask Congress to risk a billion dollars on the same gamble.

CARSON CITY, NEV., *August 17, 1949.*

Hon. PAT MCCARRAN,
United States Senator from Nevada,
Senate Office Building, Washington, D. C.:

We are informed by Northcutt Ely that a hearing will be held on Monday, March 21, before Senate Committee on Interior and Insular Affairs to consider the Colorado River litigation resolution, also the Arizona project for diversion of water into the Salt River Valley. As our legislature is in session, a press of work and obligations will prevent our attending the hearing on behalf of Nevada, as contemplated by Governor Pittman. The Governor has directed a letter to Senator O'Mahoney, chairman of the committee, reaffirming our desire for the enactment of Senate Joint Resolution 4 and our opposition to the Arizona project, or its consideration until Colorado River water allocations are clarified. A copy of this letter is being air mailed to you by the Governor. We will greatly appreciate your contacting Senator O'Mahoney and doing what you can to sustain our views as presented before the House Subcommittee of the Judiciary last year.

Sincerely,

ALAN BIBLE,
Attorney General for Nevada.
ALFRED MERRITT SMITH,
Nevada State Engineer.

The CHAIRMAN. The committee will stand in recess until tomorrow morning at 10 o'clock, when Senator McFarland will resume the stand.

(Whereupon, at 12:40 p. m., a recess was taken until 10 a. m. the following day, Tuesday, March 22, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

TUESDAY, MARCH 22, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Millikin, Anderson, Ecton, Kerr, Malone, Watkins.

The CHAIRMAN. The meeting will come to order.

Yesterday, it was indicated, Senator McFarland, that some of the members of the committee might desire to query you.

Senator DOWNEY. Mr. Chairman, I think I was one of the Senators who so indicated, but I have no questions to ask Senator McFarland. Later in the hearing, one of our own witnesses may discuss certain matters that were presented.

I don't know whether my colleague, Senator Knowland, desires to ask any questions of Senator McFarland or not.

Senator KNOWLAND. No; but I do have a brief statement to make at the proper time.

Senator MCFARLAND. Well, then, Mr. Chairman, that completes our summarization of the evidence.

I would like to give the secretary a list of references to the testimony which will be printed in the record later. It may be more detailed.

I would like to introduce for the printed record what is known as the Doane Agricultural Service report on the project. I do not care to read it.

The CHAIRMAN. What is the Doane Agricultural Service?

Senator MCFARLAND. It is a company that makes reports on any project, as to the feasibility, and so forth.

The CHAIRMAN. It is a private corporation?

Senator MCFARLAND. Private corporation; yes.

The CHAIRMAN. How did they come to make the report?

Senator MCFARLAND. They were employed by interested parties.

Senator ANDERSON. What is the purpose of it—to counteract the Department of Agriculture report?

Senator MCFARLAND. Well, it is a very complete report, Senator Anderson. Yes, it will do that; it will have that effect.

Senator ANDERSON. Then don't you think we ought to put in the record something about the agricultural experience of the Doane agri-

cultural people in surveying farm lands, as contrasted to the experience of the Department of Agriculture?

Senator McFARLAND. That is in the back of the report. There is a complete statement in the back of the report showing who they are and their experience. It all appears in the report.

Senator ANDERSON. Some of us know who they are.

Senator McFARLAND. I think, Senator, you could state that a little more definitely than I.

Senator ANDERSON. No; I think not.

The CHAIRMAN. Without objection, the report may be received.

Senator DOWNEY. Mr. Chairman, will it be filed as a committee document, or will it be printed?

Senator McFARLAND. I would like it to be printed. The committee can determine that later on.

The CHAIRMAN. The committee can determine what is to be done about it.

(The document referred to above has been made a part of the committee's records on file: Report on Central Arizona Project by the Doane Agricultural Service, Inc., St. Louis, Mo.)

The CHAIRMAN. Senator McFarland, I desire to ask a simple question about the distance between the Bridge Canyon Dam site and the pumping stations at the Parker Dam.

Senator McFARLAND. The Bridge Canyon Dam site?

The CHAIRMAN. The length of the tunnel.

Senator McFARLAND. I believe, Mr. Baker, that is about 123 miles; isn't it?

Mr. BAKER. The tunnel is 78 miles long but the air distance between those two locations would be about 120 miles.

Senator McFARLAND. One hundred and twenty miles.

The CHAIRMAN. I understood you to say yesterday that the construction of the tunnel was not projected immediately.

Senator McFARLAND. That is correct.

The CHAIRMAN. Because of certain economic considerations?

Senator McFARLAND. That is correct.

The CHAIRMAN. What were those considerations?

Senator McFARLAND. Well, until the cost of construction comes down, and the demand for power is sufficiently great to justify its construction—that is, the demand for the power that is used for this pumping—the revenue from the extra power that would be saved by discontinuing pumping would equal or more than pay for the tunnel.

The CHAIRMAN. Well, the agricultural features of the project—that is to say, the irrigation—would be dependent, or not, on the tunnel?

Senator McFARLAND. No, that would be taken care of in the meantime, Mr. Chairman, by the pumping from Lake Havasu. The project would be complete, so far as the agricultural end of it is concerned. The tunnel might be constructed 5 years from now, 10 years from now, 25 years, or 40, depending upon conditions at the time.

The CHAIRMAN. Is there a statement here somewhere to show the difference in cost with the tunnel in and the tunnel out?

Senator McFARLAND. Well, we have not tried to show the difference, or the Reclamation Service in their report did not file complete data on the cost of the tunnel, for the reason that it can never be determined, except in light of the factors prevailing at the time when it is to be

built. In other words, they say it should not be built right now because of the present high cost.

I am just giving offhand the last estimate I had of what it would cost, and that would be around $400,000,000, as I recall. The tunnel, in years to come, may be constructed for half that amount.

The CHAIRMAN. Is that estimate included in the estimate of the cost of the project or not?

Senator MCFARLAND. No, it is not; because that feature is to be delayed until some future date, when it will have to be presented again.

Senator DOWNEY. Mr. Chairman, in that connection I might make this comment from the standpoint of California:

One of the defects in the present plan of Arizona, as pointed out, I think, by the Federal Power Commission and other agencies, is that there is no connection, in the irrigation features, or logically, between the Bridge Canyon Dam and the central Arizona project. Central Arizona will not draw any water from the Bridge Canyon Dam. It gets its water out of the Hoover Dam and out of the river.

Consequently, the Bridge Canyon Dam is merely being brought into the project, so that a very valuable power project in the lower basin may be used as a means of financing a project that otherwise would not be considered feasible.

Now, to overcome that objection which has been made by the Government agencies, S. 75 then projects the possibility at some time in the future, of actually diverting the water from Bridge Canyon Dam by this tunnel. It would thereby be made an integral part of the central Arizona project, if the height of the dam were utilized and the water were diverted from it.

I might say that I believe that, in prior reports, the Department of the Interior has found the building of the tunnel infeasible and that its building might easily enough double the cost of the project; it might make it a billion-and-a-half-dollar proposition, instead of three-quarters of a billion. I am just stating California's viewpoint on that.

Senator MCFARLAND. Mr. Chairman, if I might make this statement:

Originally this proposed legislation did not provide for the pumping plant at Lake Havasu, it provided solely for the water to be diverted through the tunnel at Bridge Canyon. Then as it developed, it was found that the cost of construction was going up to the point that it was advisable to delay the construction of the tunnel. The building of that dam, of course, has a direct connection with the project, other than to provide a forebay for entrance to the tunnel, because it will afford the power to be used for the pumping of the water.

Everyone knows that you could have those pumping plants out there from now on and if you did not have power for them they would not be any good. You could have the aqueduct, but without power to pump the water into the aqueduct it would not be any good.

There is now no power available out in that part of the country, from any source whatever, to pump this water; Bridge Canyon is the closest available source for developing adequate power, so the dam, power plant, and pumping facilities have to be brought in as one project.

It is just as completely one project as if water were diverted into the tunnel from the beginning.

Senator DOWNEY. Mr. Chairman, might I just comment upon that: Undoubtedly Bridge Canyon and Glen Canyon will be built. Undoubtedly that power will become available for pumping purposes, for California, Arizona, or elsewhere in that neighborhood.

It is not that Arizona has to have this plan in order to get the power from Bridge Canyon to pump her water; she has to have it as an integral part of the project to finance this otherwise impossible proposition. By joining one with the other she has taken a very valuable power asset in the lower basin and converted it wholly to her own use; first, by the direct use of a third of the power itself, of which the market value would be worth a great deal to the Government or to other places, and then by adding a considerable amount to the charge for the use of the power. That makes it no longer cheap power, but makes it rather expensive power. We will go into that later, and I will not prolong it now.

Senator MCFARLAND. I would say that power to be sold at 4.02 mills is cheap power. As a matter of fact, that is as cheap power as you will find any place. If Glen Canyon, or anything else, is to be built, and if there is no more substance in this project than there is in the average project throughout the United States as to power and irrigation, these are questions this committee will have to decide.

The CHAIRMAN. I wonder if it would be feasible for us to agree that in the preliminary presentation of this matter we shall do our utmost to confine ourselves to the facts and then defer argument until after the facts are in. Would that be agreeable to both sides?

Senator MCFARLAND. That is certainly agreeable.

Senator DOWNEY. It is entirely agreeable to me. I had not realized in my statement that I was transgressing.

The CHAIRMAN. This is just a suggestion for the future.

Senator DOWNEY. Entirely agreeable. I think it is a very wise provision.

Senator MCFARLAND. Mr. Chairman, if I have argued, I beg the Chairman's pardon, but it is difficult to keep from arguing on something in which you are so much interested.

The CHAIRMAN. That is all right.

Any other questions to be directed to Senator McFarland on his testimony of yesterday?

Yesterday, a statement was handed to me by Senator McCarran, of Nevada which was inserted in the record. A statement was also handed to me by Mr. Louis G. Hines, national legislative representative of the American Federation of Labor, discussing Senate Joint Resolution 4. This was also presented for inclusion in the record.

Without objection, it will appear at the appropriate place.

(The statement referred to above is as follows:)

STATEMENT OF LEWIS G. HINES, NATIONAL LEGISLATIVE REPRESENTATIVE OF THE AMERICAN FEDERATION OF LABOR, BEFORE THE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS IN RE SENATE JOINT RESOLUTION 4, MARCH 21, 1949

I am appearing here today in my official capacity as the national legislative representative of the American Federation of Labor in support of Senate Joint Resolution 4. The subject matter contained in this resolution claimed the attention of the American Federation of Labor at its convention held at Cincinnati, Ohio, November 15 to 22, 1948, inclusive.

The following resolution was presented to the convention and adopted unanimously:

"RESOLUTION NO. 48

"Whereas it is common knowledge that the available volume of water in the Colorado River system is far from being sufficient to satisfy the claims and demands of the States of the basin of said river system, particularly as to the States of the lower basin, and interstate controversies exist and have existed for 25 years between said States, or some of them, as to the amount of water from said Colorado River system each is entitled to utilize, and such controversies have tended to hamper the development and maintenance of civic, agricultural, and industrial life within the States of the lower basin particularly; and

"Whereas so long as there remain undeveloped economically feasible hydroelectric potentialities on said river, the use of oil and other fuels for the purpose of generating electric power is unduly expensive, uneconomic, and wasteful of the national resources of our Nation; and

"Whereas so long as there remain undeveloped economically feasible reclamation potentialities which can be supported by the use of the waters of said river system, the full development of the national agricultural economy is retarded to the detriment of the Nation as a whole: Therefore be it

"*Resolved by the sixty-seventh convention of the American Federation of Labor,* That such interstate controversies are against the best interests of the Nation and should be determined, and that the Federal Government should take and support such action as may be necessary to have such controversies speedily adjudicated by the appropriate court of the United States, and to this end the American Federation of Labor recommends speedy enactment by the Congress of such legislation as will enable such judicial determination of existing interstate controversies which hamper and delay the full utilization of the waters of said river system.

"Referred to committee on resolutions.

"Your committee recommends the adoption of the resolution.

"On motion of Assistant Committee Secretary Soderstrom the report of the committee was adopted."

While we realize that a controversy exists between certain States affected in this matter, I desire to point out that the American Federation of Labor is not taking any sides in the interstate controversy. What we are doing is suggesting the adoption of Senate Joint Resolution 4, as a way out of this dilemma that exists at the present time. We believe that the Constitution of the United States gives the Supreme Court original jurisdiction in interstate disputes. There appears to be no other place to go in order to settle this matter but to the Supreme Court. Only Congress can grant consent for the Government to be made a party to a suit that will enable the matter to be decided by the Supreme Court.

I urge speedy enactment by the Congress of such legislation as will enable judicial determination of existing interstate controversies which hamper and delay the full utilization of the Colorado River system.

Mr. Chairman and members of the committee, I desire to extend to you the thanks of the American Federation of Labor for your courtesy and attention.

The CHAIRMAN. It occurs to me, however, to ask how many persons intend to or would like to be heard. Let me suggest not to interrupt the proceedings at this time, but all persons who have come with the idea of presenting any views to this committee should give their names to the clerk at the conclusion of this morning's session, so that the committee may be advised.

Senator Downey, there being no other matters at this time, you may proceed.

Senator DOWNEY. Mr. Chairman, I will present the list of witnesses for California which I believe will be very brief and will expedite this hearing as much as possible. I will present those names.

My colleague from California is here. He has to go to another committee meeting, so he will make the first statement for California.

The CHAIRMAN. Senator Knowland, we will be very glad to hear from you.

Senator MCFARLAND. Senator, would you like to come up here while you are making your statement?

Senator KNOWLAND. I think this will be all right.

STATEMENT OF WILLIAM F. KNOWLAND, UNITED STATES SENATOR, STATE OF CALIFORNIA

Senator KNOWLAND. Mr. Chairman and gentlemen, as a coauthor of Senate Joint Resolution 4, I must necessarily be in opposition to S. 75, and I therefore appear before you for the dual purpose of supporting Senate Joint Resolution 4 and opposing S. 75.

Mr. Chairman, all of the members of this committee represent States where, to more or less degree, sufficient water for man's activities, for domestic, agricultural, and industrial uses, represents the difference between progress, prosperity, and civilization, and desert and desolation. Water is the lifeblood of our Western States. Without an adequate and dependable supply, much fertile agricultural land would revert to desert and industrial expansion would come to an end. While the Colorado River has a long historical record, a realization of its potentialities is but of recent acquisition.

The Secretary of the Interior has officially told the Congress that there is not enough water in this interstate, international stream system to satisfy all claimants, and surely the unfortunate difference of opinion between the State which I have the honor to represent and Arizona over their respective rights to use the waters of the river is well known to most of you. It is, of course, the insufficiency of the water to satisfy the aspirations of both States that has led to this controversy. There are three ways in which honest differences of opinion might be settled: First, negotiation; second; arbitration; third, judicial determination. If I believed it was possible to settle this problem by either of the first two methods, I would not be here advocating Senate Joint Resolution 4. It is now the only alternative. The sooner the facts are settled by the Supreme Court, the better it will be for Arizona, California, and Nevada.

Gov. Earl Warren, of California, and previous governors of the State, have attempted to get a settlement agreed upon, by negotiation or arbitration. Arizona has declined. Big stakes are at issue. California thinks its position is correct, and has backed its belief with the expenditure or commitment of about $550,000,000 by the people of our State. Arizona is just as sure it is correct, and asks this Congress to back her belief with the expenditure of $738,000,000. This is important money on both sides, but the difference is that Arizona seeks to spend not its money to back up its belief in the correctness of its position, but, rather, seeks to get the Federal Government to put it up—and this before the rights of either State have been firmly, finally, and judicially determined.

For bear in mind, Mr. Chairman, that the rights of Arizona and California, to a large part, at least, stem from the apportionment of use of Colorado River system waters as made by the Colorado River compact in 1922. That compact did not make any apportionment to any State, and for 26 years the contest has raged, to the point that neither side, apparently, can recede from its political and publicly stated position. Each State honestly interprets that document differently.

The Boulder Canyon Project Act, adopted by the Congress in 1928, required that California adopt an act of limitation if Arizona failed to ratify the compact. Arizona at first did fail to ratify and California adopted its Limitation Act, and each State has its separate interpretations of the Project Act and of the Limitation Act.

The Project Act authorized the Secretary of the Interior to make contracts for the storage and delivery of Lake Mead water, and contracts have been made by the Secretary with Arizona and California and Nevada. But each of these contracts declares that the specified water shall be delivered only if it is available to the State under the Compact and the Project Act. So, Mr. Chairman, the controversy goes on. None of the States has a certificate of title to its claimed water, and it is but natural that the longer the controversy lasts, the hotter the fires of antagonism flame. California contends that, under our Constitution and law, the United States Supreme Court is the proper forum for a settlement of this type of dispute between the lower basin States.

The American way to settle this dispute is to leave it to the courts. Our Constitution—article III, section 2—gives the United States Supreme Court original jurisdiction in such an interstate controversy, and the Judicial Code, section 233, passed years ago, gives that Court exclusive jurisdiction in such an interstate controversy.

Yet before a judicial determination has been made Arizona seeks by S. 75 to have this Congress authorize a three-quarter-billion-dollar project where the rights to the water to serve that project are in dispute. We all know what the Secretary of the Interior said last year. I quite:

> The water which California projects, Federal or other, now in existence or under construction will require when they are in full operation is a great deal more than the amount which that State is entitled to use if all of Arizona's contentions are taken to be true. Similarly, the water which Arizona projects now in existence, under construction, or authorized will require when they are fully developed is much more than the supply available to that State if all of California's contentions are taken to be true.

So said Mr. Krug, in his letter to Senator Butler on May 13, 1948. That's the situation, gentlemen, without the central Arizona project which is not yet authorized. It will be worse if that project is added to those bidding for the water which isn't there.

I deplore this quarrel, which can only be aggravated if either State claims more water for more projects, makes even greater "overdrafts" on the water account of the already "insolvent" lower Colorado River. Three-quarters of a billion dollars is a lot of money to be spent on any project. That's more than the Panama Canal cost; it's more than TVA cost; it's about the estimated cost of the St. Lawrence seaway. And it's a lot of money, even if backed up with a gold bond title policy of insurance. Certainly, it cannot be built if there is the slightest question as to Arizona's rights to the necessary water to serve it. When, as, and if, the Court speaks and says that Arizona's claims are valid, then will be time enough to consider so huge an expenditure.

So, Mr. Chairman, I oppose S. 75 at this time, and I urge that this committee withhold its approval of that bill. I support and urge the adoption of Senate Joint Resolution 4, of which I am a coauthor, because it offers the only hope for a legal, for an American decision—one that will settle the existing controversy between two States whose borders touch, whose economies are tied together, who, but for this blocking situation which stands in the way of one or the other's proper ambitions, should and could move forward to new horizons. Once we have had a judicial determination I hope that all of us can join

together to aid in the most economic and productive development of the water resources of the Nation.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Are there any questions?

Senator MCFARLAND. I have one question.

Senator, your last statement interests me. I take it from your statement that your objection to this project is chiefly your dispute as to the rights of Arizona to the water?

Senator KNOWLAND. That is one of the basic objections, yes. On all of these projects it is important to all of our States to be sure that they are economically feasible, because I find in the 3½ years that I have been in the Senate, that there are many people in other sections of the country who do not recognize the importance and desirability of reclamation in general. I do not like to see any controversies which may in effect weaken our whole theory of reclamation, which I personally believe is sound.

Senator MCFARLAND. Well, if this were settled, as we contend that it is settled, and if the Congress was convinced that we had the right to this water, either by a decision of the Supreme Court, or otherwise, would you still be opposing the project?

Senator KNOWLAND. No. I would say this: That if we could get a judicial determination of this matter so that that was out of the way, and if the able Senators from Arizona could demonstrate that the project was economically feasible, I have long felt that anything which builds one section of our country builds the whole Nation. I would be just as much interested in aiding the Senator from Arizona in bringing water which is its lifeblood, to his State as to my own State, or to any other Western State.

But I think in all of these projects we all have a double responsibility to be sure that they are economically feasible.

Senator MCFARLAND. But as far as your State is concerned, the settlement of the water right is all you are interested in?

Senator KNOWLAND. No. I am speaking now on my own responsibility as one United States Senator in this body. I think that we have to settle the controversy. When there is an honest difference of opinion which cannot be settled by either arbitration or negotiation, there is only one way left to settle it, in my judgment, and that is by judicial determination. It seems to me that the legitimate aspirations of Arizona, California, Nevada, and the other States can then best be carried out with that part of the controversy behind us.

Senator MCFARLAND. Senator, frankly, what I am trying to determine is whether, if it were settled, you would still be in here opposing us and trying to prevent us from using our water.

Senator KNOWLAND. No, Senator, I think you will bear me out—it was my privilege to serve on the Appropriations Committee for 2 years with your senior colleague from Arizona. I took just as much interest in aiding your colleague to get appropriations for projects in your State, as for mine, or any of the other Western States, just as I have for projects in other sections of the country of a public-works nature.

I believe that it is sound, I believe that it contributes to the wealth and prosperity of the Nation. If you mean to imply that I would be interested in holding the development of your State back, the answer

is definitely no. I am interested in Arizona and all of the States moving forward on a sound basis.

Senator McFARLAND. That is all the questions I have.

Senator KERR. I would like to ask a question, Mr. Chairman.

The CHAIRMAN. Senator Kerr.

Senator KERR. As I understand it, the sole purpose of S. 75 is to authorize the project, Senator. If it were acted upon favorably by this committee, then by the Senate, and then by the House, and then signed by the President, it would still have only the dignity of an authorization act and would carry no appropriation within itself.

Senator KNOWLAND. That is correct; S. 75 is an authorization bill. But I will say to the able Senator from Oklahoma that it has been my observation that getting an authorization bill was something like a camel getting his nose in under the tent. It is then used to come before the Appropriations Committee and say, "Well, now, we have the authorization, consequently let us immediately get started on the appropriation."

Since it is apparent—and I think all people who have examined the situation will admit—that there is an honest difference of opinion in this controversy, and hence, as I tried to point out in my statement, there is not not enough available water in the lower basin to take care of what each State considers to be its legitimate needs from the lower basin quota of water, then it is not sound public policy to add to the potential overdrafts until we find out just what the situation actually is.

Senator KERR. It still is but an authorization bill?

Senator KNOWLAND. It still is but an authorization bill.

Senator KERR. And could not be vitalized except by further action of Congress is appropriating money to do so?

Senator KNOWLAND. That is correct.

Senator KERR. As I understand it—and, frankly, I will now say that I certainly do not know what my opinion would be until I have heard a lot more than I have now heard—but as I understand it Arizona takes the position that there is at this time no controversy over which the Supreme Court could take jurisdiction, as between California, Arizona, and Nevada?

Senator KNOWLAND. I would like to say this in answer to the Senator——

Senator KERR. Is that their position? I would like to know.

Senator KNOWLAND. The Senator from Arizona would probably be able to better state his position than I would be able to state it for him. I am not an attorney. I happen to be a newspaperman. I would prefer not to get into the legal phases of the problem because we have able lawyers on both sides of this controversy, who, I think, will testify here.

I am convinced, as a layman, from what the attorneys have pointed out to me, that there is a case sufficient to warrant going before the Supreme Court of the United States. I know that the people of California and the government of California feel very deeply that there is a matter which needs to be judicially determined.

Senator KERR. I did not want to engage in an argument with the Senator, and since I don't seem to be able to get him to answer my questions, I will not ask any more.

The CHAIRMAN. Senator Anderson.

Senator ANDERSON. Mr. Chairman, I am wondering if it is possible, based on some of the things said here, that the Bureau of Reclamation can furnish us a sort of balance sheet on Colorado River water, as of 1922 and as of 1949. That is a fairly substantial period of years, but what I mean is this: There are those people who contend that water is disappearing from the river. I was reading Frank Waters' book on the Colorado River in which he says that the old-timers say water is gradually disappearing. There are others who claim that changes in the glacial situations are changing the flows in these rivers.

Would it not be possible for someone to tell us whether that is true or not? Whether there is still as much water in the river as there was in 1922 when we divided it up?

Then wouldn't it be possible to find out whether the demand has increased per acre?

For example, in the beginning years the feasibility of a project was based upon the type of crops under that finding of feasibility, it might use 2 feet per acre. Now you have a type of agriculture that uses 4 feet per acre. Have you no obligation to stay within the calculated limits?

The same thing is true in California, of course. The type of agriculture that has been brought in is using tremendous quantities of water. In the meantime, Nevada has not gotten to use its water yet, and we in New Mexico, although the San Juan pours an awful lot of water into the Colorado, have not had a chance to use any of that yet. One little tiny project, involving about 3,000 acres has been tentatively rejected at least, because they are not sure there will be enough water to do all the other things they want to do with the river. We cannot get an acre-foot, apparently——

The CHAIRMAN. Before this hearing is over——

Senator ANDERSON. I am just wondering if we could not get some sort of a sheet to look at which would show us whether the water is disappearing or whether the demand per acre is increasing. I have never seen the over-all figures on the river. I have heard what Arizona wants and what California wants, but what does the whole stream want? The settlement which was made in the Upper Basin States is eminently satisfactory to my State. I think it is a very fine piece of work, and I could not praise too highly the other States which were generous to those of us that were somewhat small.

But I do feel that any businessman looking at his business would like to compare a balance sheet of 1922 with what the balance sheet might be in 1950.

The CHAIRMAN. The information that the Senator states is essential, I think, to an understanding of the problem. It will be brought out.

Senator ANDERSON. Will it be requested?

Senator WATKINS. Mr. Chairman, may I suggest the comprehensive report on the Colorado River gives all that information?

Senator ANDERSON. I am not so sure, I have gone through it.

Senator WATKINS. If they don't have it there, then there probably isn't any, because that contains all the records, the reports, and the measurements on the stream.

Senator ANDERSON. Let me put it this way, Mr. Chairman:

I have a set of books on my business. The individual books contain all the information that I want. But they are not brought together in a single balance sheet until an accountant does it and sends it to me. All the information in the Colorado River report that I have seen is of an over-all nature, and I do not know where it is brought together—at least, I have never found it, and I have gone through it—showing the differences between the time they signed the contract and the present flow of the Colorado River, both at Lee Ferry and where it crosses into Mexico.

Senator WATKINS. I was pointing out, Senator, that I think all the records they have up to the time that report was made are contained in there.

Senator ANDERSON. Yes; but the working out of it statistically is not done.

Senator WATKINS. Well, I imagine that it would be helpful if they would go ahead and lay it out here in very simple language so that we would all see it.

Senator ANDERSON. That is what I wanted.

Senator WATKINS. But I just wanted to mention, I think all the information I have up to the date of that report is in the report.

Senator ANDERSON. That could be.

Senator MALONE. Mr. Chairman, I think the Senator from New Mexico has brought up a very pertinent subject, along the lines regarding which I remarked yesterday.

There is no doubt that in the last 10 or 12 years there is considerably less water in the whole system than there was when we authorized the Boulder Dam project. Now, if we could get this record, I would suggest that we go even back of 1922, because hearings started then and we were using data back of 1922.

When I supervised the writing of Senate Document 186, that was in 1927, 21 years ago, and water has gone under the bridge for 21 years. I would suggest that is one of the first things we should have, not only the total amount of water but the run-off at Lee Ferry, and perhaps the estimated use in the upper States, together with some clarification for the benefit of the committee as to where and how much the river is augmented below Lee Ferry; what the evaporation is, or was then, and is now. Experiments have been run almost continuously, because we have Lake Mead there, which increases its operation.

In other words, the water supply of the river for these years from, say, 1915 to 1948, inclusive. All those years are available.

I believe the Senator from New Mexico is exactly right. Another thing which I regret very much—but we are still doing it—is that first we talk about California and Arizona, then reluctantly we bring Nevada into the picture, and then very reluctantly we say that maybe New Mexico and Utah might be a part of it, if it was finally considered. Let's get this whole picture before the committee.

The CHAIRMAN. That is the purpose of this hearing, and if we were to proceed to listen to the evidence instead of arguing about it, we might get somewhere.

Senator MALONE. Well, let us ask for it.

The CHAIRMAN. But we have a regular order here. Senator Downey is about to present his case.

Senator McFARLAND. I do not want to make a statement, but I would like to call attention to the fact that the amount of water was fully discussed in the hearings on S. 1175 and is also contained in this report.

I would like to ask that this report also be printed in the record.

The CHAIRMAN. What report is that?

Senator McFARLAND. This is the report on the Central Arizona project.

The CHAIRMAN. Whose report?

Senator McFARLAND. By the Bureau of Reclamation.

The CHAIRMAN. It is part of our record here.

Senator McFARLAND. I agree that it would be well for it to be summarized.

Senator MALONE. Mr. Chairman, we are not talking about summarizing a project that might be cut out for Nevada, California, or Arizona, we are talking about the over-all water supply.

Now, I have before me here——

Senator McFARLAND. Senator, if I may interrupt, that is what I meant by a summarization.

Senator MALONE. This, as I understand it, is a report on the project itself, is it not?

Senator McFARLAND. It discusses the whole water supply of the project.

Senator MALONE. I have the report and I went over it last night. It does not discuss it from this angle.

Senator McFARLAND. I do not care to argue the matter.

The CHAIRMAN. Senator Downey.

STATEMENT OF SHERIDAN DOWNEY, UNITED STATES SENATOR, STATE OF CALIFORNIA

Senator DOWNEY. Mr. Chairman and gentlemen, I am going to read what I hope will be a brief and compact statement, in which I will only anticipate the issues that will be covered by witnesses from California, who have a far greater familiarity with the subject than have I. If the statement seems somewhat terse, it will be understood. It is more the recital of the points that we expect to develop than a discussion or defense of them.

Congress has before it two conflicting measures relating to the Colorado River. One is S. 75, a bill offered by Arizona to authorize construction of the Central Arizona project. The other, Senate Joint Resolution 4, is a resolution offered by California and Nevada to grant the consent of Congress to a suit in the United States Supreme Court to determine the wate rcontroversy in the lower basin of the Colorado River.

The basic question is whether Congress shall give serious consideration to authorization of a billion-dollar project to utilize water which is in dispute between Arizona and California, or whether it shall authorize a determination of the dispute in the Supreme Court before considering the project further.

As to the litigation resolution:

The California witnesses will endeavor to show that—

1. Arizona and California have been locked in controversy over the meaning of the Colorado River compact and associated documents for

a quarter century. There is no prospect of settling the controversy by negotiation or arbitration.

Now, Mr. Chairman, I wish to divert from my written statement to say this: The junior Senator from Arizona criticized California because it was only recently that we sought a resolution allowing California to proceed to the Supreme Court of the United States. I believe we have had such a resolution in Congress for the last 3 years, and through the opposition of Arizona we have been prevented from securing its passage.

This dispute between Arizona and California only became acute, a desperate situation for both States, about 3 years ago, when the treaty with Mexico gave to Mexico approximately a million acre-feet of water more than all of us, at least in California, had believed that Mexico was entitled to or should receive.

Of course, we all accept as wise and just that allotment to Mexico. There is no criticism or complaint about that, but it was after this subtraction of approximately a million acre-feet from the waters of the Colorado River that none of the pioneer developers there had foreseen nor admitted that Mexico rightly deserved, when this situation did become acute.

I now return to my written statement.

2. The existence of this controversy imperils the orderly development of the lower basin of the Colorado River.

3. Two of the three lower Division States, California and Nevada, seek a judicial determination of the controversy by submission of their case to the United States Supreme Court.

4. As the United States is an indispensable party to such a case in the Supreme Court, the consent of Congress is necessary.

5. The controversy is justiciable. It involves, as said by the Interior Department, at least four great unsolved questions encompassing over 2,000,000 acre-feet, and I now interpolate to say that our witnesses will discuss those four complicated legal questions hereafter. As said by the Interior Department:

> The bare statement of these questions, the knowledge that there is disagreement between Arizona and California about the answers to be given them, and the fact that, if the contentions of either State are accepted in full and if full development of the upper basin within the limits fixed by the Colorado River Compact is assumed, there is not available for use in the other State sufficient water for all the projects, Federal and local, which are already in existence or authorized, would seem to indicate that there exists a justiciable controversy between the States.

And in frankness, I want to say that later the Interior Department did indicate that if Congress felt there was not a justiciable controversy, then it certainly could be made one by the authorization of some project in Arizona.

6. The issues, as defined by the Department of the Interior, are all questions of law and of interpretation of written instruments, primarily the Boulder Canyon Project Act, the Colorado River compact, and the California Limitation Act. They can all be disposed of speedily, without protracted testimony.

Even in a jury case, the interpretation of written instruments is primarily the duty of the judge, and not of the jury.

7. These issues cannot be constitutionally determined by Congress.

As to the Central Arizona project:

The California engineering witnesses will endeavor to show that:

1. Cost. The cost of the project is some $750,000,000, and, on some assumptions, will exceed a billion dollars. And I might say materially exceed that sum. This is more than the cost of TVA or the St. Lawrence seaway, and about five times the cost of the Boulder Canyon project.

2. Area benefited. Unlike TVA or the St. Lawrence seaway, on which a comparable expenditure benefits several States, this project is to "rescue" 150,000 acres of land. This is equal to the area put into production in this area during the war boom by drilling wells to "mine" the ground water, which was known to be inadequate.

3. Cost and values per acre. Central Arizona land is worth at most $300 per acre. Much of the desert land put into cultivation during the war, which will be "rescued" by this project, was bought from the State at a fraction of that price. But at $300 per acre, the whole irrigated area of central Arizona, less than 600,000 acres, could be bought for $180,000,000, and the 150,000 acres at stake could be bought for $45,000,000. By contrast, this project will cost approximately $750,000,000. If only half that amount is allocated to irrigation, the cost per acre of land "rescued" is about $2,500 and the cost of the whole project is four or five times the value of all the agricultural land in central Arizona.

I mean that good land, with the water there and ready for cultivation is worth $300 per acre. I do not mean, if it is in citrus, as a comparatively small amount is, that it is not worth more, or in other isolated cases. But the value of the land, with water, seldom exceeds $300 per acre.

4. Financing. The capital cost is not expected to be repaid by Arizona. The water will be sold to irrigators at $4.50 per acre-foot. This is less than the cost of operation and maintenance, even if a nominal charge is made for power for pumping.

I now divert from my written statement to say this: The pumping of the water on the 985-foot lift will take one-third of all the great bulk of power developed in Bridge Canyon. That power at commercial rates in Arizona or California could be sold for $5,000,000 a year, and if you consider pumping charges as a part of operation and maintenance, as I think you would, operation and maintenance would run to ten, eleven or twelve dollars per acre-foot. According to the statement of the Department of the Interior, the most the farmer could pay for all charges is about $4.75 an acre-foot. In other words, operation and maintennace, including pumping charges, would be three times the total amount that the lands of Arizona could pay.

The power users or the Federal taxpayer will thus have to liquidate not only all the capital costs, but provide part of the money for the operating expense of the aqueduct, several million dollars per year.

The Treasury will not receive any net revenues with which to pay interest on the billion dollars which the project will add to the national debt. While the California power customers will pay interest, S. 75 contemplates that the money so collected will be used to retire capital invested in the aqueduct, as a subsidy to Arizona.

5. Sales of power. Since the irrigators cannot repay the capital, it is planned to write off about $80,000,000 and to recover about $700,000,000 by selling power, primarily to California, for enough to pay

not only for the Bridge Canyon power dam, but also for the Central Arizona aqueduct. The power users of California are thus expected to pay for the Arizona aqueduct, to take the water that the California projects were built to use.

6. Water requirements: The California witnesses disagree with the estimates of the project's sponsors as to the water requirements of the area now cultivated in Arizona, and will state their reasons.

7. Proposal for an engineering board. Finally, California's engineering witnesses will present a specific proposal, based on the precedent of the Boulder Canyon project, for the appointment of an engineering board of national standing to review the project's economic, engineering, and water questions, before Congress attempts to pass on these technical matters.

I wish now, Mr. Chairman, to insert in the record, without reading it, a memorial of the California Legislature, a copy of which is attached to my statement. I hold the original certified copy here.

Now Mr. Chairman, anticipating two or three questions——

Senator MILLIKIN. Mr. Chairman, may I ask what this memorial is about?

Senator DOWNEY. I beg your pardon, Senator, I should have described it. It is a memorial of our State Legislature stating California's position on this controversy with Arizona. I will be glad to read it, if that is desirable.

The CHAIRMAN. I do not think that is necessary.

(The document referred to above is as follows:)

MEMORIAL OF THE CALIFORNIA LEGISLATURE

California's case was summarized by Joint Resolution No. 10 of the California Legislature, adopted January 27, 1949, as follows:

"Whereas more than three million five hundred thousand inhabitants of this State are dependent upon the Colorado River as a source of supplemental water supply for domestic purposes; and

"Whereas the metropolitan areas of Southern California, including those within approximately two thousand two hundred square miles of coastal plain and foothills extending from Los Angeles to Riverside and San Bernardino and those in San Diego and vicinity are dependent upon the Colorado River as a source of supplemental water supply for municipal and industrial purposes; and

"Whereas over one million acres of lands of this State are solely dependent upon the Colorado River as a source of water supply for irrigation purposes; and

"Whereas there is now pending in the United States Senate a bill (S. 75) which, if enacted, would authorize the Central Valley Project; and

"Whereas there is insufficient water available in the Lower Basin of the Colorado River to supply the Central Arizona Project without depriving the people of California of their right to use that water and jeopardizing their investment in distribution facilities which amounts to more than five hundred million dollars ($500,000,000); and

"Whereas the States of California and Arizona have been unable to agree as to their respective rights to the use of the water of the Colorado River; and

"Whereas resolutions (S. J. Res. 4 and H. J. Res. 3) are now pending before the United States Congress which would, if adopted, authorize a suit in the United States Supreme Court to determine the respective rights of the States of Arizona, Nevada, and California to the use of the water of the Colorado River; and

"Whereas the authorization of the Central Arizona Project prior to an adjudication of water rights would greatly intensify the dispute between the States of California and Arizona and result in the possible expenditure of hundreds of millions of dollars of public money to construct a project for which there would be an inadequate water supply; now, therefore, be it

"*Resolved by the Assembly and the Senate of the State of California, jointly,* That the United States Congress is respectfully memorialized and urged to adopt

one of the resolutions authorizing a suit in the United States Supreme Court to adjudicate the respective rights of the States of Arizona, Nevada, and California to the use of the water of the Colorado River; and be it further

"*Resolved*, That the United States Congress is respectfully memorialized and urged to suspend further consideration of the proposed Central Arizona Project pending the determination of the respective rights of the States of Arizona, Nevada, and California to the use of the water of the Colorado River; and be it further

"*Resolved*, That copies of this resolution be transmitted to the President of the United States, the President of the Senate of the United States, the Speaker of the House of Representatives of the United States, and to each Senator and Representative from California in the Congress of the United States."

Senator DOWNEY. It is a reiteration of what has been said and what will be said hereafter.

First, anticipating a question that might be asked me by Senator McFarland, as to whether California would have no opposition to this project if the Supreme Court, or some other agency should decide the matter, yes, I, as a Senator from California, from the Colorado River Basin, and representing the Nation, would have serious objection. First, I think it is totally inequitable to all of the Colorado River Basin States.

The Bridge Canyon Reservoir site is the foundation for a power project of great profit. Out of that, the financial plan of the Arizona project expects to take one-third of the power, without any cost, and all profits from two-thirds of the power. I would say that under their financial statement, that dam site is worth $400,000,000 to the lower basin States. I cannot believe that it is equitable and fair to set over to Arizona the entire value and profits from that project for a period of 70 or 80 years to provide water for the equivalent of 150,000 acres, and that is what it amounts to.

At 4 acre-feet to the acre, that comes to six or seven hundred thousand acre-feet, and that is about the net amount of water that will be delivered.

I think that Utah, New Mexico, Nevada, California, and Arizona all have some interest in the value of that asset, which undoubtedly will be developed by the Nation some day.

Mr. Chairman, it will later be developed that there is another item of expense here without which the Arizona project cannot be carried out, and that is the building of Glen Canyon Dam. It is admitted in the reports of the Bureau of Reclamation that Bridge Canyon Dam, left to itself, will silt up in 40 years and will become of little value. This project does not expect to pay out for perhaps 90 or 100 years.

Consequently, in order to protect the Bridge Canyon Dam from silting up; we have to build Glen Canyon Dam, which is above Bridge Canyon, in the upper basin. That will cost another $150,000,000.

Senator MILLIKIN. What did you call that dam, sir?

Senator DOWNEY. Glen Canyon Dam. It will cost another $150,000,000. That is in the upper basin.

Of course, that will have other uses than providing against silting in the Bridge Canyon Reservoir. But one of its large profitable uses would be to help to detain the silt that would otherwise fill up Bridge Canyon Reservoir.

No provision is made in this project as to how the upper or lower basin States should participate in the cost of Glen Canyon Dam, or how they should participate in the profits that would be made there.

The authorization of this project, rather casually, as is suggested, would be an authorization, in my opinion, of Glen Canyon Dam and a direction to the Secretary of the Interior, under S. 75, if he believes it is necessary to protect Bridge Canyon Dam, to build Glen Canyon Dam and spend 150 or 200 million dollars.

I might say that S. 75 is a wide-open blank check for the Secretary of the Interior to spend any money that he deems necessary to make this project feasible.

In the third place, Mr. Chairman, my objection to this project, going beyond the legal dispute, is this: I think the reclamation States have a heavy interest in preventing an authorization such as this, which would rescue lands at such an extraordinary expense that it will undoubtedly shock all Senators, certainly those outside of the reclamation States. I think it would retard the advancement of reclamation in the West. And I think that merely by the imposition of a direct burden of eight or nine hundred million dollars—and I include in this figure the cost of Glen Canyon, that has to be considered; but not the possibility of building the tunnel—the bill would impose such an obligation on the Federal Government that it would become most difficult for any of the Western States to get appropriations behind this mammoth appropriation without a great deal of trouble.

In connection with that, in the 50 years—slightly less—that the Reclamation Bureau has been in existence, it has only spent $1,500,000,000. Now, S. 75 contains the possibility of going beyond that sum. As a minimum it would certainly be substantially more than half of it.

I want to say to my distinguished and dear friend from Oklahoma, that, from my own viewpoint, I have never looked at an authorization otherwise than as the solemn and binding finding of the authorizing committee, to be taken as such by the Appropriations Committee. The attitude that the distinguished Senator seems to express is: Well, this is not too important here. We can authorize this perhaps to make a justiciable controversy, but the Appropriations Committee can check us if it is too extravagant and grandiose a project.

To me at least, the primary obligation of determining the financial feasibility of any great undertaking by the Federal Government rests upon the authorizing committee. As far as financial feasibility and justice is concerned, that is generally considered binding upon the Appropriations Committees. They, then, make appropriations as they think money is available and as they think appropriations should properly be made.

Subsequent witnesses, quoting the Department of Justice and other agencies of the Government, will convince the Senator—I hope—that there is a justiciable controversy existing right now of the firmest kind, and that at the worst, if the Supreme Court should decide not, we would only lose a few months' time by presenting it on the present basis.

Senator KERR. If I may ask a question at that point, Senator: First, let me say this. I was not trying to get into an argument with your colleague. I was trying to get some information which I am going to eventually try to get somewhere. It seems that I succeded only in starting an argument. I am certainly not going to do that now.

As I understand it, if there is no justiciable issue, Congress cannot make one.

Senator DOWNEY. Oh, well, Senator, I would not go that far. It might be, although I could not agree with this theory—it is Arizona's theory—that if there is no justiciable issue now, but if the authorization were made and the construction of the works by the United States Government were imminent, then California would be in a stronger position for claiming there is a justiciable controversy.

Senator KERR. The thing that came to my mind is this: I take it that this committee and this Congress are not going to authorize a project that is not justified on adequate studies, from the standpoint of economic feasibility.

Senator DOWNEY. I am relieved to hear the Senator say that. Then we are in complete accord.

Senator KERR. The thought I was trying to develop here with your colleague was this—and I would like to ask you, if you don't mind, Senator, without starting an argument, because I am not going to engage in an argument——

Senator DOWNEY. Please do, Senator.

Senator KERR. In view of the fact that there would be no authorization unless there was economic justification, and in view of the fact that even if there were authorization there would be no vitalization of it without appropriation, the question I was going to ask him was this: If it were not a fact that the authorization of this project, if it were found economically feasible, would not serve to create the justiciable issue which, as I understand it, California seeks to create by this Senate Joint Resolution 4.

Senator DOWNEY. No, Senator; we do not attempt to create the justiciable controversy by Senate Joint Resolution 4. We claim that a very serious and substantial one now exists.

Senator KERR. Then why doesn't California take it to the Supreme Court?

Senator DOWNEY. Because, Senator, no State can resort to the Supreme Court on any case involving the rights of States to Colorado River water in which the United States is an indispensable party without the consent, either of the Executive, in certain cases, or Congress. We have been unable to go to the Supreme Court because we have not been able to secure the consent of Congress to make the United States Government a party to it. All this resolution would do would be to waive the immunity of the United States not to be sued by a State.

There have been three cases between Arizona and California in which Arizona was the petitioner. The last case was dismissed because the United States Government was not a party defendant. The Supreme Court held that the United States is an indispensable party.

Senator KERR. Did they not also hold that there was no justiciable issue between the States?

Senator DOWNEY. I am not aware of that, if they did, Senator.

Senator MCFARLAND. I think that was absolutely the fact.

Senator DOWNEY. Very well. As I understood, the cases were each dismissed. There might have been a further reason.

The only point I am trying to make is that California cannot get into the court without the consent of Congress or the Chief Executive.

Senator KERR. That would only be where California had a controversy with the Nation, would it not, Senator?

Senator DOWNEY. No; with the sister States.

Senator KERR. In those cases where cause is limited to the sister State aren't the books full of cases where the Government was not a party to the litigation?

Senator DOWNEY. No. In the case I mentioned the Court held that the United States Government is an indispensable party in any litigation between States involving rights in the Colorado River. The United States has certain rights on that river, including great dams and navigation rights. The United States is an indispensable party, Senator.

Senator ANDERSON. Will you yield to me for just a second?

Senator KERR. Certainly.

Senator ANDERSON. When California was defending did it raise that as a defense?

Senator DOWNEY. No.

Senator ANDERSON. Did California, in other words, try to rush into court and go through with it, or was that raised by defense?

Senator DOWNEY. Mr. Shaw, was that raised as a defense by the State?

Mr. SHAW. The contention was raised by California and the five other States in the basin.

Senator ANDERSON. Therefore California has not been so interested to get this adjudicated, has it, really?

Mr. SHAW. I would like to present that subject a little later.

Senator DOWNEY. Yes, Mr. Shaw will cover that later.

I might say, Senator, that that did not involve this controversy we are dealing with here. We will be very glad to discuss those cases with you. It was an entirely different problem.

Senator ANDERSON. I just wondered if it dealt with this question of water between the two States.

Senator DOWNEY. Mr. Chairman, I now want to read the Bureau of the Budget communication to the Secretary of the Interior, being the report of the Bureau of the Budget on the central Arizona project.

I want to state that later on there was a communication from the Bureau of the Budget to the Interior Department. In my own opinion it does not vary the effect of the recommendation made in the report which I will read. I must admit that to me, at least, the later letter is quite ambiguous and just why it was written I do not know. But I will read this, and will rest upon this.

Probably subsequent documents which developed out of this document will come before the committee, but in my own opinion the declaration of the Bureau of the Budget on the policy of the President in relation to the central Arizona project has not been modified by any subsequent document. But I will freely admit that the Senator from Arizona, or someone else, may claim there have been such documents.

This is dated February 4, 1949. It is signed by Frank Pace, Jr., and is addressed to the Secretary of Interior:

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., February 4, 1949.

MY DEAR MR. SECRETARY: In Director Webb's letter of September 16, 1948, concerning your report on the central Arizona project, he pointed out that the Bureau of the Budget had not completed its review and analysis but agreed with your suggestion that the report should be forwarded to the Congress. I am now able to advise you that the Bureau of the Budget has completed its study of the

report and a determination has been made of the relationship of the proposed project to the program of the President.

The report proposes the construction of the Bridge Canyon Dam and power plant, a pumping plant at Lake Havasu, and an aqueduct from there to Granite Reef Dam in central Arizona, together with other appurtenant works for the purpose of providing supplemental water to irrigation areas in central Arizona and hydrolectric power in the Arizona-southern California area. The total estimated cost of the project as of January 1948 is $738,408,000, of which (based on existing law) $420,000,000 would be allocated to irrigation, $291,000,000 to electric power, $18,000,000 to municipal water supply, $6,000,000 to flood control, and about $3,000,000 to fish and wildlife. It is proposed to install 750,000 kilowatts capacity of power generation at Bridge Canyon Dam, with about 2 percent additional generation at smaller dams on the project.

The report calls for an ultimate annual diversion of 1,200,000 acre-feet of water from the Colorado River at Lake Havasu (Parker Dam) with a pump lift of 985 feet to the Granite Reef aqueduct through which it would be conveyed for a distance of 241 miles to the Phoenix area of Arizona as a supplemental supply of irrigation water. The use of such supplemental water would be (1) to replace the overdraft on the ground water basins, (2) to permit the drainage of excess salts out of the area and maintain a salt balance, (3) to provide a supplemental supply to lands now in production but not adequately irrigated, (4) to increase the water supply for the city of Tucson, and (5) to maintain irrigation of 73,500 acres of land formerly irrigated but now idle for lack of water. It is proposed to charge the district $4.50 per acre-foot of water. The duty of water varies between projects and between surface and pumped water. However, diversion demand of surface water at district headgate is given as an average of something about 5 acre-feet per acre. The rate for power would be (under existing law) 6.22 mills.

It is the opinion of the regional director of the Bureau of Reclamation that the "project has engineering feasibility in the sense that there are no physical obstacles * * * that could not be overcome." He states, however, that "financial feasibility of the project is more difficult to determine" and further in his report to the Commissioner of Reclamation, he raises the question of adequacy of the water supply for this project.

It is pointed out in the report that the project as proposed is economically infeasible under existing Reclamation laws and that it is essentially a "rescue" project designed to eliminate the threat of a serious disruption of the area's economy. Modifications in these laws are therefore proposed in the report to extend the repayment period for the entire project, including power, to 78 years and to use one-fifth of the interest component on the commercial power investment to aid in the repayment of irrigation features.

Here I wish to interpolate that that plan is changed in S. 75 and now all of the interest component on the power will be diverted to the irrigation features. This is not a report on S. 75. We have had no report on S. 75. This report was on the central Arizona project as it was presented last year.

I return now to the letter:

The State of Arizona says that under the Colorado River compact, other agreements, and California's self-limitation act, Arizona has allocated to its use 3,670,000 acre-feet of water per year. It states that it is now using from the main stream of the Colorado and its tributaries in Arizona a grand total of 1,408,000 acre-feet of water per year, thus leaving 2,262,000 acre-feet for additional consumption which cannot be lawfully used elsewhere than in Arizona. It estimates the (consumptive) use for the central Arizona project at 1,077,000 acre-feet, which together with the other planned uses will still leave in the main stream, according to the State's estimate, a balance of 619,000 acre-feet apportioned to Arizona for future use and for reservoir losses. Arizona bases its case for diversion of water from the Colorado River upon these figures and proposes to use such water as a supplemental supply for lands now inadequately irrigated. It states further that the irrigation of lands in central Arizona has been expanded beyond the water supply of central Arizona and that this is resulting in an exhaustion of their underground supply with insufficient surface stream flow to maintain production in the lands now irrigated. To avoid the danger to the entire economy of the State, it considers it essential that the central Arizona project be expedited.

The Commissioner of Reclamation states that assurance of a water supply is an extremely important element of the plan yet to be resolved; that the showing in the report of there being a substantial quantity of Colorado River water for diversion to central Arizona for irrigation and other purposes is based upon the assumption that claims of the State of Arizona to this water are valid. He states that the State of California challenges the validity of Arizona's claim and that if the contentions of the State of California are correct, there will be no dependable water supply from the Colorado River for this diversion. He further states that the Bureau of Reclamation and the Department of the Interior cannot authoritatively resolve this conflict between States and that it can be resolved only by agreement among the States, by court action, or by an agency having proper jurisdiction.

The comments of the several affected State governments and interested Federal agencies with respect to his report contain a number of objections and reservations with respect to the proposed project. Specifically, the Department of Agriculture questions whether the benefits actually exceed costs. It questions, as it has on numerous other occasions in commenting on proposed Reclamation projects, the use of the gross rather than the net crop return method of computing benefits. The Department further says, "The actual relation of benefits to costs is still further obscured by what appears to be a failure to use the market value of power in estimating for evaluation purposes, the cost of pumping the water supply. Market value must be used in economic evaluation because the power has alternative uses." Commenting further on benefits, the Secretary of Agriculture states " * * * while it is necessary that benefits exceed costs if a project is to be considered economically justified, this alone is not sufficient. Sound economies and common sense require: First, the consideration of possible alternatives; and, second, the choice of that alternative yielding the largest return on the investment." The comments of the Department of Agriculture go even further and state, "At least in the respects mentioned above, the benefits used in testing the economic soundness of the project are in error. We would recommend, therefore, that further and more careful consideration be given to the economic evaluation of the proposed project."

The Federal Power Commission points out that there is no essential physical relationship between the Bridge Canyon power project and the central Arizona diversion project but that the two are linked together in the report because of the need for subsidies from electric power income to help finance the irrigation improvement. It also indicates that the burden of the irrigation costs are considerable and that the proposed charges for electric power consequently approach a level where such power cannot be classed as low cost in this region. The Federal Power Commission also suggests that further studies are required before the proper installed capacity at Bridge Canyon power plant can be finally determined and that it could probably be considerably more than the 750,000 kilowatts proposed.

The State of Nevada says: "There is a grave question regarding the availability of water to Arizona to supply the project. * * * Studies have been made by California and Nevada engineers which show there will be little or no water for the central Arizona project. * * * Investigations and reports should be held up or be only preliminary in character where there is a question as to availability of water." The State of Nevada further says that some engineers have expressed an opinion that the Bridge Canyon Dam and Reservoir cannot be utilized properly and to its full extent as a power project because of the limited storage behind the dam which in a few years would fill with silt and power service would depend on natural fluctuating river flow. They raise questions as to whether it would not be desirable to construct Glen Canyon, which would provide much additional storage capacity, at the same time as Bridge Canyon.

The State of Nevada, in commenting on the economic justification of the project, computes the net irrigation construction costs on the acreage which will be salvaged by the project at $1,469 per acre and questions the justification of such costs in the face of an estimated farm-land value with irrigation of $300 per acre.

The State of California says that a controversy has existed between California and Arizona for many years as to their respective claims to Colorado River water and that conferences held on this subject throughout have not brought a solution. The State further says that until there is a final settlement of the water rights, the aggregate of Arizona and California claims to Colorado River water will exceed the amount of water available to the lower basin

States under the Colorado River compact and relevant statutes and decisions. It states that as long as the present unsettled situation exists, each State in the lower basin must, of necessity, interest itself in the others' projects which would overlap its claims. Accordingly, the State of California submits the following conclusions: (*a*) The plan for construction, operation and maintenance of the proposed project is not financially feasible under existing Federal reclamation law and the modifications thereof considered in the report; (*b*) consideration of an authorization for the central Arizona project should be withheld until a determination has been made of the respective rights of the lower basin States to the waters of the Colorado River system; and (*c*) extensive and detailed studies and investigations should be made by the Bureau of Reclamation of local water supply and use in order to determine accurately the amount of supplemental water needed for existing irrigated lands in the Salt River and Middle Gila River Valleys and to formulate plans for additional conservation of local water supplies.

With reference to the controversy that exists between the claims of the States of the lower basin, it is concluded that the situation has not changed since your interim report of July 14, 1947, on the status of your investigations of potential water resource developments in the Colorado River Basin. In the report of the Commissioner of Reclamation, approved by you, it is stated "that further development of the water resources of the Colorado River Basin, particularly large-scale development, is seriously handicapped, if not barred, by lack of a determination of the rights of the individual States to utilize the waters of the Colorado River system."

On July 23, 1947, Director Webb replied to your letter of July 19, 1947, as follows:

"* * * Acting under authority of the President's directive of July 2, 1946, I am able to advise you that there would be no objection to submission of the proposed interim report to the Congress, but that the authorization of any of the projects inventoried in your report should not be considered to be in accord with the program of the President until a determination is made of the rights of the individual States to utilize the waters of the Colorado River system."

From an examination of the report, of the comments of the affected States, and of the comments of other interested Federal agencies, it is apparent that there are a number of important questions and unresolved issues connected with the proposed central Arizona project. The provision of adequate water supply, if found to be available, is admittedly a high-cost venture which is justified in the report essentially on the basis of an urgent need to eliminate the threat of a serious disruption of the area's economy. Even so, the life of certain major parts of the project is appreciably less than the recommended 78-year pay-out period. The work could be authorized only with a modification of existing law or as an exception thereto. Furthermore, there is no assurance that there will exist the "extremely important element" of a substantial quantity of Colorado River water available for diversion to central Arizona for irrigation and other purposes.

The foregoing summary and the project report have been reviewed by the President. He has instructed me to advise you that authorization of the improvement is not in accord with his program at this time and that he again recommends that measures be taken to bring about prompt settlement of the water-rights controversy.

Sincerely yours,

FRANK PACE, Jr., *Director.*

Now again, I reiterate there are certain subsequent documents that, according to the Bureau of the Budget, were prompted by the interposition of certain of the congressional representatives, and that to me are ambiguous——

Senator MCFARLAND. I will be one of them, Senator.

Senator DOWNEY. Well, I understand there was nobody from California. As I say, those documents are ambiguous to me. The Senator might justly make some argument that they modified it but in my opinion they do not. I am not going to read them at this time but they should, of course, be read and considered as a part of the proceeding before we are through.

Likewise, Mr. Chairman, before we conclude we will want to read the full reports of the Agriculture Department, the Federal Power Commission and other reports.

That is all I have unless my very distinguished friend from Arizona wants to ask a question.

Senator WATKINS. Is that letter a report from the Bureau of the Budget?

Senator DOWNEY. Yes.

Senator WATKINS. And what is the date of that?

Senator DOWNEY. That is dated February 4, 1949. There was another letter written February 11, I believe, but I will leave Senator McFarland to read and interpret that if he wants to.

Senator MCFARLAND. Mr. Chairman, I suggest that be made a part of the record. The committee will be able to interpret these documents themselves. They are clarifying.

The CHAIRMAN. These letters have already been admitted into the record and are available to all the members. However, I will ask that the letter dated February 11, 1949, now be made a part of the record.

(The document above referred to is as follows:)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
February 11, 1949.

MY DEAR SENATOR O'MAHONEY: Members of the Congress have raised a question as to the interpretation to be placed upon the last clause of the last sentence of my letter of February 4, 1949, addressed to the Secretary of the Interior advising him of the relationship to the program of the President of the central Arizona project. The clause referred to reads as follows: "* * * and that he [the President] again recommends that measures be taken to bring about prompt settlement of the water-rights controversy."

During the last Congress in connection with consideration of Senate Joint Resolution 145 and House Joint Resolution 227, this Office advised the Attorney General that it would be in accord with the program of the President to resolve the water-rights controversy by waiving immunity of the United States to suit and by granting permission to the States to bring such actions as they might desire, if the Congress felt it to be necessary to take such action. This advice was transmitted to the Congress by the Attorney General. Similar advice was also transmitted by the Secretary of the Interior, together with specific suggestions as to a form of a resolution which the Congress might consider.

In order that there may be no misunderstanding of the President's position, I shall be grateful if you will advise the members of your committee that the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him. On the contrary, the letters addressed to the Congress last year, as indicated above, stated specifically that enactment of the resolution authorizing suit would be acceptable to the President "* * * if the Congress feels it is necessary to take such action in order to compose differences among the States with reference to the waters of the Colorado River * * *."

The project report and materials relating to the posititon of the several States affected are now before your Committee for consideration. If the Congress, as a matter of national policy, makes a determination that there is a water supply available for the central Arizona project, the President will consider all factors involved in any legislation to authorize the project and will inform the Congress of his views respecting the specific provisions of this legislation.

Sincerely yours,

FRANK PACE, Jr., *Director.*

The CHAIRMAN. Senator Downey, I should like to ask you one or two questions. Senate Joint Resolution 4 is different from the resolution which was introduced in the Congress last year?

Senator DOWNEY. That is correct, sir.

The CHAIRMAN. Would you care to state for the record the difference between the two?

Senator DOWNEY. Mr. Chairman, I do it with some hesitation, as I understand the resolution last year directed the Attorney General to commence a suit in the Supreme Court. This year it waives the immunity of the Federal Government from suit. They accomplish the same end with somewhat different language.

Senator WATKINS. Mr. Chairman, I just want to suggest—didn't the one before the first resolution also direct the Attorney General to intervene?

Senator DOWNEY. Yes; I think that is a correct statement.

The CHAIRMAN. I thought Senator Downey might desire to make a statement of the difference for the record.

Senator DOWNEY. Yes.

The CHAIRMAN. Do you know what the reason was for changing that?

Senator DOWNEY. It was done at the suggestion of the Department of Justice. Our present resolution conforms to the suggestions made by the Department of Justice.

The CHAIRMAN. The resolution which is now before us opens with this preliminary clause:

"Whereas there are controversies of long standing among the States of the lower Colorado River Basin over the rights of those States to the use of water under certain provisions of the Colorado River compact—

and so forth.

The second clause:

Whereas those controversies—

namely, the controversies among the States of the lower basin—I am interpolating here—

now adversely affect and limit the development of various projects in that basin—

assuming that to be the lower Colorado River basin.

Senator DOWNEY. Yes.

The CHAIRMAN (reading):

For impounding, regulating, and using the waters of the Colorado River and its tributaries—

et cetera.

Then the final preliminary clause reads:

Whereas the Supreme Court of the United States in *Arizona* v. *California* (298 U. S. 558) held in effect that there can be no final adjudication of rights to the use of the waters of the Colorado River system without the presence, as a party, of the United States: Now, therefore, be it *Resolved*—

and so on.

As an advocate, and one of the sponsors of this resolution, is it your thought that if it should be enacted and the consent of Congress should be given to the joinder of the United States, the issues in controversy before the Supreme Court and to be passed upon by that Supreme Court would be confined to the controversies in the lower Colorado River Basin, or would they involve the entire system?

Senator DOWNEY. The suggestion was made that the resolution should be enlarged so as to bring within its scope all of the States in the basin.

The CHAIRMAN. Do you mean the entire basin, or the lower basin?

Senator DOWNEY. The entire basin. That suggestion has been made.

But as far as we are concerned, we can conceive of no controversy between the lower and the upper basin States, or any of the States in the lower or upper basins. We have no controversy of any kind to settle with any other of the basin States.

The CHAIRMAN. Well, again calling your attention to the fact that the preliminary clauses refer to the controversies of the States of the lower basin and their effect upon the projects which have been constructed or are contemplated for the lower basin, nevertheless the body of the resolution proceeds thus:

That consent is hereby given to the joinder of the United States of America as a party in any suit or suits, commenced within 2 years—

and I will ask you a question about that later—

from the effective date of this resolution in the Supreme Court of the United States by any State of the lower basin of the Colorado River, as that basin is defined in the Colorado River compact, for the adjudication of claims of right asserted by such State—

which I take to be a State of the lower basin—

by any other State—

that includes any State at all.

Senator DOWNEY. That is right.

The CHAIRMAN. Whether in the basin or out of the basin—

or by the United States, with respect to the waters of the Colorado River system, as defined in said compact available for use in that basin. Process in any such suit may be served upon the Attorney General.

Now, I ask you two questions: Why does it propose to grant consent to litigation in which any State may participate, whether within the lower basin or within the whole basin, or not; and, why does it refer, or why does it mean that the waters of the Colorado River system is the basis of the adjudication?

Senator DOWNEY. Mr. Chairman, all I can say is that that resolution, I am informed, was drafted in conformity with the suggestions of the Department of Justice. I never thought that it included within its scope anything affecting any States outside the Colorado River Basin, but it does leave open, as we understand that resolution, the right of any State in the Colorado River system to proceed to litigation.

I might say this, Mr. Chairman: I rather think that that was drafted and introduced before we knew about the upper-basin compact. I want to assert that we will be very happy at any stage to amend this resolution to make it appertain only to disputes among the lower-basin States. As a matter of fact, that was our idea. I am informed that it was the Department of Justice that desired this.

I have also been told that certain representatives of the upper-basin States either have acquiesced in this or have desired it. I see no purpose, and I know of no possible dispute that could now exist between the upper- and lower-basin States.

The CHAIRMAN. As you say, the upper-basin States have made a compact by which they have undertaken to distribute the waters which have been allocated to the upper basin by the Colorado River compact, among themselves.

Senator DOWNEY. Yes, sir.

The CHAIRMAN. If the lower-basin States had been able to make a similar compact, why, of course, we would not be here.

Senator DOWNEY. That is right.

The CHAIRMAN. But the language of this resolution naturally prompts the inquiry as to whether or not the sponsors of the resolution desire to involve the whole basin in the controversy.

Now, the purpose of the upper-basin compact was to secure this agreement as to the utilization of the water to which the upper basin is entitled under the compact, and to proceed at the earliest possible date to the construction of the projects which will utilize that.

Now, you have just said, as I understand it, that sponsors of the resolution would not object to an amendment of this resolution.

Senator DOWNEY. I would prefer that. I am very much in accord with that.

The CHAIRMAN. I am just asking for information on that.

Senator DOWNEY. I would prefer that.

The CHAIRMAN. You would prefer to amend it so as to make it clear that the upper basin and the States of that basin are not included in the controversies?

Senator DOWNEY. That is correct.

The CHAIRMAN. Now, then, adverting to the time limit, the consent which is asked here is to the joinder of the United States, "in any suit or suits commenced within two years after the effective date of the resolution." Why so long a period?

Senator DOWNEY. I think perhaps there is some thought that they might file a suit and then want to go back and file it a second time. We want to have plenty of time. I want to say again, that we would be glad to shorten that time.

The CHAIRMAN. If that period were to remain unchanged, would it not have the effect of bringing to a halt all development until that period had passed and the controversy had been settled?

Senator DOWNEY. Well, Mr. Chairman, if we took advantage of that full 2 years, it certainly would. I can understand the propriety of what the chairman is suggesting, that that is too long a period. We would be very happy to shorten that period.

I think it was done with the idea that as a practicality, these things take quite a long time, and there was the possibility that as to some suit we might have it dismissed, because it was not properly drawn or properly defended, or something like that.

I have great confidence in counsel for California, and I think they would know how to proceed to prosecute their rights if they are so authorized.

The CHAIRMAN. I have equal confidence, I would say to the Senator from California.

Senator WATKINS. I would like to ask the Senator if California is not prepared now to immediately begin a suit, as soon as the authorization is made.

Senator DOWNEY. I think the suit would probably be filed within 60 days, Senator.

Senator WATKINS. I thought that probably was the situation because this controversy, as I understand it, has been brewing for 25 years.

Senator DOWNEY. It is a most unhappy one for us in California.

Senator WATKINS. I will grant that, but what I wanted to indicate was that you should be all ready, if you have been fighting it out for 25 years, to start at once.

Senator DOWNEY. I doubt that it would take more than 60 days to prepare the suit and file it.

Senator WATKINS. I would like to observe that I am very happy to note the Senator would exclude the upper-basin States, because we do not want to be held up by any controversies that California and Arizona may have.

Senator DOWNEY. I would be happy to have the chairman of the committee discuss that with our witnesses who actually are to contact the representatives of the Department of Justice.

Now, unless I have misunderstood our California lawyers, this was drafted in this form at the suggestion of the Department of Justice. If I am mistaken in that, I apologize to the committee, but I think not.

The CHAIRMAN. Off the record, please.

(Discussion off the record.)

The CHAIRMAN. Senator Knowland, the Chair was questioning Senator Downey at the conclusion of his opening statement, with respect to the meaning of some of the terms in Senate Joint Resolution No. 4. The preliminary clauses make it clear that the resolution is filed because of controversies among the States of the lower Colorado River Basin, and that the purpose of the resolution is to secure an adjudication of those controversies in the lower Colorado River Basin.

I pointed out, however, the language of the resolution itself is such as to enable any State, whether in or out of the lower basin, or indeed, the whole Colorado River Basin, to become a party to the litigation, and also seems to make the waters of the entire Colorado River system a subject of the litigation.

I pointed out that the Senate has just passed the law giving approval to the upper Colorado Basin compact; that this compact represents an agreement among the States of the upper basin with respect to the division of the waters of that basin. I was asking the Senator whether it was intended to include the whole basin and thereby prevent development in the upper-basin States. His answer was that he saw no reason why the resolution should not be amended to make it clear that all that is sought here is the controversy affecting the lower-basin States. I wanted you to be apprised of that in case you cared to make any comment.

Senator KNOWLAND. Well, I would comment on it at this time, that certainly, as far as the junior Senator from California is concerned, that is his intent, that this matter shall determine the differences of interpretation between the lower-basin States. I know of nothing other in this Senate Joint Resolution 4, as drafted, and there is certainly no intent on the part of the junior Senator from California, that this legislation shall delay the going ahead by the upper-basin States in the development of their problems in that area.

So I am sure if the language is not clear in that regard, that it can be made satisfactorily clear.

The CHAIRMAN. Another question was asked of the Senator from California with respect to the fact that consent is given to the initiation of a suit at any time within 2 years after the approval of this resolution, if it should be approved?

Senator Downey suggested that a much shorter time might be written into the resolution.

Senator KNOWLAND. I would not only think it would be possible, but desirable to write in a shorter period of time, because, as far as I am concerned, I would like to see this moved into the Supreme Court and action secured at the earliest possible time, so that in the interest of both States we may have a determination and then proceed as we will have to proceed, based on the decisions of the Court.

So that anything which would expedite, rather than retard getting a decision, I would most heartily favor.

The CHAIRMAN. Senator McFarland, you indicated you wanted to ask a question?

Senator MCFARLAND. Yes; I wanted to ask a few questions. I do not want to enter into this discussion about the resolution, but I would like to say this: It will be thoroughly developed that when the evidence is really put on in regard to the resolution, that any definition the Supreme Court might make in regard to consumptive use would be applicable to all places, and in the upper basin. That is the reason I judge, why Mr. Howell made his presentation here yesterday in opposition to the resolution. That is the reason it was gone into.

But I do not want to go into that discussion at this time. What I wanted to correct the Senator on was one thing. He spoke of 150,000 acres of land in Arizona which would be redeemed by this project. Of course, this is a rescue project, a project for supplemental water. But the correct amount is 226,020 acres of land which have been, or are now being irrigated and will have to be thrown out of irrigation permanently. The reference on that is given in my opening statement. I thought I had it here, but I seem to have misplaced it. I will supply it for the record. Here it is. It is on page R–29 of the report and in table B–5.

Senator Downey, you stated that you objected to this project—as I understood your statement—one of the reasons being because it had subsidies from power for building the irrigation project. Do you subscribe to that theory in regard to all irrigation projects, or is it just this one?

Senator DOWNEY. I think the Senator has misrepresented my position. My point is that it is not equitable or fair to the lower-basin States to set over all of the power benefits that will come from this one great dam and its great investment, to the State of Arizona alone.

Senator MCFARLAND. I would like to call your attention to the fact that in the Central Valley in California, the average firm power rate is 5.30 mills. The portion of the rate required for irrigation subsidy is 0.68 of a mill. Do you agree that that is proper, or do you think that that should not have been done?

Senator DOWNEY. Senator, I think my position has been made clear. I think what we have done in the Central Valley is correct and proper, but let me say this to you: The commercial rate for steam in Los Angeles—and I am using round figures—is about 5 mills a kilowatt-hour. This power could be laid down in Los Angeles for somewhere around 4 mills, but, in order to provide the revenue to carry out the central Arizona project it would have to be increased by 25 percent and sold somewhere around 5 mills.

Senator McFARLAND. Senator, if I may correct you, the price for the power, according to the Bureau of Reclamation, is 4.82 mills, and the amount of that which is subsidy is 0.72 of a mill, which is only .04 mill more than the central California project.

Senator DOWNEY. Well, Senator, I don't think you have those figures quite right.

Senator McFARLAND. Well, they were given to me by the Bureau of Reclamation, which you could check later on. But if they are right, there wouldn't be much difference, would there?

Senator DOWNEY. Well, there is a difference from a little over 4 mills up to approximately 5 mills, Senator. I think you have your figures confused.

Senator McFARLAND. No; I am just reading you the figures, Senator. We can put this in later on, but the figures for power at the place of delivery for this project are 4.82 mills.

(NOTE.—Report of Bureau of Reclamation concerning these power rates appears at the conclusion of these hearings, p. 905.)

Senator DOWNEY. I understand that is now raised to 4.89, Senator. That is my information from the Bureau of Reclamation, 4.89, which approaches 5 mills.

Senator McFARLAND. We can determine that later. This was given me just the other day. The amount of the subsidy is 0.72 of a mill. Now, that is only 0.04 of a mill more than the subsidy in the Central Valley of California.

I call your attention to the fact that in the Colorado-Big Thompson project, which is also a Colorado River project, the average firm power rate is 5.10 mills per kilowatt-hour, and the amount of the subsidy is 0.89 of a mill, which is 0.17 of a mill higher than the subsidy would be in the central Arizona project.

Are you going to oppose all these projects in Utah, Colorado, and the other States because they have subsidies for irrigation? Are you in opposition to that principle? Or is it just the central Arizona project?

Senator DOWNEY. Mr. Chairman, in view of the Senator's statement and question, and its implications, I feel that I have to restate my position.

Bridge Canyon Dam is not an essential part of the central Arizona irrigation project. It does not store any water there, it is not necessary to, but it is necessary to get the cheap power. Now, there is an item of power, a very valuable item, say, $400,000,000 or more, that I think should be equally shared in by all the lower-basin States, as was Hoover Dam. There was a very equitable arrangement worked out for Hoover Dam. As a matter of fact, Arizona and Nevada have been given the power they wanted and they have never been able to use that which was set apart for them. Now, here it is also for the benefit of one project, not the whole basin.

In order to work it out, one-third of this power is set over to Arizona for pumping the irrigation water of the project, the million acre-feet of water, up 985 feet. A third of the power is just given to them without any payment for it.

Now, as to the other two-thirds, our electrical engineer, Mr. Peterson from Los Angeles, will state this: That the cost of the power in Los Angeles will have to be increased by about 20 percent in order to make the additional profits necessary to finance this. It is something over

4 mills, and up to approximately 5 mills, or approximately 25 percent. That no longer gives us what we call cheap power. That would give us power provided at the same rate at which our steam power plants would produce it.

In other words, in Los Angeles or in Arizona and elsewhere, instead of having what we call cheap power, we have power that is competitive with steam.

Of course I am in favor of using power to help out the irrigation enterprises.

Now, in the great Utah project, it will buy its own power. The power and water are integral parts of each other. That is a wholly different proposition where a very valuable power site, not connected with your irrigation enterprise at all, is tied in merely for the purpose of financing a project.

I might say this, bill S. 75, on which there has been no report at all by anybody, does call for the building of this great tunnel that would cost a half billion dollars. Certainly if that added expensive project had been worked out and the water was then taken from Bridge Canyon Reservoir that might have been a subterfuge by which you could have said they were parts of the same project.

But the only reason they are here tied together is to preempt for Arizona the value of that power and to set over to Arizona, without any cost for its pumping, about $5,000,000 worth of power a year and to allow Arizona to get the advantage of about 20 percent increase in power rates down in Los Angeles.

Of course, I very much favor power as a subsidy for irrigation, where it is properly handled. I do not think it is here.

The CHAIRMAN. Are there any other questions?

Senator WATKINS. With respect to the central California project, that power is all bought in California, the entire project is in California, is it not?

Senator DOWNEY. Only utilized within the Central Valley itself.

Senator WATKINS. And the power is largely used in the same territory where the water is used?

Senator DOWNEY. That is correct. I might say this: It is not as cheap power as we get from the Hoover, it is not as efficient. Of course, it costs more; it costs more to produce and more to buy it.

The CHAIRMAN. Any other questions?

Mr. MCFARLAND. No, Mr. Chairman, I do not care to ask any other questions. I just wish to state that I cannot agree with the Senator, but that can be developed. This is an integral part of the project. If California does not want any of this power, they do not have to buy it, and I think the evidence will show that we can use all of it in Arizona.

The CHAIRMAN. Now, Senator Downey, what is your desire?

Senator DOWNEY. We have another witness here, if the committee desires to go ahead.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 12:10 p. m., a recess was taken until 10 a. m. of the following day, Wednesday, March 23, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

WEDNESDAY, MARCH 23, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), McFarland, Downey, Anderson, Miller, Ecton, Watkins, Millikin.

The CHAIRMAN. The hearing will be in order, please.

Senator DOWNEY. Mr. Shaw.

Mr. Chairman, this is Arvin Shaw, one of our assistant attorneys general who is here to testify on certain of the legal issues before the committee. I think that I may justly say that Mr. Shaw in California, and in the West, is regarded as one of our outstanding lawyers on the question of water rights and even in a much broader field, which is not necessary to describe.

The CHAIRMAN. Mr. Shaw is well known to this committee, I think, and we are always glad to see you, Mr. Shaw.

Mr. SHAW. Thank you, Mr. Chairman.

STATEMENT OF ARVIN B. SHAW, JR., ASSISTANT ATTORNEY GENERAL, STATE OF CALIFORNIA

Mr. SHAW. I am assistant attorney general of California, assigned exclusively to advise the Colorado River Board of California. That is a State agency set up by statute to protect and conserve the interests of California in the Colorado River. Incidentally, I have also for 30 years acted as attorney for one or more irrigation districts in the Colorado River desert in southeastern California. I appear here on behalf of the State, and my remarks are addressed primarily to Senate Joint Resolution 4.

Before proceeding with my prepared statement, may I ask leave to enlarge a little on the answers which Senator Downey gave the Chair yesterday, as to the intent, at least, of this resolution?

The CHAIRMAN. We would be very happy to have you do that.

Mr. SHAW. There were two questions.

The CHAIRMAN. May I ask you first if you know who drafted the resolution?

Mr. SHAW. I did, in conjunction with a group of other attorneys representing interests in California concerned with this matter.

The first question was as to whether the purpose of the resolution was to involve the upper basin States or questions relating to the upper basin in the proposed litigation.

Since the question has arisen, it is quite possible that the language of the resolution is unclear. But I can state to you that the language at line 10, page 2, beginning at the end of the line reads: "with respect to the waters of the Colorado River system as defined in said compact available for use in that basin," were intended to limit the subject matter of the action to the water rights of the lower basin. The words "that basin" refer back to the lower basin of the Colorado River in line 7. The intent was not to involve problems arising between the two basins or in the upper basin alone.

The CHAIRMAN. In other words, you mean in the "said" lower basin?

Mr. SHAW. Yes, if the concluding words in line 12 were, "available for use in said lower basin" it would be easier, perhaps, to read. I think the chairman's question in that respect is quite illuminating that the language used here does not immediately convey the impression which is intended.

The CHAIRMAN. I think it would do that if it were not for the presence of the phrase in lines 9 and 10, "by any other State" comma.

Mr. SHAW. Those words were intended to refer to the interests of other States in the lower basin in the waters belonging to the lower basin. Obviously, I think the States of the upper basin could not have any interest in the waters of the lower basin, any direct claim to them, because those are set apart by the compact to the lower basin.

That is the first matter. I should say, as I have noted in my prepared statement, that there is no intent on the part of California or Nevada to involve the States of the upper basin in the proposed litigation, except to such an extent as they may desire to intervene or to appear as friends of the court, to present such views as they may wish.

There is no desire to litigate, for example, the issues as to relative water rights of the upper basin States among themselves, which we understand now to have been settled by the upper Colorado River Basin compact. That would be obviously idle.

The CHAIRMAN. May I suggest this, which I think I brought out yesterday, that in line 4, authority is granted, or consent is granted to the filing "in any suit or suits," then in line 5, "commenced within 2 years." So that in its actual words, the resolution, as it is now before the committee, is granting a consent to a very broad series of suits during a comparatively long period.

Mr. SHAW. Yes.

The CHAIRMAN. Particularly when one takes into consideration the vagueness of the lines you have already discussed, 10 and 11.

Mr. SHAW. Yes.

The CHAIRMAN. Would it not be possible to have this redrafted or amended in such form, if the committee should want to pass upon the matter, as to narrow the field of litigation and narrow the time period within which consent is granted?

Mr. SHAW. As to the first, the narrowing of the field of litigation, it was not our purpose——

The CHAIRMAN. How many suits, for example, do you think would likely be started?

Mr. SHAW. One, unless the Supreme Court should find some technical difficulty with the first, which could be overcome by a second. That is a possibility that might take place. We never know when the Supreme Court is going to seize upon some detail of procedure as vitiating a bill and dismiss it. We never know whether it is possible then to clear the difficulty by a second proceeding, or not.

May I say with respect to the narrowing of the field of litigation that it was not our purpose to constrict the matter so that anyone might feel aggrieved. It is possible that others than ourselves have different ideas as to what the scope should be. You can see, I think, readily, Senator, that if we limit the scope then it is obvious that someone may come in and say it is too narrow and it must be expanded. If we make it broad it is open to the opposite course of saying it is too broad and must be limited.

We have no pride of authorship at all about the text of this resolution. It is simply a vehicle to effectuate a general purpose, or objective, and is, of course, subject to clarification as the committee may see fit.

May I now refer to the second question which the Chair asked of Senator Downey, which is as to the 2-year period that has just been mentioned.

In the hearings last year before this committee, two departmental reports were submitted. One, the Department of Justice, in which it suggested that the resolution be amended to make it one, not directing the Attorney General to file an interpleader action, but simply granting consent to the joinder of the United States, so that any one of the States that saw fit might file an acion.

In that report the Attorney General suggested that the resolution be redrafted so as to permit the commencement of the action within 1 year.

The Department of the Interior filed a separate report in which it set out a proposed redraft of the text of the resolution, generally in accord with the principles laid down by the Attorney General, but giving us some specific language by way of text to bite on. That language happened to incorporate the term of 2 years, instead of 1.

When we came to prepare this resolution for introduction in this Congress, we undertook, since it was the only model that we had to go by, to pattern the resolution rather closely upon the text as suggested by the Secretary of the Interior, and in so doing we included the 2-year period, rather than the 1-year period.

The CHAIRMAN. Where was that text suggested?

Mr. SHAW. By the report of the Department of the Interior which was put in on the last day, I believe, in the hearings of this committee last year.

Now, as to the possible merits of a 2-year period as opposed to a 1-year period. There are two possible circumstances that might affect your judgment. One is that if the case is to be truly determinative and set up a pattern by which the future of the whole basin is to be governed, it might be distinctly in order for the States of the lower basin to confer together upon the contents of the bill, or upon an agreed statement of facts, in order to see that the issues are presented that the States want presented, and so that the Court

will have before it, in as expeditious form as possible, something which will test the questions of law that we see coming out of the facts.

That process might take some time. It is impossible to put specific limits on it.

The other consideration that appeals to me at the moment is that if any resolution looking toward litigation of these issues is adopted, then it is apparent, that immediately, and by that fact, the position of the lower States of the basin toward each other is definitely changed. Instead of arguing with each other, as they have been doing for the last 25 years, they have now got to fish or cut bait. They have got to get down to business and get to a definitive decision as to their rights.

Under such circumstances as those, it is quite in the cards that they might decide to cool off and attack again the possibility of negotiating a peace.

The CHAIRMAN. One of the possibilities, may I say to Mr. Shaw, of a hearing of this kind, is that it may develop the issues. But I am frank to say to you that in my judgment it can succeed in developing the issues only if in the presentation of the facts we abandon these arguments of which you have just spoken, for arguments tend to becloud the facts. I think arguments, after the presentation of fact, has a very proper place. But argument which is submitted at the same time that the facts are being developed, has a very great tendency to becloud the facts, as every lawyer knows.

That is why courts strive to have the facts presented first.

Mr. SHAW. Yes, sir.

The CHAIRMAN. I am hopeful that in the presentation here that may be the development. So I shall ask you and other witnesses on all sides of this, as you present your testimony, to express to the committee, in the briefest possible manner, and brief, only for the purposes of clarity, just what you conceive to be the issues.

One of the things with which I think we could start, very advantageously, is the question which was asked yesterday by the Senator from New Mexico, Mr. Anderson, with respect to the water supply in the Colorado River, particularly available for the lower basin at the time the compact was made and at the present time.

Senator ANDERSON. Mr. Chairman, may I just interject there to say that in trying to read these again, I find a good many places, such as page 248, where they list the flow at Lee Ferry. But in all this I still do not find any place where there seems to be any agreement between the various parties as to the amount of water available to the lower basin States right now, and how it is to be used. Here you are discussing a project which runs to $738,000,000. It would seem to me the very first question which might be asked is: Is there any water for it? I do not find that question answered in here.

The CHAIRMAN. After you raised the issue yesterday I said to you that I thought it was in the record. Between then and now I have endeavored to find it in the record and I have been as unsuccessful as you have, Senator Anderson.

I have asked Mr. Nelson of our staff to go through all the available material and see whether or not we do have it. The only thing I have seen so far of any great advantage is the information contained

in the comprehensive report, to which Senator Malone adverted yesterday.

Senator ANDERSON. Yes; we do find the statement that the needs of the lower basin States are 10,500,000 acre-feet. The allocation is 7,500,000 acre-feet.

The CHAIRMAN. I am sure that all of the engineers who have been at work on this matter have had the water supply in mind, otherwise they could not very well plan for these great works. We are going to try to get that out.

Senator ANDERSON. I am beginning to wonder if they are not planning to use the water supply of the upper basin States.

Senator MCFARLAND. So far as Arizona is concerned, we are not planning to use that supply. As the table set forth in the report will show, the surplus water which we and the Bureau of Reclamation estimated only gave Arizona about one-fourth of it, assuming that the upper basin States would claim at least half of it. We could not come in here and make as the basis for a bill a claim of more than a fourth, that is, a fourth for Arizona. Then we agreed that Nevada would have one-twenty-fifth of that, as per our agreement with the Secretary of the Interior and our tentative agreement with Nevada.

So Arizona has not claimed any water and does not now claim any water that belongs to the upper basin States.

Mr. SHAW. May I comment on that inquiry?

Senator ANDERSON. Yes; if you will show me where you get 10,500,000 for the lower basin States without taking any of the water of the upper basin States. I would be interested in it.

Mr. SHAW. The comment is that we in California understand that the Colorado River compact apportions to the upper basin the beneficial consumptive use of seven and a half million acre-feet. We are bound by that compact and entitled to the benefits of it, and we intend to respect it. The situation in the lower basin, however, is such that if the project contemplated by S. 75 is authorized and constructed, one of two results has got to follow: Either that the project must take the water from California, which California believes it is entitled to or, in the absence of that, it must take the water from the upper basin. There are only those two possibilities, because we understand that Mexico must have its water under the treaty.

Senator MCFARLAND. You say Arizona must take its water from the upper basin?

Mr. SHAW. Since there would be a condition of overdraft, shortage.

Senator MCFARLAND. California would not think of such a thing.

Mr. SHAW. The water must be taken by Arizona either from California, or the upper basin.

Senator WATKINS. Let me say this——

Senator ANDERSON. Then you believe there is reasonable ground for fear that either California, Arizona, or Mexico will get the upper basin States water pretty shortly?

Mr. SHAW. I don't think there is any ground to fear that, provided the project is not authorized which would create that fear.

Senator WATKINS. Mr. Chairman, it seems to me the upper basin States are now being put on notice.

Senator ANDERSON. I object to that statement, because it is California's 5,360,000 that may complicate the situation.

Senator MCFARLAND. That is right.

Senator ANDERSON. It is not necessarily the Arizona water. I am not particular as to which person picks our pocket, but I just want to be sure you realize we understand we are about to have it picked.

Mr. SHAW. The peculiarity of the situation is, Senator, that we are willing, and ready to submit to the decision of the Supreme Court as to what our rights are, to accept the answer and abide by it.

Senator ANDERSON. That brings me back to the question as to whether you did or did not take that position when Arizona had you in the Supreme Court.

Mr. SHAW. Let me give you the answer.

Senator ANDERSON. You were there three times with Arizona.

Senator MCFARLAND. And opposed the petition every time.

Mr. SHAW. Yes. I will give you the answer:

Reference has been made to the fact that Arizona, in 1936, attempted to file a suit in the Supreme Court to determine the relative right of the seven States to appropriate water from the Colorado River. The case was decided (298 U. S. 558) upon objections of all of the other six States to the granting of leave to file the bill. Each of the six States which were then members of the Colorado River compact objected to the filing of the bill upon the ground, among other, that the bill did not show a justiciable controversy, and upon the second ground that the United States, which had not consented to be sued, was an indispensable party.

Now, may I amplify that statement? Two separate briefs were filed by the six compact States in that proceeding, one by California and Nevada, the other by Colorado, New Mexico, Utah, and Wyoming. The first subhead of the argument of the upper-basin States was—

The proposed bill does not state facts sufficient to constitute a cause of action against the defendant States, or any thereof, and it does not appear from said bill that any justiciable case or controversy exists between plaintiff States and defendent States, or any of them.

Senator ANDERSON. I have not been arguing that the other States took that position then because they are taking it now, but what was California's position, simply stated?

Mr. SHAW. California joined in the same two contentions that the upper-basin States did, and may I show you why?

At that time the State of Arizona had not ratified the Colorado River compact. It sought an adjudication that it had a right to appropriate water without being restricted by the limitations imposed by the compact. There was no showing that there was a shortage of water in that case, but there was a showing that there was water available for Arizona's appropriation, if she saw fit to appropriate. The Court held that since Arizona was not a party to the compact, it was not prejudiced by the compact——

Senator MCFARLAND. Which case are you reading, now?

Mr. SHAW. I am reading from my own statement, sir.

Senator MCFARLAND. Oh, I beg your pardon.

Mr. SHAW. And that Arizona could not, in advance of making appropriations, demand a decree for its benefits prohibiting other States from appropriating. No present injury or threat of injury was found to exist. The Court held finally that the United States was a necessary party and could not be sued without its consent. The situa-

tion now existing is distinctly different from that existing when the case of the State of Arizona versus California was decided. Arizona has now enacted a statute ratifying the compact. It is now concerned, as it was not theretofore concerned, with the obligations and rights created by the compact. Arizona is now moving actively toward the development of more or less tangible irrigation projects which were not contemplated at the time of the prior decision. Further, it is now apparent, as it was not apparent from the bill presented in the last case, that there is a condition of overlapping of rights and of shortage in the ultimate water supply available to the lower-basin States.

These elements, we think, distinguish the present situation from that existing at that time.

Senator McFARLAND. Mr. Shaw, it is a fact, though, that in the case of Arizona versus California, to perpetuate the testimony, that California was the only State that opposed that bill, or that petition, is it not? The other States agreed to it?

Mr. SHAW. It is also true that the Supreme Court agreed with California.

Senator McFARLAND. Yes.

Mr. SHAW. For this reason, that the effort made in that case was to obtain a perpetuation, a recording of testimony consisting of the oral statements of persons present at the time the compact was negotiated as to what they personally meant by the language they used. The Supreme Court held there was no ambiguity in the language used, and that the intent of the compact was the intent of the legislatures which adopted it and that they, seeing the language which was put before them to ratify, ratified it and thereby took the action. The Court held that the proposed oral testimony would be utterly immaterial, in the first place, because there was no ambiguity, and in the second place, the testimony of what these conversations may have been between various persons who were present when the compact was negotiated was immaterial.

Senator McFARLAND. Mr. Chairman, I do not want it to be understood that I am agreeing with the witness. I just want to state that I do not want to prolong the discussion. I want to bring out, though, that they were the only State that did oppose the petition.

The CHAIRMAN. Mr. Shaw, will you proceed, now, to develop your theory of law and the factual basis on which it rests?

Mr. SHAW. Yes, sir.

As was stated in a brief filed with this committee by the attorneys general of California and Nevada in hearings held in 1948:

California and Arizona are the major claimants to the use of waters of the Colorado River which are available for use in the lower basin of that river. Nevada has a smaller claim. Utah and New Mexico, which lie chiefly in the upper basin, claim still smaller quantities for the minor portions of those States lying in the lower basin.

A complex controversy exists between Arizona and California over their claims to waters of the river. This controversy has continued in one form or another for 25 years. It is grounded on the fact that the two States interpret differently a series of documents and statutes which, collectively, have been called the "law of the river."

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These writings include the Colorado River compact (1922), the Boulder Canyon Project Act (1928), the California Limitation Act (1929), the Boulder Canyon Project Adjustment Act (1940), the Mexican Water Treaty (1945) and a group of water contracts executed by the Secretary of the Interior under the authority of section 5 of the Project Act with five public agencies in California (1930–34); the State of Nevada (1942–43), and the State of Arizona (1944).

At the instance of Arizona, several facets of the problem have been submitted to the Supreme Court in *Arizona* v. *California et al.* (283 U. S. 423 (1931)), *Arizona* v. *California et al.* (292 U. S. 341 (1934)), and *Arizona* v. *California et al.* (298 U. S. 558 (1936)). Each of these cases was dismissed by the court, with opinion, on preliminary proceedings. At the instance of the United States, the case of *United States* v. *Arizona* (295 U. S. 174 (1935)) was prosecuted to enjoin military resistance by Arizona to construction of Parker Dam by the Bureau of Reclamation. Injunction was denied and the difficulty was then overcome by act of Congress.

The subject matter of the controversy has not been comprehensively treated by the Supreme Court. There is, consequently, a variety of unsolved questions, upon the solution of which depends the economic future of the lower basin.

No specific question is known to exist relative to the claims of Nevada, Utah, and New Mexico. Yet their interests are part of a complex whole and will be concerned in the judicial treatment of the whole.

May I stop there and note one of the defects of the authorization by Congress to the lower basin States to enter into a compact, which was contained in the second paragraph of section 4 (a) of the Project Act. It was this:

It proposed to divide among Arizona, California, and Nevada the waters of the lower basin. It entirely omitted any reference to the interests of New Mexico and Utah. That proposed compact could not have been agreed upon by the three States of Arizona, California, and Nevada without doing violence to the obvious interests of the other two States. That is one reason only why that provision has never been carried out.

Senator WATKINS. You are referring now entirely to the interests of Utah and New Mexico in the lower basin?

Mr. SHAW. Yes, sir.

Senator WATKINS. The interests that come to them out of that part of the water division?

Mr. SHAW. Yes, sir.

Senator ANDERSON. You don't regard those interests to be very substantial, do you?

Mr. SHAW. The Bureau's estimate, I believe, Senator Anderson, of the requirements in the two States I believe total 134,000 acre-feet.

Senator ANDERSON. Twenty-nine thousand in New Mexico.

Mr. SHAW. And the balance in Utah.

Senator ANDERSON. Nothing whatever from the Little Colorado in New Mexico?

Mr. SHAW. The Little Colorado?

Senator ANDERSON. Yes.

Mr. SHAW. Do you mean in New Mexico?

Senator ANDERSON. Yes.

Mr. SHAW. I believe that anything which may exist there in the way of possible usage was taken into account in the Bureau's figures, but I can't check that positively. The engineers can answer that more readily than I. Those figures are not my figures.

Senator ANDERSON. You think we will get some engineering figures on that before we are through?

Mr. SHAW. These are figures in the comprehensive report, covering the approximately 134,000 acre-feet for the two States.

Senator ANDERSON. I know they are there.

Mr. SHAW. Yes, but whatever they are they cannot be disregarded by the other three States and we have no such intention, of course.

Senator WATKINS. May I ask at this point, Mr. Shaw, if California is ready now to state its position with reference to the claims of Utah and New Mexico in the lower basin division?

Mr. SHAW. I can only say this in a very general way, that we consider that the quantities of water which are referred to in the Secretary's comprehensive report on the Colorado River appear to us to be reasonable and within the probabilities of use in those areas. And there is no disposition on the part of California to take any proceedings by which use of those quantities of water in New Mexico and Utah would be prevented.

Senator WATKINS. In other words, you are willing to go along with what the Bureau of Reclamation says can be used to advantage?

Mr. SHAW. That is right.

Senator WATKINS. Under projects which they outline as possible and properly feasible?

Mr. SHAW. That is my understanding, yes, sir.

Senator MCFARLAND. So long as it doesn't come out of California's pocket.

Mr. SHAW. I did not qualify that answer, sir.

Senator MCFARLAND. I have not seen any statement where you were willing to give any of the 3 (a) water for that. You would not be willing for it to come out of that, would you.

Mr. SHAW. The answer probably is that Arizona has already accepted that responsibility, in the contract which was executed on February 9, 1944, by the Secretary of the Interior.

Senator MCFARLAND. Oh, yes, we are willing for it to come out of us, and California is willing to go along with us that it may be taken out of our share, but has she ever offered to give any water to New Mexico or Utah?

Mr. SHAW. I don't think that question has ever been asked.

Senator WATKINS. Let me ask this question——

Senator MCFARLAND. It is being asked now.

Senator WATKINS. Has anybody asked that we be given that water? Don't we come in there as primary interests on the same ground as the other two States?

Senator MCFARLAND. We have agreed to it, Senator.

Senator WATKINS. That is what I am trying to find out. California now agrees that we are in there for whatever amount can be used beneficially by Utah and New Mexico, according to the Bureau; that we are on the ground floor, we have the same priority and same interests exactly proportionately to what we could use as the other States in the lower basin.

Mr. SHAW. The answer is "Yes," and I should amplify it. Certain uses of water have existed in the St. George region of Utah, on the Virgin River and around Hurricane in Utah, for many, many years, long prior to the 1922 compact. Those rights are within the language of article 3 (a) of the compact which specifies that the water there apportioned to the lower basin, or to either basin, shall include rights which now exist. That is roughly the language.

As to future uses of water, I cannot state with any positiveness whether those quantities which will belong to Utah and New Mexico, in addition to their existing uses in 1922 or in 1929, when the compact became effective, will be 3 (a) water or some other classification. Nevertheless, they are rights which must be recognized. The States are entitled to equitable treatment, and I have not the slightest doubt but that they will be.

Senator MCFARLAND. Well, Mr. Shaw, right there we of course have no quarrel with these other States, because we have recognized their rights as coming out of the 2,800,000, but you say we have not the right to do that, that is not settled. Now, if it is not settled, would you state now that California would be in a position to say that if there were litigation these waters might be taken out of the 3 (a) water, your claimed 4,400,000, which is the maximum to which California limits herself?

Mr. SHAW. I do not think that question can be answered until the Supreme Court answers it, Senator.

Senator MCFARLAND. Well, what are you going to ask for? We have agreed to these things with these people.

Senator WATKINS. In what way, Senator?

Senator MCFARLAND. What is that?

Senator WATKINS. In what way? In a formal contract?

Senator MCFARLAND. Well, yes, in a contract with the Secretary of the Interior.

Senator WATKINS. That you would allow this to be taken out of the primary water, the 2,800,000?

Senator MCFARLAND. Yes. In the contract, Arizona recognized the rights of New Mexico and Utah to equitable shares of the water apportioned by the compact to the lower basin, and also unapportioned water.

Senator WATKINS. I am glad to know that. I would like to know what California will stand for.

Senator MCFARLAND. That is what I am trying to find out, too, whether they would be willing to give up a little of their share of that 3 (a) water.

Senator WATKINS. I would like to ask this, while we are on it. We may forget it, or something else may divert us from it. Utah has now, in the planning stage, the so-called Dixie project in southern Utah, that would take water from the lower division.

Mr. SHAW. Yes, sir.

Senator WATKINS. Is California in a position to say now whether it will oppose the diversion of—Mr. Bennett, can you tell me how much it is?

Mr. BENNETT. Offhand, it would run about 70,000 acre-feet.

Senator WATKINS. About 70,000 acre-feet. To complete my question, I want to know how California stands on that.

Mr. SHAW. My answer, Senator, is "No." I base that on not merely my own opinion as to what California should do, but upon discussions which have taken place in interstate negotiations looking toward a lower basin compact. In those negotiations, at which I was present, it was uniformly considered that New Mexico and Utah should have, without dispute or controversy, such water as was required for their lower basin lands.

Senator ANDERSON. In those conferences, were New Mexico and Utah present?

Mr. SHAW. They were not. Possibly the line of least resistance was taken by those who were present, to avoid conflict with the interests of New Mexico and Utah, that is, simply to concede them what they could reasonably use.

Senator WATKINS. As a matter of fact, you know the territory there, don't you, Mr. Shaw?

Mr. SHAW. Quite well.

Senator WATKINS. It is not possible to use any great amount of water because of the difficulty in getting the water out?

Mr. SHAW. Yes. My understanding is that the water usable in New Mexico and Utah is usable from the tributaries only as the tributaries happen to flow, or only through such moderate storage as might be put on those tributaries. It is not possible to take water out of the mainstream of the Colorado River, pump it up out of the canyon and on the lands, either along the Virgin River, or along the Rio Puerco in New Mexico, or the upper Gila River.

Senator ANDERSON. No, but we have had some very bitter experience on the Gila in the past.

Mr. SHAW. That is my understanding.

Senator ANDERSON. And we will never get any water out of it, apparently, or it does not appear possible to get any water out of it. The amount the Department of the Interior sets down is an amount that we are not ready to concede as the fair amount at all. Yet, when there is a conference on the matter Utah can stay at home, and so can New Mexico.

Senator WATKINS. I do not feel hurt over there, providing they have agreed in advance to take care of us and there is not any controversy between us.

Senator ANDERSON. Well, you are in good shape.

Mr. SHAW. I am utterly in the dark about the discussions which Senator Anderson has just mentioned. I understood there was some dispute over the Upper Gila. That was not a dispute in which the State of California or the State of Nevada had any participation, and which, I suppose, must have existed between the two States which are concerned with the Gila.

Senator ANDERSON. But it ties right back into this whole question of water again, because we are taking it away from Arizona if we do it.

Mr. SHAW. Thinking of the matter as I do, Senator Anderson, I think it is obvious that both Utah and New Mexico would expect to be parties to any litigation by which a decision might be rendered indicating the division of the lower basin water. That is the reason for their being mentioned there.

I do not, as stated in my statement, consider that there is any specific question with respect to the claims of Nevada, Utah and New Mexico.

The CHAIRMAN. Then may the Chair ask you, in order to clear that up definitely, would it be possible so to amend the resolution which defines the area of litigation, as to exclude the waters for New Mexico and Utah in the lower Division, as you have just discussed them in your responses to Senator Anderson and Senator Watkins?

Mr. SHAW. I rather doubt it, Mr. Chairman, for this reason:

I think that in the first place those two States would have to reach a final decision as to what they wanted out of the rivers, which has not been done in any specific terms that I know of, except by the computations made in the comprehensive report. Whether those are satisfactory to New Mexico and Utah, I do not know.

Senator ANDERSON. No; they are not, but we need not tie up this hearing. The difficulty we had did not arise because of the State of Arizona, but arose in the Federal court because of an action in behalf of the Indians. It was litigation for the determination of our water rights by the Federal district court in Arizona in behalf of the Indians, effectively cutting us off from water in the Gila River. It was not the action of the State of Arizona.

We would like to see it reopened some time, because we do not think that sort of action is the best way to litigate water rights.

The CHAIRMAN. The Chair suggests that perhaps we can make more rapid progress if we permit Mr. Shaw to develop his theory of law and the facts before he is questioned at length.

Senator MILLER. I would like to ask one question.

The CHAIRMAN. All right.

Senator MILLER. Since you mention the Virgin River, are there any possibilities downstream before you get to the Arizona strip of reservoiring that stream?

Mr. SHAW. My understanding is that any reservoiring on the Virgin River has to be done in the upper reaches and not in Nevada or in the Arizona strip. That is because the reservoirs must be above the point of use in order to be of any value to those areas.

Senator MILLER. Didn't the city of Los Angeles come in there at one time and do some surveying work with respect to doing such a thing, carrying water down to Los Angeles from that source?

Mr. SHAW. I never heard of any such work.

Senator MILLER. That was possibly 20 years ago or more.

Mr. SHAW. I would say that in the period between 1920 and 1925, the city of Los Angeles made very extensive explorations all over the lower basin to determine what water supplies there were, what possible reservoir sites there were, and so on. I know that any number of routes were surveyed for the carrying of Colorado River water to Los Angeles.

Senator MILLER. That may have been in 1925 that I have in mind. I remember seeing the surveying crews work out there.

Mr. SHAW. That is quite possible.

Returning to my prepared statement on page 2:

No problems requiring present disposition are believed to exist between the upper basin and the lower basin. The upper basin States, Wyoming, Utah, Colorado, and New Mexico and, as a trifling interest, Arizona, have for a year or more been engaged in negotiations for a compact to divide the upper basin water among them. It is believed that this effort will be effectual.

Senator MILLIKIN. Mr. Chairman, may I ask a question?

The CHAIRMAN. Senator Millikin.

Senator MILLIKIN. I notice, Mr. Shaw, that you use this language, "No problems requiring present disposition are believed to exist between the upper basin and the lower basin." Do you foresee any problem in the future requiring disposition?

Mr. SHAW. That may come about, Senator, or it may not. The reason I say that is that any group of men having interests which may conflict, will likely develop differences of opinion as to law and entertain them. Whether any such differences of opinion will ever reach the stage that requires decision by a court, is entirely speculative at this time.

It is to my mind most probable that any such differences of opinion will not have any impact upon the economic life of the States for many years, possibly 40 to 50 years, and that as a consequence it is wholly possible that differences of opinion of that kind, as they develop, may be ironed out long before they ever have any practical importance.

Senator MILLIKIN. What is the measure of the differences of opinion which you contemplate might arise?

Mr. SHAW. Well, one has come to the light in the course of the discussion of the upper basin compact, and that is the question of method of measurement of individual consumptive use.

There may be questions as to whether or not the upper basin is bound at any particular time to contribute to the Mexican diversion. I do not think of any others on the spur of the moment, but it is obvious that where interests may come into conflict, there may be divergent opinions. That is a long way from saying that those differences of opinion have any practical importance. They will not reach the stage of practical importance, probably, until the upper basin approaches full development, which may be 75 years from now.

The CHAIRMAN. Does that mean that so far as it concerns the resolution which is before this committee, you are ready to say now, as I understood you to say earlier in the testimony, that this resolution would be quite satisfactory to California if it were so amended as to make clear that the consent which is sought here covers only the lower basin?

Mr. SHAW. That is correct.

Senator MCFARLAND. But, Mr. Shaw, you do recognize, do you not, that inasmuch as there might be a question arise between the upper and the lower basin States as to the definition of beneficial consumptive use, that Mr. Howell's position is well taken that the upper basin States would not want to be involved in anything like that at this time? And if there was a Supreme Court decision which would definitely define consumptive use, the upper basin States would of course want to be there, be in the lawsuit, and take an active part in it.

Senator ANDERSON. As a matter of fact, Mr. Shaw, if the California definition of consumptive use as against depletion is followed, the upper basin States are up against the gun right now, are they not?

Mr. SHAW. I hardly think so, Senator.

Senator ANDERSON. Well, that 7,500,000 shrinks very materially, does it not?

Mr. SHAW. Well, put it the other way. 7,500,000 is only 7,500,000 and not 8,300,000, as it is rather contemplated that the upper basin theory might lead to, or the Arizona theory.

Senator ANDERSON. Well, they tried to divide this seven and a half and seven and a half in the beginning. If the California theory on depletion and consumptive use is followed, they would divide it about 6 and 10, would they not?

Mr. SHAW. I don't think so, Senator. It is my understanding that under whatever circumstances, whichever definition of measurement is followed, the upper basin will at least be entitled to the consumptive use of 7,500,000 acre-feet. That is the right to burn that much water up, even though their diversions might run up to 15,000,000.

Senator ANDERSON. It makes a great deal of difference, though, whether there is any return flow, which there is not from California.

Mr. SHAW. All the return flow would be taken into account under either system, according to my information.

Senator MILLIKIN. Mr. Shaw, is it not true that under the California theory of measuring water, more water would have to come out of the upper basin States, would have to pass Lees Ferry, than under the upper basin States theory of how to measure water?

Mr. SHAW. As I understand the testimony, it has some effect on the water passing Lees Ferry.

Senator MILLIKIN. And under one theory of measurement more would have to pass than under the other theory of measurement?

Mr. SHAW. I think that is true, and that is my understanding of what the engineers have testified to. That is to say, that by the depletion method of measurement, and in fact, the upper basin would lift itself by its own bootstraps from approximately 7,500,000 feet to approximately 8,300,000 feet of consumptive use. I am only gathering this from what I have been told by the engineers.

Senator MILLIKIN. I am not arguing the merits of either. I am simply pointing out that under the California theory more water would have to come out of the upper basin States and pass Lees Ferry, than under the upper basin States theory of how to measure water.

Mr. SHAW. That is my understanding of why the upper basin States adopted this method of measuring the water supply under the upper basin States compact.

Senator ANDERSON. I think that is a very liberal construction of what we are trying to do.

Senator WATKINS. What do you mean by that, Senator?

Senator ANDERSON. From the standpoint of California.

The CHAIRMAN. Some time during the development of your testimony, Mr. Shaw, I hope you will give us a lawyer's view of how to divide the waters of the Colorado system.

Mr. SHAW. Would you like a discussion of the depletion theory and the consumptive use theory?

The CHAIRMAN. I say some time. Let us proceed now, with what you have prepared.

Senator DOWNEY. Mr. Chairman, I just want to interpolate to say that we from California are anxious to expedite this hearing. We do think these questions are most valuable and searching and develop the facts, but I hope it will not be too harshly construed against California

as to the amount of time we take. I think the questions are very illuminating.

Senator ANDERSON. I hope the Senator will realize that what we are trying to do is to get at where the water is, and not what the law is in all this discussion.

Senator DOWNEY. That is correct, and I am very happy to have an extended interrogation, as long as it is not charged up against California's time.

Senator WATKINS. Are we up against a time limit here? I was not here at the beginning.

The CHAIRMAN. No; no time limit. We are just expressing pious hope that we may get the law and the facts in a brief compass.

Mr. SHAW. Mr. Chairman, I have just quoted at some length from a memorandum filed last year with the committee. May I offer for the committee's file, but not to print, a copy of the memorandum? I believe the clerk has copies which will be available for the members of the committee.

The CHAIRMAN. This additional copy will be placed in our file.

Mr. SHAW. That memorandum, of course, was concerned with last year's resolution. It was printed in last year's hearings, and therefore need not be reprinted.

On the other hand, for reasons hereinafter shown, it is not believed that such a lower basin compact can be negotiated.

Moved by the gravity of the controversy and its long continuation, Governor Warren of California on March 3, 1947 (hearings, p. 4) wrote the Governors of Nevada and Arizona an identical letter, in part as follows:

> The negotiations of the past have failed to bring about agreement between Arizona and California, but I am of the opinion that there must be some fair basis upon which their respective rights can be determined. The only methods that occur to me are (1) negotiation of a compact; (2) arbitration; and (3) judicial determination.
>
> I would therefore like to suggest that we three Governors of the affected States endeavor first to enter into a compact which will resolve our differences and finally determine our respective rights.
>
> In the event you believe for any reason that this cannot be done, I suggest that we submit all our differences to arbitration, agreeing to be bound by the results thereof.
>
> If this is not feasible, I propose that we join in requesting Congress to authorize a suit to determine our rights in the Supreme Court of the United States, which suit could, if agreeable to the States, be submitted on an agreed statement of facts.

Governor Pittman of Nevada replied on March 6, 1947 (hearings, p. 5), saying, in part:

> Our experience leads us to an opinion that California and Arizona will be unable to negotiate a compact, and may be unwilling to agree on terms of arbitration. Nevada has spent much time and money in efforts to bring the tri-State compact into being, completely without results.
>
> I am in accord with your thought that the three States, in the absence of other agreement, should join in requesting Congress to authorize a suit in the Supreme Court of the United States to determine our respective rights, and suggest that a method of presentation before the Court be agreed upon between Arizona and California, with which agreement Nevada will concur.

Governor Osborn of Arizona replied March 12, 1947 (hearings, p. 6), stating that he would be glad to meet with Governor Warren, but saying, in effect, that all that was needed was for California and

Nevada to support Arizona's bills for construction of the central Arizona project and arguing that the rights of the three States have already been determined by the relevant statutes and documents:

> It is difficult for me to understand what, if anything further, need be done to place either California or Nevada or Arizona in position to support the utilization in our respective States of our respective shares of the water of the Colorado River, which shares have already been determined by the Colorado River Compact, the Boulder Canyon Project Act, the California Limitation Act, the water delivery contracts of the California agencies, the Nevada water delivery contracts, and the Arizona water delivery contracts.

Inasmuch as there appeared to be no other solution for the controversy, Senators McCarran, Downey, Malone, and Knowland introduced in the Eightieth Congress Senate Joint Resolution 145. Five California Representatives introduced counterparts in the House (H. J. Res. 225, 226, 227, 236, and H. R. 4097). These measures proposed that the controversy be determined in an action in the nature of interpleader, to be filed by the Attorney General, in which the States of the lower basin might present their claims and have them determined. Extensive hearings were held by subcommittees in both Houses; no reports were filed.

The Senators from California and Nevada introduced in this Congress Senate Joint Resolution 4, which is before you. The Representative from Nevada and each of the 23 Representatives from California have introduced companion measures (H. J. Res. 3, 38, 41, 55, 64, 73, 75, 95, 96, 100, 107, 113, 126, 128, 133, 135, 146, 148, 150, 152, 153, 164, 166, and 180).

Instead of directing the Attorney General to commence the proposed action the measures pending in this Congress contemplate the initiation of the action by any one of the States, and grant consent to the joinder of the United States as a party defendant. The United States has been held by the Supreme Court to be a necessary party to an action concerning the rights of the States in the lower basin of the Colorado River (*Arizona* v. *California*, 298 U. S. 558, 572).

A. Program of the President: In reporting on the measures pending in the Eightieth Congress, the Director of the Bureau of the Budget stated, in a letter to the Attorney General, May 7, 1948 (hearings before Subcommittee No. 4 of House Judiciary Committee on H. J. Res. 225, etc., May 17, 1948, p. 29):

> * * * The proposed legislation would be in accord with the program of the President if amended, as suggested by you in the second paragraph of page 2 of your letter, in such a way as: (a) To waive the immunity of the United States to suit and permit the States to bring such actions as they may desire if the Congress feels that it is necessary to take such action in order to compose differences among the States with reference to the waters of the Colorado River; (b) to place a reasonable limit on the time for the bringing of such action; and (c) to insure that in any such action the United States would have the right to defend and also to assert any affirmative claim which it may have or wish to assert in connection with the subject matter of any action filed pursuant to the legislation. * * *

The report of the Attorney General was as above indicated.

The report of the Secretary of the Interior (hearings pp. 363, 368) amplified the recommendations of the Budget Bureau by setting out the full text of a proposed substitute for Senate Joint Resolution 145, which would convert the measure from one directing the Attorney General to initiate an action, into one granting consent of Congress to

joinder of the United States as a party in an action to be brought by one of the States.

Senator MILLIKIN. Mr. Chairman, may I ask Mr. Shaw a question?

The CHAIRMAN. Certainly.

Senator MILLIKIN. The United States, at various times, has asserted interest in the water of our interstate streams, somewhat at variance with the views of the States as to their own rights; has it not?

Mr. SHAW. It has, in at least three or four cases.

Senator MILLIKIN. Thank you.

Mr. SHAW. And may I say that there is now pending before the Supreme Court for decision, having been argued on March 2, a case, United States against Gerlach Livestock Co., in which the United States is claiming the right to destroy the riparian rights on a stream in California without compensation, under the commerce power.

Senator MILLIKIN. Generally speaking, if the view of the United States prevailed, the control of water by the States would be seriously diminished; would it not?

Mr. SHAW. It would be destroyed, in my humble judgment.

Senator MILLIKIN. Thank you.

Mr. SHAW. The resolutions now pending in the Eighty-first Congress not only conform to the foregoing suggestions of the Bureau of the Budget, but are very closely patterned on the detailed form of the draft of bill contained in the report of the Secretary of the Interior.

B. Necessity of the United States as a party: The United States, if it is a necessary party, cannot be sued without its consent.

The report of the Department of Justice on the resolutions in the Eightieth Congress, to which the Director of the Bureau of the Budget above referred, stated (hearings, p. 10):

* * * *Arizona* v. *California* (298 U. S. 558 (1935)) was instituted by Arizona to have adjudicated certain rights to the unappropriated waters of the Colorado River. In that action six other basin States were named as parties defendant. The Supreme Court dismissed that action on the grounds that since the United States was an indispensable party and had not consented to be sued, the suit could not be maintained.

The decision of the Supreme Court in *Arizona* v. *California* made it clear that the type of relief desired by the States in a suit between them cannot be had in the absence of legislation giving the required consent.

C. The issues requiring determination: The report of the Secretary of the Interior on Senate Joint Resolution 145, Eightieth Congress (hearings, pp. 363, 366) stated the issues which might be presented to the Supreme Court as follows:

Confining my attention to this section (sec. 4 (a)) of the Boulder Canyon Project Act—it being impossible to predict all of the issues that may be raised by the various parties to the proposed suit—four major problems would appear to be in dispute between California and Arizona. I may summarize them in question form thus:

(1) Are the 1,000,000 acre-feet of water for which provision is made in article III (b) of the Colorado River compact "surplus" or "apportioned" within the meaning of section 4 (a) of the Boulder Canyon Project Act? That is, is or is not California entitled to share in the use of III (b) water?

(2) Is the flow of the Gila River, for purposes of determining the water supply of the Colorado River Basin, to be measured at the mouth of the stream or elsewhere? And, as another aspect of the same problem: Is beneficial consumptive use by Arizona of the waters of the Gila to be measured in terms of diversion from the Gila River less returns to that river or in terms of the depletion of the virgin flow of that river at its mouth?

(3) Is the water required for delivery to Mexico under the treaty with that nation to be deducted from "surplus" water prior to determination of the

amount available for use in California under section 4 (a) of the Boulder Canyon Project Act, or is California entitled to use a full one-half of the "surplus" diminished only by so much of the Mexican requirements as cannot be supplied from the other half?

(4) Is the burden of evaporation losses at such reservoirs as Lake Mead to be borne by California and Arizona in proportion to the waters stored there for each of them, or is the burden of these losses to be fixed in some other fashion?

These propositions embrace the questions suggested by California and Nevada (hearings, pp. 60, 61).

I do not believe it is appropriate, Mr. Chairman, to argue at this time the merits of the positions of the two States on these questions. Another witness will give you sufficient information on this subject to disclose to you whether or not the questions are substantial, whether they are merely superficial or immaterial, and what their magnitude is.

The CHAIRMAN. Do you agree with the Secretary's statement, that there are four major problems, and that he has described them correctly?

Mr. SHAW. He has set up four which include the three which we had contemplated as the probable issues. The third question is not one that, at the moment, I feel we should necessarily take as an issue in the proposed suit.

The CHAIRMAN. Are you prepared at any time, or is California prepared at any time, to state for this record what issues it believes ought to be settled, and whether or not such issues can be so stated as to form a definitive area of litigation?

Mr. SHAW. Well, Senator, as to the first part of the question, we have outlined the three major points that we consider to be necessary to answer, and those are the points listed by the Secretary of the Interior, as 1, 2, and 4 in his list. Now, whether you have in mind the limitation of the jurisdiction of the Court by the limitation of points or issues to be determined by the Court, I am not very clear. If you did have that in mind, I would hesitate to feel that all of the States would be satisfied to have that kind of limitation, because each has its own slant on these problems, and they may desire to approach them from different angles than we do.

The CHAIRMAN. Well, that does not enter into my mind in asking you the question.

Mr. SHAW. Yes, sir.

The CHAIRMAN. I am merely trying to probe here to determine whether there is any possibility, for the information of this committee, so to define the issues in simple questions that we all may see them. Frequently in the courts litigants do attempt to submit agreed questions for adjudication by the Court, upon the answers to which they are willing to have their rights determined. So I am trying to find out whether there is any such possibility here.

It would seem, so far as my recollection of last year's hearings is concerned, and as to some of the things that have been said here, that there are always specifications attached which make it unclear.

Mr. SHAW. You are dealing, Senator, with a very complex situation.

The CHAIRMAN. I realize that, of course.

Mr. SHAW. And one which I would hesitate to see defined down to the point of saying such and such and such issues, and only those

shall be discussed before the Supreme Court. I do not believe it would satisfy the wishes of any of the five States, probably, to do that.

The CHAIRMAN. Well, the point is this, Mr. Shaw: You are asking a committee of Congress to approve a resolution. I am asking you to tell this committee precisely what this committee will be giving its consent to if it should file a favorable report. I feel that the committee is entitled to the utmost clarity of definition of which the issues are capable.

Now, I do not want you to answer that question on the spur of the moment. I throw it out to you now, and all who are going to testify, because before this hearing is closed if any progress is to be made it seems to me that the issues will have to be determined in some such manner, otherwise this committee is just guessing what will be before the Court, if it goes before the Court.

Mr. SHAW. I want to answer just as directly as possible, Mr. Chairman. In the brief which you have before you, which was just presented for the record, there is a direct statement of the three major issues we consider to be involved here. I have found those to be three of the four issues which the Secretary of the Interior stated in his report.

Senator ANDERSON. You would not go beyond them?

Mr. SHAW. That is my present impression, sir. I do not want to be misunderstood—I say that these are the three major issues which we consider should be determined. Other parties to the case may have in mind other issues; I do not know.

Senator ANDERSON. I asked you whether you wanted to go beyond those.

Mr. SHAW. These are the issues which we desire to have determined.

Senator ANDERSON. And you do not want to go beyond those?

Mr. SHAW. I do not want to be misunderstood in answering that. There are some details——

Senator ANDERSON. You will not be misunderstood by answering yes or no.

Mr. SHAW. I cannot answer it specifically until I am sure what you mean, sir.

Senator ANDERSON. Then why we are going to get into controversy between the upper and lower basin States eventually by some of the things involved in this?

Mr. SHAW. What I am trying to express is that there are subdivisions of each of these points, detailed argument which I would not want to be precluded from bringing up.

Senator ANDERSON. But except for the subdivision beyond these three items you do not wish to go beyond those?

Mr. SHAW. That is my understanding of it, sir.

Senator MILLIKIN. Mr. Chairman.

The CHAIRMAN. Senator Millikin.

Senator MILLIKIN. I would suggest maybe those responsible officials of the States who might be involved, would not want to preclude themselves from any or all issues which at the time would be considered as in the best interests of those States to raise. I suggest that is an important a privilege for States other than Arizona and California as it is for the States of Arizona and California. I suggest that the most we can get here, Mr. Chairman, is a full, frank, and candid

discussion of the issues as they are seen now. I certainly would not want Colorado to be committing itself eternally to a full statement here of what it might want to raise in any litigation over the Colorado River. I suggest again it would be irresponsible for any State to bind itself that tightly.

Moreover, when we get all through and think that we have the issues well defined and settled, the Supreme Court may have a different notion and we open up a lot of other inquiries that will take us God knows where. That is one of the things which should be considered in giving this kind of a grant of authority.

Senator MCFARLAND. Mr. Chairman, I might ask one question here in regard to the suggestion that Mr. Shaw has just raised.

As I understand it, Mr. Shaw, you would not want this question litigated, that is, No. 3 in the Interior Department's letter:

> Is the water required for delivery to Mexico under the treaty with that nation to be deducted from "surplus" water prior to determination of the amount available for use in California under section 4 (a) of the Boulder Canyon Project Act, or is California entitled to use a full one-half of the "surplus" water diminished only by so much of the Mexican requirements as cannot be supplied from the other half?

Mr. SHAW. That is my present opinion, sir.

Senator MCFARLAND. And that is a major question, when it comes to the availability of water, which the upper States would be very much interested in; is it not?

Mr. SHAW. I am not sure, I have not given that very serious consideration.

Senator MCFARLAND. Under the compact, wouldn't they be interested in that?

Senator ANDERSON. Very much so.

Mr. SHAW. I hardly think so, sir. It is a question which relates to the application of surplus, not of the upper basin's apportioned water.

Senator MCFARLAND. In conformance with the chairman's wishes, I do not wish to argue with you, but I submit, Mr. Chairman, that under the compact, if Mexico is not to be supplied first out of the surplus, the upper basin States would be very much interested in it.

Mr. SHAW. I think the Senator has misapprehended the Secretary's statement here.

Senator MCFARLAND. I do not want to argue the matter with you. The record is here. Each one can make up his own mind.

Senator MILLIKIN. Mr. Chairman, may I ask a question, please?

Mr. Shaw, do you preclude from the realm of possibility, any of the questions Nos. 1, 2, 3, at the bottom of page 7, and No. 4 at the top of page 8, from being raised by California, let us say, in such a suit?

Mr. SHAW. I think the Senator answered that question a moment ago by indicating that it would be improvident for anyone to say with definity and certainty that any question might not arise.

Senator MILLIKIN. We are in complete agreement on that, Mr. Shaw, but I am trying to find out whether there is anything in here which you can now say, under your present lights, will not be brought to the attention of the court of California?

Mr. SHAW. I just stated to Senator McFarland that it is not my present opinion that the No. 3 point requires a disposition, and that I would be glad to say again.

Senator MILLIKIN. But under the principle, I think, which we are both agreed on, you would not preclude the possibility if you consid-

ered it in the interests of California to raise it at the time and under all the circumstances?

Mr. SHAW. I think that is necessarily true.

Senator ANDERSON. Mr. Chairman, I only want to say—not being a lawyer, I do not understand how they should prepare their briefs, or what they should do. I was just trying to find out if California was interested in any of those questions which touched the rights of the upper basin States. No. 3 does quite definitely. He does not want that adjudicated. I think it is important to us in voting on the resolution to know whether this is an attempt to open up those questions which apparently have been decided by the compact.

The CHAIRMAN. Why, of course, it has to be decided. Every member of the committee has to know what he is voting for. I think the proposition that consent should be granted to a suit, the nature of which nobody knows, is absurd. Now, litigation that may arise in the future is another thing altogether. You are here asking for the consent of this committee to the presentation of certain questions to the Supreme Court for adjudication. I submit that those questions should not be beclouded by speculative issues that may be raised at some time in the future.

There is no sense, it seems to me, in beclouding the problem here with a lot of possibilities that may be raised. Let us reach those possibilities when they come. Let us tell the committee now precisely what are the issues which ought to be adjudicated to settle this controversy.

If we go on the other theory, no solution can be projected.

Senator WATKINS. Mr. Chairman, did I understand that the witness would exclude No. 3? I thought he said California's interests were in having determined 1, 2, and 3.

The CHAIRMAN. 1, 2, and 4.

Mr. SHAW. That is right.

Senator MCFARLAND. Mr. Chairman, may I suggest at this time, that if the Secretary of the Interior is made a party to this suit, certainly he is going to raise No. 3, which he set forth in his letter.

The CHAIRMAN. Hay I suggest to the Senator that he is going beyond the field of the present inquiry. That is an argument.

Mr. SHAW. I have gotten the impression, Mr. Chairman, that the third point may have been misunderstood. The third point is simply this: We all know that the Mexican treaty water is first to be taken from surplus water, that is, the surplus is to be applied against the Mexican portion until the surplus is exhausted. The question here presented by the Secretary is: When is California's half of the surplus to be measured, before or after the Mexican treaty burden is deducted from surplus? If it is deducted before the division of the surplus is made, as between Arizona and California, one result is arrived at; if it is made afterward, another. That is not a point in my understanding of it which involves any interest in the upper basin.

Senator ANDERSON. Even if there were a deficit?

Mr. SHAW. If there was a deficit in the surplus sufficient to supply the Mexican burden, then the upper States must contribute, but that is by force of article 3 (c) of the compact, and not by force of anything involved in this question, as I understand it.

Senator MILLIKIN. Mr. Chairman, I should like to respectfully suggest to Senator Anderson that this measurement of the water busi-

ness goes to the heart of surplus, and surplus is inseparably identified with the Mexican treaty burden. And that if you are going to have a clarification of the rights of the States in the Colorado River, you must necessarily go into 3.

Mr. SHAW. May I proceed, Mr. Chairman?

The CHAIRMAN. Please do.

Mr. SHAW. Referring to the justiciable character of the controversy:

As to the question whether the controversy is a justiciable one the Department of Justice advised the committee (hearings, p. 11):

> It has been suggested that there is some question as to the existence of a justiciable controversy. That question itself can be determined authoritatively only by the Supreme Court. Cogent arguments can be made in support of, and also against, the existence of a justiciable controversy. Presumably all aspects of this question will be thoroughly presented and vigorously maintained by different States in case the question is presented to the Supreme Court.

But, upon the same subject, the Interior Department's report stated (hearings, p. 366):

> The bare statement of these questions, the knowledge that there is disagreement between Arizona and California about the answers to be given them, and the fact that, if the contentions of either State are accepted in full and if full development of the upper basin within the limits fixed by the Colorado River compact is assumed, there is not available for use in the other State sufficient water for all the projects, Federal and local, which are already in existence or authorized, would seem to indicate that there exists a justiciable controversy between the States. Should the Congress, however, entertain doubt about the existence of such a controversy, it could dispel that doubt by authorizing the construction of the central Arizona project, a report on which has been prepared by this Department and has been sent, pursuant to the provisions of section 1 of the Flood Control Act of 1944, to the States of the Colorado River Basin and to the Secretary of the Army for consideration and comment.
>
> It is probably true that, in view of the existing physical water supply in the lower basin—a supply which is ample as it is chiefly because the upper basin States are using far less than the 7,500,000 acre-feet apportioned to them by the compact—the situation is not such that the Court would be warranted in granting an injunction against either California or Arizona if it were found to be using more water than it is entitled to use. The controversy, nevertheless, appears to be of the sort that would justify the Court's determining the rights of the parties and definitely adjudicating their respective interests in the waters available to the lower basin. It matches in every particular the requirements for a "case" or a "controversy" in the constitutional sense of these words as those requirements were spelled out by the Supreme Court in *Aetna Life Insurance Company* v. *Haworth* (300 U. S. 227, 240 (1937)). "A 'controversy' in this sense," the Court said, "must be one that is appropriate for judicial determination. * * * The controversy must be definite and concrete, touching the legal relations of parties having adverse legal interests. * * * It must be a real and substantial controversy admitting of specific relief through a decree of a conclusive character, as distinguished from an opinion advising what the law would be upon a hypothetical state of facts. * * * Where there is such a concrete case admitting of an immediate and definitive determination of the legal rights of the parties in an adversary proceeding upon the facts alleged, the judicial function may be appropriately exercised although the adjudication of the rights of the litigants may not require the award of process or the payment of damages * * * And as it is not essential to the exercise of the judicial power that an injunction be sought, allegations that irreparable injury is threatened are not required."

(The complete text of Mr. Shaw's statement is as follows:)

STATEMENT BY ARVIN B. SHAW, JR., BEFORE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS ON SENATE JOINT RESOLUTION 4

I am assistant attorney general of California, assigned exclusively to advise the Colorado River Board of California. That is a State agency, set up by statute to protect and conserve the interests of California in the Colorado River.

Incidentally, I have also for 30 years acted as attorney for one or more irrigation districts in the Colorado River desert in southeastern California. I appear here on behalf of the State.

AN INTERSTATE CONTROVERSY EXISTS

As was stated in a brief filed with this committee by the Attorneys General of California and Nevada in hearings[1] held in 1948 (hearings before Senate Committee on Interior and Insular Affairs, Subcommittee on Irrigation and Reclamation, on S. J. Res. 145, p. 55):

"California and Arizona are the major claimants to the use of waters of the Colorado River which are available for use in the lower basin of that river. Nevada has a smaller claim. Utah and New Mexico, which lie chiefly in the upper basin, claim still smaller quantities for the minor portions of those States lying in the lower basin.

"A complex controversy exists between Arizona and California over their claims to waters of the river. This controversy has continued in one form or another for 25 years. It is grounded on the fact that the two States interpret differently a series of documents and statutes which, collectively, have been called the law of the river. These writings include the Colorado River Compact (1922), the Boulder Canyon Project Act (1928), the California Limitation Act (1929), the Boulder Canyon Project Adjustment Act (1940), the Mexican Water Treaty (1945), and a group of water contracts executed by the Secretary of the Interior under the authority of section 5 of the Project Act with (a) five public agencies in California (1930–34), (b) the State of Nevada (1942–43), and (c) the State of Arizona (1944).

"At the instance of Arizona, several facets of the problem have been submitted to the Supreme Court in *Arizona* v. *California et al.*, 283 U. S. 423 (1931),[2] *Arizona* v. *California et al.*, 292 U. S. 341 (1934),[3] and *Arizona* v. *California et al.*, 298 U. S. 558 (1936).[4] Each of these cases was dismissed by the Court, with opinion, on preliminary proceedings. At the instance of the United States, the case of *United States* v. *Arizona*, 295 U. S. 174 (1935) was prosecuted to enjoin military resistance by Arizona to construction of Parker Dam by the Bureau of Reclamation. Injunction was denied and the difficulty was then overcome by act of Congress.

"The subject matter of the controversy has not been comprehensively treated by the Supreme Court. There is, consequently, a variety of unsolved questions, upon the solution of which depends the economic future of the lower basin.

"No specific question is known to exist relative to the claims of Nevada, Utah, and New Mexico. Yet their interests are part of a complex whole and will be concerned in the judicial treatment of the whole.

"No problems requiring present disposition are believed to exist between the upper basin and the lower basin. The upper basin States, Wyoming, Utah, Colorado, and New Mexico and, as to a trifling interest, Arizona, have for a year or more been engaged in negotiations for a compact to divide the upper basin water among them. It is believed that this effort will be effectual.[5] On the other hand, for reasons hereinafter shown it is not believed that such a lower basin compact can be negotiated."

I offer a copy of the brief mentioned and ask that it be made a part of the record.

GUBERNATORIAL CORRESPONDENCE

Moved by the gravity of the controversy and its long continuation, Governor Warren of California on March 3, 1947 (hearings, p. 4) wrote the Governors of Nevada and Arizona an identical letter, in part as follows:

"The negotiations of the past have failed to bring about agreement between Arizona and California, but I am of the opinion that there must be some fair basis

[1] References hereinafter are to page numbers of these hearings, unless otherwise specified.
[2] A suit to enjoin the construction of Hoover Dam and to declare invalid the Boulder Canyon Project Act and the Colorado River Compact. The Court dismissed the bill.
[3] A suit to perpetuate the testimony of the negotiators of the Colorado River Compact. The Court refused to file the bill.
[4] A suit for an equitable apportionment of the waters of the Colorado River. The Court refused to file the bill.
[5] The upper Colorado River Basin compact was executed by representatives of the five States referred to, on October 11, 1948, has been ratified by their legislatures, and bills to grant the consent of Congress thereto are pending in the Eighty-first Congress (S. 790, H. R. 2325 to 2334, inclusive). S. 790 has been passed by the Senate.

upon which their respective rights can be determined. The only methods that occur to me are (1) negotiation of a compact; (2) arbitration; and (3) judicial determination.

"I would therefore like to suggest that we three Governors of the affected States endeavor first to enter into a compact which will resolve our differences and finally determine our respective rights.

"In the event you believe for any reason that this cannot be done, I suggest that we submit all our differences to arbitration, agreeing to be bound by the results thereof.

"If this is not feasible, I propose that we join in requesting Congress to authorize a suit to determine our rights in the Supreme Court of the United States, which suit could, if agreeable to the States, be submitted on an agreed statement of facts."

Governor Pittman, of Nevada, replied on March 6, 1947 (hearings, p. 5), saying, in part:

"Our experience leads us to an opinion that California and Arizona will be unable to negotiate a compact, and may be unwilling to agree on terms of arbitration. Nevada has spent much time and money in efforts to bring the tristate compact into being, completely without results.

"I am in accord with your thought that the three States, in the absence of other agreement, should join in requesting Congress to authorize a suit in the Supreme Court of the United States to determine our respective rights, and suggest that a method of presentation before the Court be agreed upon between Arizona and California, with which agreement Nevada will concur."

Governor Osborn of Arizona replied March 12, 1947 (Hearings, p. 6), stating that he would be glad to meet with Governor Warren, but saying, in effect, that all that was needed was for California and Nevada to support Arizona's bills for construction of the central Arizona project and arguing that the rights of the three States have already been determined by the relevant statutes and documents:

"It is difficult for me to undersand what, if anything further, need be done to place either California or Nevada or Arizona in position to support the utilization in our respective States of our respective shares of the water of the Colorado River, which shares have already been determined by the Colorado River compact, the Boulder Canyon Project Act, the California Limitation Act, the water delivery contracts of the California agencies, the Nevada water delivery contracts, and the Arizona water delivery contracts.

SENATE JOINT RESOLUTION 145, EIGHTIETH CONGRESS

Inasmuch as there appeared to be no other solution for the controversy, Senators McCarran, Downey, Malone, and Knowland introduced in the Eightieth Congress Senate Joint Resolution 145. Five California Representatives introduced counterparts in the House (H. J. Res. 225, 226, 227, 236; and H. R. 4097). These measures proposed that the controversy be determined in an action in the nature of interpleader, to be filed by the Attorney General, in which the States of the lower basin might present their claims and have them determined. Extensive hearings were held by subcommittees in both Houses; no reports were filed.

SENATE JOINT RESOLUTION 4

The Senators from California and Nevada introduced in this Congress Senate Joint Resolution 4, which is before you. The Representative from Nevada and each of the 23 Representatives from California have introduced companion measures (H. J. Res. 3, 38, 41, 55, 64, 73, 75, 95, 96, 100, 107, 113, 126, 128, 133, 135, 146, 148, 150, 152, 153, 164, 166, and 180).

DIFFERENCES BETWEEN SENATE JOINT RESOLUTION 145 AND SENATE JOINT RESOLUTION 4

Instead of directing the Attorney General to commence the proposed action, the measures pending in this Congress contemplate the initiation of the action by any one of the States, and grant consent to the joinder of the United States as a party defendant. The United States has been held by the Supreme Court to be a necessary party to an action concerning the rights of the States in the lower basin of the Colorado River (*Arizona* v. *California*, 298 U. S. 558, 572).

EXECUTIVE RECOMMENDATIONS TO EIGHTIETH CONGRESS

A. Program of the President

In reporting on the measures pending in the Eightieth Congress, the Director of the Bureau of the Budget stated, in a letter to the Attorney General, May 7, 1948 (hearings before Subcommittee No. 4 of House Judiciary Committee on H. J. Res. 225, etc., May 17, 1948, p. 29):

"* * * The proposed legislation would be in accord with the program of the President if amended, as suggested by you in the second paragraph of page 2 of your letter, in such a way as: (*a*) to waive the immunity of the United States to suit and permit the States to bring such actions as they may desire if the Congress feels that it is necessary to take such action in order to compose differences among the States with reference to the waters of the Colorado River; (*b*) to place a reasonable limit on the time for the bringing of such action; and (*c*) to insure that in any such action the United States would have the right to defend and also to assert any affirmative claim which it may have or which to assert in connection with the subject matter of any action filed pursuant to the legislation. * * *"

The report of the Attorney General was as above indicated.

The report of the Secretary of the Interior (hearings, pp. 363, 368) amplified the recommendations of the Budget Bureau by setting out the full text of a proposed substitute for Senate Joint Resolution 145, which would convert the measure from one directing the Attorney General to initiate an action, into one granting consent of Congress to joinder of the United States as a party in an action to be brought by one of the States.

The resolutions now pending in the Eighty-first Congress not only conform to the foregoing suggestions of the Bureau of the Budget, but are very closely patterned on the detailed form of the draft of bill contained in the report of the Secretary of the Interior.

B. Necessity of the United States as a party

The United States, if it is a necessary party, cannot be sued without its consent.

The report of the Department of Justice on the resolutions in the Eightieth Congress, to which the Director of the Bureau of the Budget above referred, stated (hearings, p. 10):

"* * * *Arizona* v. *California* (298 U. S. 558 (1935)), was instituted by Arizona to have adjudicated certain rights to the unappropriated waters of the Colorado River. In that action six other basin States were named as parties defendant. The Supreme Court dismissed that action on the grounds that since the United States was an indispensable party and had not consented to be sued, the suit could not be maintained.

"The decision of the Supreme Court in *Arizona* v. *California* made it clear that the type of relief desired by the States in a suit between them cannot be had in the absence of legislation giving the required consent."

C. The issues requiring determination

The report of the Secretary of the Interior on Senate Joint Resolution 145, Eightieth Congress (hearings, pp. 363, 366) stated the issues which might be presented to the Supreme Court as follows:

"Confining my attention to this section (sec. 4 (a)) of the Boulder Canyon Project Act—it being impossible to predict all of the issues that may be raised by the various parties to the proposed suit—four major problems would appear to be in dispute between California and Arizona. I may summarize them in question form thus:

"(1) Are the 1,000,000 acre-feet of water for which provision is made in article III (b) of the Colorado River compact 'surplus' or 'apportioned' within the meaning of section 4 (a) of the Boulder Canyon Project Act? That is, is or is not California entitled to share in the use of III (b) water?

"(2) Is the flow of the Gila River, for purposes of determining the water supply of the Colorado River Basin, to be measured at the mouth of the stream or elsewhere? And, as another aspect of the same problem: Is beneficial consumptive use by Arizona of the waters of the Gila to be measured in terms of diversion from the Gila River less returns to that river or in terms of the depletion of the virgin flow of that river at its mouth?

"(3) Is the water required for delivery to Mexico under the treaty with that nation to be deducted from 'surplus' water prior to determination of the amount available for use in California under section 4 (a) of the Boulder Canyon Project

Act, or is California entitled to use a full one-half of the 'surplus' diminished only by so much of the Mexican requirements as cannot be supplied from the other half?

"(4) Is the burden of evaporation losses at such reservoirs as Lake Mead to be borne by California and Arizona in proportion to the waters stored there for each of them, or is the burden of these losses to be fixed in some other fashion?"

These propositions embrace the questions suggested by California and Nevada (hearings, pp. 60, 61).

D. Justiciable character of the controversy

As to the question whether the controversy is a justiciable one the Department of Justice advised the committee (hearings, p. 11):

"It has been suggested that there is some question as to the existence of a justiciable controversy. That question itself can be determined authoritatively only by the Supreme Court. Cogent arguments can be made in support of, and also against, the existence of a justiciable controversy. Presumably all aspects of this question will be thoroughly presented and vigorously maintained by different States in case the question is presented to the Supreme Court."

But, upon the same subject, the Interior Department's report stated (hearings, p. 366):

"The bare statement of these questions, the knowledge that there is disagreement between Arizona and California about the answers to be given them, and the fact that, if the contentions of either State are accepted in full and if full development of the upper basin within the limits fixed by the Colorado River compact is assumed, there is not available for use in the other State sufficient water for all the projects, Federal and local, which are already in existence or authorized, would seem to indicate that there exists a justiciable controversy between the States. Should the Congress, however, entertain doubt about the existence of such a controversy, it could dispel that doubt by authorizing the construction of the central Arizona project, a report on which has been prepared by this Department and has been sent, pursuant to the provisions of section 1 of the Flood Control Act of 1944, to the States of the Colorado River Basin and to the Secretary of the Army for consideration and comment.[6]

"It is probably true that, in view of the existing physical water supply in the lower basin—a supply which is as ample as it is chiefly because the upper basin States are using far less than the 7,500,000 acre-feet apportioned to them by the compact—the situation is not such that the Court would be warranted in granting an injunction against either California or Arizona if it were found to be using more water than it is entitled to use. The controversy, nevertheless, appears to be of the sort that would justify the Court's determining the rights of the parties and definitely adjudicating their respective interests in the waters available to the lower basin. It matches in every particular the requirements for a 'case' or a 'controversy' in the constitutional sense of these words as those requirements were spelled out by the Supreme Court in *Aetna Life Insurance Co.* v. *Haworth* (300 U. S. 227, 240 (1937)). 'A controversy in this sense,' the Court said, 'must be one that is appropriate for judicial determination. * * * The controversy must be definite and concrete, touching the legal relations of parties having adverse legal interests. * * * It must be a real and substantial controversy admitting of specific relief through a decree of a conclusive character, as distinguished from an opinion advising what the law would be upon a hypothetical state of facts. * * * Where there is such a concrete case admitting of an immediate and definitive determination of the legal rights of the parties in an adversary proceeding upon the facts alleged, the judicial function may be appropriately exercised although the adjudication of the rights of the litigants may not require the award of process or the payment of damages * * *. And as it is not essential to the exercise of the judicial power that an injunction be sought, allegations that irreparable injury is threatened are not required.' "

E. Effect of the controversy on development of the basin

The report to the committee by the Secretary of the Interior, on this point (hearings, p. 363), after referring to "the questions that are agitating the lower-basin States," states:

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[6] The Director of the Bureau of the Budget later stated, as to the Secretary's report on the central Arizona project (letter of the Director to the Secretary, February 4, 1949): "The foregoing summary and the project report have been reviewed by the President. He has instructed me to advise you that authorization of the improvement is not in accord with his program at this time. * * *" Cf. his letter of February 11, 1949, to Senator O'Mahoney.

"* * * It was in part to these unresolved questions that the Commissioner of Reclamation referred when he concluded (see his letter to me dated July 17, 1947, printed in H. Doc. 419, p. 5) 'that a comprehensive plan of development for the Colorado River Basin cannot be formulated at this time' and 'that further development of the water resources of the Colorado River Basin, particularly large-scale development, is seriously handicapped, if not barred, by a lack of a determination of the rights of the individual States to utilize the waters of the Colorado River system.' "

As to this point, the Director of the Bureau of the Budget reported (hearings before Subcommittee No. 4 of House Judiciary Committee on H. J. Res. 225, etc., May 17, 1948, p. 28):

"There is agreement among all agencies concerned as to the urgent need for resolution of the water rights issues involved. I do not believe, however, that resolution of such issues through litigation inevitably would bar further development of water resources of the Colorado River Basin during the period of such litigation * * *."

Nevertheless, the Director of the Bureau of the Budget had previously made the broad statement in a letter to the Secretary of the Interior, dated July 23, 1947:

"* * * the authorization of any of the projects inventoried in your report should not be considered to be in accord with the program of the President until a determination is made of the rights of the individual States to utilize the waters of the Colorado River system."

And the Secretary of the Interior, in the Colorado River, House Document 419, Eightieth Congress, first session, page 1, stated:

"As stated in the interim report, existing circumstances tend to preclude the formulation of a comprehensive plan of development of the water resources of the Colorado River Basin at this time. Accordingly, although I cannot recommend authorization of any project, I am transmitting the report to you in order that the Congress may be apprised of this comprehensive inventory of potential water-resource developments in the Colorado River Basin and of the present situation regarding water rights in that basin."

F. Interests of the United States

The Secretary of the Interior's report on Senate Joint Resolution 145, Eightieth Congress (hearings, p. 367) stated, as to the interests of the United States in the disposition of this controversy:

"I have spoken thus far as if this convtroversy were of concern only to the States. Let me state briefly the interest of the United States. The United States has invested heavily in developments for the benefit of both sides of the river. These works include the Hoover, Davis, Parker, and Imperial Dams, the All-American canal, the San Diego aqueduct, and the Yuma, Gila, and Salt River reclamation projects. They also include the Colorado River and San Carlos Indian irrigation projects, and the Headgate Rock, Coolidge, and Ashurst-Hayden Dams serving these projects. All of these developments are tangible evidence of the Federal and Indian interests in a development of the area that is not yet complete. But they are more than this. They are also the means by which thousands of families live and by which the Nation benefits from a region which is rich with water and poor without it. In these people and in a continuation and expansion of the benefits which the area can yield, even more than in its financial investment, the United States has an interest to protect.

"Among these people the United States has an especial interest in the protection of the Indians. That their stake in the Colorado River Basin is a very large one is made plain in the pages of House Document 419 devoted to the present and prospective development of Indian lands. That their rights to the use of the waters of the Colorado River system for the irrigation of these lands will be an important element in any settlement of the lower basin's problems, whether that settlement is accomplished by litigation or otherwise, is made plain by many legal precedents. Notable among these is the decision of the Supreme Court in *Winters* v. *United States* (207 U. S. 564 (1908)) that a reservation for Indian use of lands within the area of an Indian cession carries with it a reservation of such waters, within the ceded area, as may be needed to make the reserved lands valuable for agricultural pursuits or otherwise adequate for beneficial use, and that such a reservation of waters has priority from the date, at least, when the lands involved were reserved for Indian use. The obligation of the United States to maintain the prior water rights of the Indians of the Colorado River Basin, and to enforce the immunity of these rights

against displacement by action inconsistent with their status and interests protected by Federal law, is one that has been recognized by all seven States of the basin in the provisions of the Colorado River compact itself.

"The vital concern of the United States in the waters of the Colorado River also stems from its traditional guardianship over navigable streams, the particular responsibility which it has taken on itself with respect to the Colorado by having entered into a treaty with Mexico, and its authority (asserted in sec. 5 of the Boulder Canyon Project Act) to control the use and disposition of the waters impounded behind Hoover Dam—all of which clearly make it an indispensable party to any general litigation involving water rights in the Colorado. But, quite apart from these broad policy considerations, the specific Federal developments, existing and potential, on both sides of the river are, as I have pointed out, so extensive and so important that, if those on either side are threatened by claims asserted on the other, the United States has a clear interest in seeing those assertions defeated.

"It likewise has an interest in knowing what its obligations are under the various water storage and delivery agreements that the Secretary of the Interior has entered into with Arizona, Nevada, and several California agencies under the authority given him by section 5 of the Boulder Canyon Project Act. The validity, meaning, and effect of those agreements depend upon their conformity to the relevant provisions of the Boulder Canyon Project Act and the documents related to it, and, therefore, depend in part at least upon the answers to such questions as those previously outlined in this letter."

The Secretary of the Interior's report also stated (hearings, p. 368):

"It may be, of course, that the Supreme Court would not agree with all of the contentions of either of the States. For the present, however, the purpose of this discussion is to emphasize the fact that the United States has an interest of its own in the proposed litigation, that if any of the resolutions before your committee becomes law the United States may have to take a position before the Court independent of that taken by either of the States, that it is highly desirable that this likelihood be anticipated and recognized in the proposed legislation and that the constitutional bases for the Federal developments in the lower basin ought, therefore, to be clearly asserted in this legislation if it is to be enacted."

VIEWS OF A HOUSE COMMITTEE

The 1948 hearings (p. 14) contain an extract from the report of the House Committee on Public Lands on H. R. 1597, a bill authorizing the Gila project (Rept. No. 910, 80th Cong., July 16, 1947), in which, referring to the controversy between Arizona and California, the committee said:

"The committee feels the dispute between these two States on the lower Colorado River Basin should be determined and settled by agreement between the two States or by court decision because the dispute between these two States jeopardizes and will delay the possibility of prompt development of any further projects for the diversion of water from the main stream of the Colorado River in the lower Colorado River Basin.

"Therefore, the committee recommends that immediate settlement of this dispute by a compact or arbitration be made or that the Attorney General of the United States promptly institute an action in the United States Supreme Court against the States of the lower basin and other necessary parties, requiring them to assert and have determined their claims and rights to the use of the waters of the Colorado River system available for use in the lower Colorado River Basin."

POSITION OF NEVADA, UTAH, AND NEW MEXICO

A. M. Smith, State engineer of Nevada, phrased that State's problem as follows (hearings before Subcommittee No. 4 House Judiciary Committee on H. J. Res. 225, etc., May 20, 1948, p. 212):

"I might explain that we are in a rather anomalous position as tenants in common on that river without knowing just how much any of the States in the lower basin are entitled to unless there should be an adjudication or a definite determination by the Court.

"Senator MALONE. Or a compact.

"Mr. SMITH. Or a compact."

Utah and New Mexico, of course, are in much the same relative position as Nevada, with respect to their interests in Lower Basin water.

EXECUTIVE REPORTS TO THE EIGHTY-FIRST CONGRESS

A. Report of Secretary of the Interior

In his report to the chairman of this Committee on Senate Joint Resolution 4 dated March 18, 1949, the Secretary of the Interior makes reference to his report on Senate Joint Resolution 145 dated May 13, 1948, and says:

"In that letter it was pointed out that the United States is an indispensable party to any litigation that may be brought to decide the dispute which now exists among the States of the lower Basin of the Colorado River and that that dispute appears to have the elements of a justiciable controversy. There is, therefore, no need for me to elaborate on these matters here."

These two important factors of the legislation before you are, accordingly, in the view of the Interior Department, still definitely settled.

The Secretary proceeds:

"Our hope that the dispute will be settled—by amicable means if possible, by the Congress if an amicable settlement is impossible, and if it be the judgment of the Congress that the dispute can be effectively disposed of by it, and by litigation only as a last resort—was also made clear in that report."

Two of the three means of settlement of interstate water controversies mentioned in this statement, namely, agreement and litigation, are well recognized and accepted. The third idea, a decision by Congress upon issues of a judicial nature, will be shown by another witness to be untenable. No decision by the Congress can effectively dispose of such a dispute. It is interesting, however, to note that the Secretary makes no attempt to support with authority, or to argue, that lawsuits between States can be effectively disposed of in the political forum.

The Secretary next seems to drop his suggestion of a congressional decision. He quotes from a decision of the Supreme Court, one among several of like tenor, in which the Court advises States, if possible, to settle differences by agreement.

Continuing on this line of thought, the Secretary next says:

"Both the executive and legislative branches of our Government might well consider to what extent they can contribute toward lending new impetus to negotiations among the States. In a letter addressed to you on February 11, Budget Director Pace has made it clear that 'the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him.'"

Although the State governments of California and Nevada have concluded that no serious prospect exists that the differences between California and Arizona can be composed by negotiation, California has never closed the door to negotiation. As is evidenced by Governor Warren's letter to the Governors of Arizona and Nevada dated March 3, 1947, which has been placed before you, California would prefer that method of settlement, were it possible. It is, candidly, difficult to expect that the executive or legislative branches of the Federal Government can exercise such suasion upon Arizona as to convince that State that it should agree to desist from reaching out for the water belonging to other States and stay within its own share of the river. On the other hand, it can be expected that Arizona would abide by a mandate of the Supreme Court.

The secretarial report next states:

"This Department is convinced that the proposal that the lower basin controversy be settled by litigation is but part of a larger picture. Of immediate importance is the question whether the institution of such litigation would hinder or expedite the development of the resources of the Colorado River Basin. Although it is not certain that lower basin litigation would inevitably have the effect of delaying progress in the authorization and construction of badly needed works in the upper basin, we are so convinced that it might well have that effect that I cannot say, to repeat a comment made by this Department on the Eightieth Congress resolutions, that there would be no objection to the enactment of legislation along the lines of those resolutions that are now before your committee unless we were fully assured that progress in the development of the basin and in the use of its waters would not be halted or seriously impeded by the litigation. More specific recommendations as to the means by which this assurance could best be evidenced are contained in the report of May 13, 1948, to which I have already referred. I may add that, in view of the fact that a compact apportioning the use of the waters of the upper basin has now been negotiated and ratified by all of the States of that basin, there is less reason now than it may have been thought there was last year for hesitating to give this assurance with respect to, at least, works in the upper basin States.

The Secretary in this paragraph makes a blind reference to a proposal in his report to the Eightieth Congress on Senate Joint Resolution 145. He there recommended legislation giving blanket authorization to the Secretary to construct projects throughout the Colorado River Basin, within certain limitations (hearings, pp. 364, 365). He now intimates that such legislation might be limited to the upper basin.

The Secretary's report to this Congress does not, nor did the report to the Eightieth Congress, make it plain that the approval of the President was expressly withheld from this portion of his former report. The Director of the Budget wrote to the chairman of the House Judiciary Committee on May 20, 1948, as follows (hearings before Subcommittee No. 4 of House Judiciary Committee on H. J. Res. 225, etc., May 17, 1948, p. 27):

"It has been called to my attention that the language of the report submitted by the Secretary of the Interior with respect to House Joint Resolution 225 and related resolutions is susceptible of misinterpretation by reason of the fact that, while a clear statement is made of the relationship to the program of the President of the resolutions themselves, no statement is made of the relationship to the President's program of the proposals advanced by the Secretary for the enactment of legislation authorizing construction in and further development of the Colorado River Basin.

"To correct any misunderstanding which already has arisen and to prevent further misunderstanding, I have today requested that my letters of May 7 to the Secretary of the Interior and to the Attorney General be inserted in the record of the hearings of the Senate Committee on Interior and Insular Affairs on Senate Joint Resolution 145. A copy of my letter to Senator Millikin is attached. I shall be grateful if you will consider these materials and decide whether they should also be inserted in the record of the hearings before your committee."

The appended letter from the Director to the Secretary of the Interior dated May 7, 1948, above-mentioned, makes clear the President's views. He said, in part:

"It seems to me that at this time relationship to the President's program of the other matters discussed in your proposed report should be left open. No proposed legislation respecting them, so far as I am aware, is far enough along to be considered at the forthcoming hearing. Accordingly, while there is no objection to the presentation by the Department of the Interior of views respecting such subjects as it believes are pertinent to the consideration of the resolution pending before the Senate committee, such views should not be considered as indicating any commitment, at least at this time, as to the relationship to the program of the President of proposals for legislation to authorize construction in, and the further development of, the Colorado River Basin by agencies of the Department of the Interior.

"There is agreement among all agencies concerned as to the urgent need for resolution of the water-rights issues involved. I do not believe, however, that resolution of such issues through litigation inevitably would bar further development of water resources of the Colorado River Basin during the period of such litigation. It also is problematical as to whether all agencies would agree on the need for the general authorizing legislation that you suggest. When agreement is reached on any particular project, I feel that the usual legislative method for authorizing it would be preferable to a general authorization, no matter how carefully circumscribed with the kinds of criteria you suggest on page 3 of the reports before you."

The remainder of the report of the Secretary of the Interior dated March 18, 1949, consists of inconclusive references to the relationship between Senate Joint Resolution 4 and the authorization of the proposed Central Arizona project and to a letter from Governor Warren of California.

Nowhere in the Secretary's latest report is there a distinct recommendation for or against Senate Joint Resolution 4. Nor does the letter from the Director of the Budget to the Secretary dated March 17, 1949, state whether or not Senate Joint Resolution 4 is in accord with the program of the President. It indicates no objection to the transmittal of the Secretary's report, but calls particular attention to his similar statement with reference to the Attorney General's report.

"The President has authorized me to advise you that while there is no objection to the presentation of your report as submitted to me, he has also authorized me to advise the Attorney General that there is no objection to his report on House Joint Resolution 3 and similar measures pending before the House Committee on the Judiciary. This report of the Attorney General, which

I understand was developed in collaboration with your representatives, suggests certain amendatory language for the consideration of the committee if the Congress proceeds to take up the proposed measure."

B. Report of the Attorney General

The Attorney General indicates that there has been no change in his view that under the decision in *Arizona* v. *California* (298 U. S. 558) the pending resolution is a necessary prerequisite to the proposed litigation. He says:

"The Court made it clear that the type of relief desired by the States in a suit between them cannot be had in the absence of legislation such as here proposed."

He comments on the fact that Senate Joint Resolution 4 has been drafted in compliance with the principal suggestion as to form contained in his 1948 report and continues:

"The first above-mentioned suggestion is incorporated in the present measure. However, as presently proposed, it would contemplate an adjudication of the rights in the lower basin only. Representatives of the Department of the Interior and this Department have recently conferred with regard to this proposed legislation and a proposed draft of substitute wording has been prepared which, among other things, would permit of a complete adjudication of all rights on the Colorado River, including the rights of the United States. In the absence of such provision in the act, a complete adjudication of the rights of all interested parties could not be had."

It is doubted that there is any present necessity for litigation of the breadth indicated by literal reading of this statement. The relations of the upper-basin States, as among themselves, appear to have been satisfactorily settled by the upper Colorado River Basin compact. No problems of urgency are known to exist between the upper basin and lower basin. Any differences of opinion which have been expressed may be resolved by agreement long before they come to constitute threats to peace in the basin.

The Attorney General proceeds:

"While enactment of the proposed legislation is a matter of legislative policy concerning which this Department has no recommendation, if the Congress gives the proposed measure favorable consideration, it is suggested that after the enacting clause the following language be substituted:

" 'That consent is hereby given to the joinder of the United States of America as a party in any suit or suits commenced in the Supreme Court of the United States within 1 year from the effective date of this joint resolution by any State or States of the Colorado River Basin, as that basin is defined in the Colorado River compact, for an adjudication of claims of right asserted against any other State or States of the Colorado River Basin or against the United States with respect to the waters of the Colorado River system available under the Colorado River compact, the Boulder Canyon Project Act, the California Self-Limitation Act, and the Boulder Canyon Project Adjustment Act to any State or States of the lower basin of the Colorado River, as that basin is defined in the Colorado compact, and of any claims of right affecting such availability which are asserted by the defendant States or by the United States. Any State of the Colorado River Basin may intervene in said suit or suits or may be impleaded by any defendant State or by the United States.' "

This suggested amendment is unclear, but it appears that the subject of the proposed litigation is meant to be:

"* * * the water * * * available * * * to any State or States of the lower basin * * *."

The text of the amendment, therefore, is not as broad as the description of it theretofore set out. With that understanding California does not object to the amendment proposed by the Attorney General. California sees no occasion for the upper-basin States to be involved in the proposed litigation, unless they so desire, and does not ask that they be involved.

The Attorney General makes no recommendations for or against the enactment of Senate Joint Resolution 4, if amended as he suggests. The letter of clearance from the Director of the Budget to the Attorney General states:

"The President has authorized me to inform you that there is no objection to the transmittal of this report to the House Committee on the Judiciary."

It is particularly noted that the Direcor of the Budge has not withdrawn the statement made in his letter to the Attorney General of May 7, 1948 (hearings before Subcommittee No. 4 of House Judiciary Committee on H. J. Res. 225, etc., May 17, 1948, p. 29):

"The proposed legislation would be in accord with the program of the President if amended, as suggested by you * * *" in the Attorney General's 1948 report.

CONCLUSION

It has been shown that an interstate controversy has existed for over a quarter of a century. The controversy is of vast public importance, concerning as it does the economic life and the future limits of development of the Pacific Southwest.

Efforts of the States to reach an agreement have not been successful. No other way to settle the argument appears to be open, except a suit in the Supreme Court.

In such a suit, the issues would primarily relate to the meaning and effect of an interstate compact, various statutes, and contracts. Such issues would be determined upon briefs and oral argument as to statutory interpretation and contract law. It would not be necessary to take interminable testimony as to factual matters. It is believed that the issues can, if the parties desire to expedite a decision, be disposed of within a reasonable time, not to exceed 2 years.

In this connection, it is noted that the three cases between Arizona and California decided in 283 U. S. 423, 292 U. S. 341, and 298 U. S. 558, which involved legal argument only, actually took, respectively, 3½ months, 5 months, and 8 months from commencement to decision.

It is believed that the official reports which have been reviewed show that congressional consent is necessary before the proposed suit can be commenced; that the United States has important interests which are involved, as well as those of the States; that the issues must be settled; and that the case is, within the decisions of the Supreme Court, a justiciable one and therefore within the jurisdiction of the Court.

It is believed that the contending States have probably, in the last few years, already expended more energy and money in debating their views in this forum, and more time has elapsed, than would be required to litigate their controversy to a decision in the Supreme Court. It is submitted that they should now, by taking the only course which appears to be effective, get the controversy behind them, so that they can join their efforts to the constructive end of the upbuilding of the Pacific Southwest.

Mr. SHAW. Mr. Chairman, I have prepared a discussion with respect to this particular point, but since that question was raised by the Senator from Oklahoma on yesterday, I would like particularly to have the privilege of presenting it at a time when he is here. He did ask a question yesterday, and I think he should have the answer.

The CHAIRMAN. Do you agree with this quotation from the Court that you have just read?

Mr. SHAW. Oh, yes; that the controversy is justiciable.

The CHAIRMAN. Then let me read this to you, and then ask you a question. I am reading now from 300 U. S. 227, 240, the *Aetna* v. *Haworth* case quoted in the Secretary's letter.

Mr. SHAW. Yes, sir.

The CHAIRMAN. Speaking of the controversy, the decision says:

> It must be a real and substantial controversy admitting of specific relief through a decree of a conclusive character as distinguished from an opinion advising what the law would be upon a hypothetical state of facts.

It occurs to the chairman that it would be highly desirable to develop the issues here in conformity with that sentence, namely, by excluding all questions of hypothesis and laying the issues bare, so that if a favorable report were granted, a favorable action obtained, we would be submitted a real and substantial controversy admitting of specific relief through a decree of conclusive character.

Senator ANDERSON. Are you at all interested in this suggestion of the Department of the Interior that the supply might be ample at the present time for the central Arizona project, by reason of the fact that the upper-basin States are using far less than their 7,500,000 acre-

feet; and if the matter went into the courts on an injunction basis and the court decided that the State of Arizona could proceed with the central Arizona project and California keep all the water it now has, that the upper-basin States would never be able to develop their water?

Mr. SHAW. I cannot conceive that as a result, Senator Anderson. In other words, as we see it, the United States Supreme Court will, and obviously must, accord to the upper-basin States exactly what the compact allocates to them. It could not do that and at the same time grant the lower-basin States any part of the upper-basin water. That we cannot conceive of as the possible result of any such litigation.

Senator ANDERSON. Do you expect any upper-basin State to ever get any power from Hoover Dam?

Mr. SHAW. I don't think they would want it, sir. It is too far away from them. There is other power to be developed so much nearer to their points of use that it would be rather impossible for them to use Hoover power. At present, as you know, the Hoover Dam output is fully contracted to various agencies.

Senator ANDERSON. California?

Mr. SHAW. California and Nevada. Arizona retains the right to take 18 percent of the power for its use, which it has not exercised.

I do not know of any power which is free to be disposed of, and, as I say, I do not think that, practically, the upper-basin States would want any of it.

Senator DOWNEY. Mr. Chairman, if I may intervene there—of course, Senator Watkins would be much better advised than I am—but we feel it is very doubtful that the Salt Lake area would even want any of the Bridge Canyon power because of the extreme length of the transmission lines and the expense involved in getting there. I am not precluding Utah from making that claim.

We believe that under Utah's plan, when she develops her water resources, she will have ample power supply right in her own back yard which will be much cheaper, and we believe the same is true of Colorado. Colorado already has a large power potential and will be able to develop all that she can possibly use.

Senator WATKINS. May I suggest, since you have raised the question, possibly that is true for the central part of Utah, the northern part of the State. But the southern part of Utah now has a power shortage which we do not believe will be taken care of by the construction of the Dixie project. We have already grown to the extent there now where we must look for other sources of power. But that would be very small in comparison with the total output. We might want some there; I would not want to preclude that.

Senator DOWNEY. I would say to Senator Watkins that that would probably come from the Bridge Canyon project, and not from the Hoover Dam, which is much farther down the river.

The CHAIRMAN. You may proceed, Mr. Shaw.

Mr. SHAW. I have just observed that the Senator from Oklahoma has taken his place, Mr. Chairman. I would like, for that reason, to continue the subject which I have just opened up, by a brief quotation on pages 8 and 9 of my statement, as to the position taken last year by the Department of Justice and the Department of the Interior on the subject of the justiciable character of the controversy.

If I may summarize what I just said for the benefit of the Senator from Oklahoma, it is that the Department of Justice says what is obvious, that only the Supreme Court can determine the matter authoritatively. The Department of the Interior takes the positive position, that the controversy is justiciable.

I would now like to interrupt my prepared statement with a separate memorandum on the justiciable character of the controversy. This memorandum is being distributed, I believe.

Article III, section 2 of the Constitution provides:

> The judicial power shall extend to * * * controversies to which the United States shall be a party; * * * to controversies between two or more States * * *

The section further provides:

> In all cases * * * in which a State shall be party, the Supreme Court shall have original jurisdiction.

The Supreme Court in a number of decisions has held that it will not entertain an action by a State unless there is shown to be an existing or presently threatened injury of serious magnitude (*Missouri* v. *Illinois*, 200 U. S. 496, 521 and other cases). In other words, the controversy is not "justiciable" unless these circumstances appear or unless some other accepted ground of jurisdiction exists.

It may be granted that the criterion of present injury is not fulfilled in the situation before us. Each of the States has so far been able to satisfy its present requirements for diversion and use of water. Turning, however, to the test of threat of injury, it appears that the circumstances fully satisfy this criterion. Perhaps the simplest threat of injury is for one man to say to another: "I will shoot you any time I can." Arizona now says to California: "I will take your water any time I can." This is not simply an idle declaration, unaccompanied by overt acts. Arizona has formulated and is seeking aggressively to carry out a program of development of considerable magnitude. The first overt act is perhaps the procurement by Arizona from the Secretary of the Interior of a water contract under section 5 of the Boulder Canyon Project Act. This contract specifies that Arizona may, "subject to availability" of water for use in Arizona, take delivery of 2,800,000 acre-feet per annum. If that nominal quantity is regarded as an actual quantity, it would greatly overlap the other contracts which the Secretary has executed under section 5 in favor of California's public agencies.

After procuring this contract, the State of Arizona has caused bills to be introduced in Congress and has procured the adoption of one of them. It has appropriated and paid over at least $200,000 to contribute to the cost of the engineering work being done by the Secretary of the Interior on the central Arizona project. The State has caused its counsel and witnesses to attend hearings here before congressional committees. It has appropriated other large sums of money to carry on the contest before the Congress. Its congressional delegation has diligently exerted its every effort for several years to procure the approval of the bills by various Federal agencies and by the Congress.

One phase of the record should not be forgotten. In 1946 Arizona introduced a bill for the reauthorization of the Gila project. It was finally adopted in 1947. It provided that Arizona might use on that

project not exceeding 600,000 acre-feet of mainstream water. At the hearings on this bill California witnesses showed the committee that this 600,000 acre-feet was the last mainstream Colorado River water which Arizona might take without invading the water belonging to other States in the lower basin. They insisted that Arizona should make its choice whether the 600,000 acre-feet should be used upon the Gila project, for the irrigation of vacant public land—there being not over 7,000 acres of cultivated private land involved—or whether Arizona should conserve that water for the relief of its necessities in the central Arizona area. Arizona chose to insist upon using the 600,000 acre-feet on the Gila project and take its chances on forcing through a central Arizona project to use additional water which was and is in controversy.

Looking at the whole record, Arizona's course of action, characterized by many overt acts, is legally sufficient to constitute a threat, so far as a threat may be required under the general rule of the Supreme Court as to justiciable controversies.

One circumstance has been mentioned as a reason why there is not either any present injury nor any present threat of injury involved in the controversy, that is, that there is now currently flowing from the Colorado River into the Gulf of California a considerable quantity of water unused by any of the States, estimated at from 6 to 7 million acre-feet annually. This fact, as applied to the claims and plans of development of the lower basin States, is an entirely false quantity. This is true, because the upper basin States are entitled under article III (a) of the Colorado River compact to the beneficial consumptive use of 7½ million acre-feet of water of the Colorado River system. They are now using not more than 2½ million acre-feet. Accordingly 5,000,000 acre-feet of the water now flowing into the Gulf of California is water belonging to the upper basin, unused by it but subject to withdrawal and consumption at any time by the upper basin. The lower basin States cannot predicate any development on this water. Any development in the lower basin must be based upon water which will be available permanently. It would be futile to invest hundreds of millions of dollars in works for which water would be available for only a relatively short period.

Two of the executive departments have expressed themselves as to whether or not there is present a justiciable controversy. The Department of Justice says, as is obvious, that the question "can be determined authoritatively only by the Supreme Court," and does not undertake to venture an opinion one way or the other.

Granting that only the Court can authoritatively decide concerning its own jurisdiction, it is still possible to have a well-grounded opinion on the subject. Such an opinion was emphatically expressed in the report of the Interior Department on Senate Joint Resolution 145, in which it is said:

> The bare statement of these questions * * * would seem to indicate that there exists a justiciable controversy between the States.

Again the report states:

> It meets in every particular the requirements for a "case" or a "controversy" in the constitutional sense of these words as those requirements were spelled out by the Supreme Court in *Aetna Life Insurance Company* v. *Haworth* (300 U. S. 227–240 (1937)).

The subject now under consideration is one of the major phases of the decision of the Supreme Court in the case of *Nebraska* v. *Wyoming and Colorado* (325 U. S. 589). That action was one brought by Nebraska against Wyoming for an equitable apportionment of the water of the North Platte River. Colorado was impleaded as a defendant.

Colorado moved to dismiss the case. The Court says, on pages 607 and 608:

> She asserts that the pleadings and evidence both indicate that she has not injured nor presently threatens to injure any downstream water user * * *. She asserts there is a surplus of water in the stream * * *. The argument is that the case is not of such serious magnitude and the damage is not so fully and clearly proved as to warrant the intervention of this Court under our established practice (*Missouri* v. *Illinois* (200 U. S. 496, 521, 50 L. ed. 572, 579, 26 S. Ct. 268); *Colorado* v. *Kansas* (320 U. S. 383, 393, 395, 88 L. ed. 116, 123, 124, 64 S. Ct. 176)). The argument is that the potential threat of injury, representing as it does only a possibility for the indefinite future, is no basis for a decree in an interstate suit, since we cannot issue declaratory decrees (*Arizona* v. *California* (282 U. S. 423, 462–464, 75 L. ed. 1154, 1169–1171, 51 S. Ct. 522, and cases cited)).
>
> We fully recognize those principles. But they do not stand in the way of an entry of a decree in this case.
>
> The evidence supports the finding of the special master—

and I ask the committee's very close attention to this language, if you please—

> that the dependable natural flow of the river during the irrigation season has long been overappropriated. A genuine controversy exists. The States have not been able to settle their differences by compact. The areas involved are arid or semiarid. Water in dependable amounts is essential to the maintenance of the vast agricultural enterprises established on the various sections of the river. The dry cycle which has continued over a decade has precipitated a clash of interests which between sovereign powers could be traditionally settled only by diplomacy or war. The original jurisdiction of this Court is one of the alternative methods provided by the framers of our Constitution (*Missouri* v. *Illinois* (180 U. S. 208, 241) * * * *Georgia* v. *Tennessee Copper Company* (206 U. S. 230, 237)).

It will be found that each sentence of the paragraph last above quoted is precisely and squarely applicable to the situation now existing among the States of the lower basin of the Colorado River. The dependable natural flow of the Colorado River during the irrigation season has long been overappropriated. A genuine controversy exists. The States have not been able to settle their differences by compact. The areas involved are arid or semiarid. A dependable water supply is essential to the maintenance of agricultural enterprises in the region. Even the dry decade on the North Platte, of which the Court speaks, was the same decade, 1931–40, which is the critical period in the history of the Colorado River.

Following the above statements the Court refers to a condition upon the North Platte River which it indicates represents a case of present injury.

I wish to attract your attention to some language in the opinion a little later on which applies to that feature.

But the Court goes on to the following statement which appears to be the key to the decision (p. 609):

> The claim of Colorado to additional demands may not be disregarded. The fact that Colorado's proposed projects are not planned for the immediate future is not conclusive in view of the present overappropriation of natural flow. The additional demands on the river which those projects involve constitute a threat of further depletion.

So it is clear that the additional demands of Arizona for its future project involve and constitute a threat of further depletion.

Finally, the Court holds that:

What we have then is a situation where three States assert against a river, whose dependable natural flow during the irrigation season has long been overappropriated, claims based not only on present uses but on projected additional uses as well. The various statistics with which the record abounds are inconclusive in showing the existence or extent of actual damage to Nebraska.

I call your particular attention to that as reflecting the Court's conclusion upon the matter which I spoke of a moment ago.

But we know that deprivation of water in arid or semiarid regions cannot help but be injurious. That was the basis for the apportionment of water made by the Court in *Wyoming* v. *Colorado* (259 U. S. 419, 66 L. ed. 999, 42 S. Ct. 552, supra.) There the only showing of injury or threat of injury was the inadequacy of the supply of water to meet all appropriative rights. As much if not more is shown here. If this were an equity suit to enjoin threatened injury, the showing made by Nebraska might possibly be insufficient. But *Wyoming* v. *Colorado*, supra, indicates that where the claims to the water of a river exceed the supply, a controversy exists appropriate for judicial determination. If there were a surplus of unappropriated water, different considerations would be applicable. (Cf. *Arizona* v. *California*, 298 U. S. 558, 80 L. ed. 1331, 56 S. Ct. 848.) But where there is not enough water in the river to satisfy the claims asserted against it, the situation is not basically different from that where two or more persons claim the right to the same parcel of land.

Interpolating, that obviously refers to a quiet title action.

The present claimants being States, we think the clash of interests to be of that character and dignity which makes the controversy a justiciable one under our original jurisdiction.

There is no question that the natural flow of the Colorado has long been overappropriated. The factual situation as between Colorado and Nebraska in the case under discussion is so strikingly parallel to that between Arizona and California in the proposed suit as to require no elaboration. The existence of purely prospective demands upon the flow of an overappropriated river, says the Supreme Court, is enough to establish a justiciable cause of action.

The Court next distinguished the case of *Colorado* v. *Kansas* (220 U. S. 383) which has been argued to support a contrary conclusion, saying that "That case turned on its special facts," and announced its decision on the motion as follows:

Colorado's motion to dismiss is accordingly denied.

It may be mentioned that this decision was to 5-to-3 decision, with one Justice not acting. That does not, it is submitted, seriously prejudice the binding force of the decision as the present law.

And this, Mr. Chairman, is the last case on the subject. It is one which, as stated, is remarkably close on its facts to the situation existing in the lower basin of the Colorado.

From what has been said, it is abundantly clear that, within the decision in *Nebraska* v. *Wyoming*, there is present in the suit proposed by Senate Joint Resolution 4 a justiciable controversy. There is, therefore, no necessity for consideration of the suggestion made by the Interior Department in its 1948 report on Senate Joint Resolution 145 that if Congress entertained any doubt about the matter it could authorize the central Arizona project, which would presumably create such a threat of injury as to make the case justiciable. This suggestion is sandwiched by the Department between reiterated positive

statements that the controversy is justiciable. It is now desired to trace out what an authorization act adopted for the purpose above-mentioned would mean.

It would mean, first, that Congress, in defiance of all precedent and almost in defiance of reason and good sense, would say: "We do not know whether there is or is not a water supply for the central Arizona project; nevertheless, we hereby authorize the construction of that project and thereby issue a mandate to the Appropriations Committee to appropriate moneys for it." It would then at least be necessary for Congress to protect itself against self-stultification, by authorizing the joinder of the United States in a suit which would test the question whether or not there is a water supply for the project. Otherwise the Congress, in adopting the authorization act, would have done an indefensible and imprudent act.

If the resolution authorizing litigation were adopted, it would be demonstrated that Congress, in adopting the authorization act, did not mean what it said and, thus, presumably the authorization act would not be regarded by the Appropriations Committee as a mandate to appropriate. That being the nub of the matter, in what way would the situation really have been changed by the adoption of the authorization act? It would be apparent that the authorization act was intended to be ineffective and nugatory. How could it therefore be regarded by a Supreme Court, which considers substance rather than form, as involving any particular actual threat?

Assume that both the authorization act and the litigation resolution are adopted and that a suit is filed and litigated to a conclusion. If the issues were decided as we think they would be decided and if it were found that no water supply exists for this project which had been authorized, then the Congress would be in the rather foolish position of having authorized a project for which no water supply existed and it would be put to the humiliating necessary of repealing the improvident authorization act.

In our view the adoption of the authorization act is not necessary to create a threat of injury. If a water supply is found by the Supreme Court to exist for the central Arizona project, the Congress can as readily, then as now, authorize the project. And if we are wrong in our conclusion that the authorization act is unnecessary to create a threat, the only loss that could be entailed would be the loss of a few months only of time. Reverting to the comment made by the Department of Justice that only the Supreme Court can authoritatively determine its jurisdiction, the jurisdictional issue would arise immediately at the threshold of the litigation. It could be and most likely would be disposed of upon the motion for leave to file the bill. As noted elsewhere, in the three cases which Arizona brought against California and the other five States of the Colorado River Basin, reported in 283 United States, 292 United States, and 298 United States, the time elapsed from the filing of the bill to the rendition of the decision, was 5 months, 3½ months, and 8 months, respectively.

Senator WATKINS. You mean the number of months from the time the action was filed until it was acted on by the Court?

Mr. SHAW. That is from the time it was filed until the day it was decided. Those were the time periods involved in those three cases.

Senator WATKINS. Isn't that rather unusual?

Mr. SHAW. Well, it simply illustrates, I believe, Senator Watkins, that the Supreme Court does handle work of this kind expeditiously.

Senator MCFARLAND. But I would like to call attention, Senator, to the fact that that is not a fair statement as to the time that would be consumed in this matter, because the Court did not take jurisdiction, and it just took them that long to decide that they did not have jurisdicton.

Mr. SHAW. That is just what I am trying to emphasize, if the chairman please, that a decision upon the question would come at the threshold of the litigation, and it would be decided within a matter of a few months. And if we are wrong, that would be the only penalty that would be imposed.

Senator MCFARLAND. But there is another element, that Congress has not taken any action authorizing the Secretary of the Interior to be a party.

Mr. SHAW. Reference has been made to the fact that Arizona in 1936 attempted to file a suit in the Supreme Court to determine the relative rights of the seven States to appropriate water from the Colorado River. The case was decided (298 U. S. 558) upon objections of all of the other six States to the granting of leave to file the bill. Each of the six States which were then members of the Colorado River compact objected to the filing of the bill on the ground among others that the bill did not show a justiciable controversy and upon the second ground that the United States, which had not consented to be sued, was an indispensable party. At that time the State of Arizona had not ratified the Colorado River compact. It sought an adjudication that it had a right to appropriate water without being restricted by the limitations imposed by the compact. The Court held that since Arizona was not a party to the compact it was not prejudiced by the compact and that Arizona could not, in advance of making appropriations, demand a decree for its benefit, prohibiting other States from appropriating. No present injury or threat of injury was found to exist. The Court held, finally, that the United States was a necessary party and could not be sued without its consent.

The situation now existing is distinctly different from that existing when the case of *Arizona* v. *California* was decided. Arizona has now enacted a statute ratifying the compact. It is now concerned, as it was not theretofore concerned, with the obligations and rights created bby the compact. Arizona is now moving actively toward the development of more or less tangible irrigation projects which were not contemplated at the time of the prior decision. Further, it is now apparent, as it was not apparent from the bill presented in the last case, that there is a condition of overlapping of rights and of shortage in the ultimate water supply available to the lower-basin States. These elements abundantly distinguish the present situation from that presented in the last Arizona suit.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 12: 15 p. m., a recess was taken until 10 a. m. of the following day, Thursday, March 24, 1949.)

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CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

THURSDAY, MARCH 24, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), McFarland, Downey, Anderson, Miller, Kerr, Watkins, Malone.

The CHAIRMAN. The committee will come to order.

You may proceed, Mr. Witness.

STATEMENT OF ARVIN B. SHAW, JR.—Resumed

Mr. SHAW. Mr. Chairman, in deference to the suggestion of the Chair at the end of yesterday's session, for clarification or identification of the issues which California considers should be presented to the Supreme Court, I have copied approximately a page of statement from the printed brief which we filed with the committee last year, and which states the three issues we consider should be presented, about as succinctly as we consider it possible to put them. I would like to have leave to clarify that subject right here, if you please.

The CHAIRMAN. You may proceed.

Mr. SHAW. I want to repeat that this is a reproduction of the same material which was put before the committee last year. Our position is unchanged:

MAJOR ISSUES INVOLVED

While there is a variety of more or less minor or detailed divergencies of opinion between California and Arizona relative to the meaning of the disputed documents, 3 major issues exist, which, in the aggregate, involve the right of one state or the other to over 1,000,000 acre-feet of water per annum. These 3 issues are:

1. Whether by the terms of the California Limitation Act California is entitled to participate in the 1,000,000 acre-feet of water referred to in Article III (b) of the Colorado River compact. This issue is one of interpretation of the California Limitation Act and the corresponding language in section 4 (a) of the Boulder Canyon Project Act.

2. Whether the measure of "beneficial consumptive use" of waters of the Gila River in Arizona is the actual beneficial consumptive use of such waters made in Arizona, or is the amount of the depletion by Arizona of the virgin flow of the Colorado River at its confluence with the Gila. This is a question of interpretation of article III of the Colorado River compact.

3. Whether the 4,400,000 acre-feet of the water apportioned by article III (a) of the Colorado River compact to which California is limited by the Project Act and Limitation Act is a net quantity, or is subject to reduction by reason of evaporation and other reservoir losses, particularly at Lake Mead. This is,

again, a question of interpretation of the California Limitation Act and section 4 (a) of the Project Act.

The CHAIRMAN. Will you insert in the record at this point the particular provision of the California Limitation Act which appears to be in question under No. 3?

Mr. SHAW. Yes, sir. The language of the——

The CHAIRMAN. It is not necessary for you to read it. I just want the record to be clear.

Mr. SHAW. Very well, we will supply the language for the record.

The CHAIRMAN. Supply the language of the California Limitation Act to which reference is made, in paragraph 1, section (4) of the Boulder Canyon Act; article III of the Colorado River compact, mentioned in paragraph 2; article III (a) and the provisions of the California Limitation Act, and section 4 (a) of the Project Act, which are mentioned in No. 3, so that any person reading this record will have before him the statutes in question.

(The documents referred to above are as follows:)

ARTICLE III. COLORADO RIVER COMPACT

(a) There is hereby apportioned from the Colorado River system in perpetuity to the upper basin and to the lower basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum.

(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then the burden of such deficiency shall be equally borne by the upper basin and the lower basin, and whenever necessary the States of the upper division shall deliver at Lee Ferry water to supply one-half of the deficiency so recogized in addition to that provided in paragraph (d).

(d) The States of the upper division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of 10 consecutive years reckoned in continuing progressive series beginning with the 1st day of October next succeeding the ratification of this compact.

(e) The States of the upper division shall not withold water, and the States of the lower division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for further apportionment as provided in paragraph (f) any two signatory States, acting through their governors, may give joint notice of such desire to the governors of the other signatory States and to the President of the United States of America, and it shall be the duty of the governors of the signatory States and of the President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the upper basin and lower basin the beneficial use of the unapportioned water of the Colorado River system as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

SECTION 4 (A). BOULDER CANYON PROJECT ACT

SEC. 4 (a). This Act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this Act, and no water

rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claims to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, mentioned in section 13 hereof, and the President by public proclamation shall have so declared, or (2) if said States fail to ratify the said compact within six months from the date of the passage of this Act then, until six of said States, including State of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and shall have approved said compact without conditions, save that of such six-State approval, and the President by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph (a) of article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

THE CALIFORNIA LIMITATION ACT

(Act of March 4, 1929; ch. 16, 48th sess; Statutes and Amendments to the Codes, 1929, pp. 38–39)

CHAPTER 16

AN ACT To limit the use by California of the waters of the Colorado River in compliance with the act of Congress known as the "Boulder Canyon Project Act," approved December 21, 1928, in the event the Colorado River compact is not approved by all of the States signatory thereto

(Approved by the Governor March 4, 1929; in effect August 14, 1929)

The people of the State of California do enact as follows:

SECTION 1. In the event the Colorado river compact signed at Santa Fe, New Mexico, November 24, 1922, and approved by and set out at length in that certain

act entitled "An Act to ratify and approve the Colorado river compact, signed at Santa Fe, New Mexico, November 24, 1922, to repeal conflicting Acts and resolutions and directing that notice be given by the Governor of such ratifications and approval," approved January 10, 1929 (statutes 1929, ch. 1), is not approved within six months from the date of the passage of that certain act of the congress of the United States known as the "Boulder Canyon Project Act," approved December 21, 1928, by the legislatures of each of the seven States signatory thereto, as provided by article eleven of the said Colorado river compact, then when six of said States, including California, shall have ratified and approved said compact, and shall have consented to waive the provisions of the first paragraph of article eleven of said compact which makes the same binding and obligatory when approved by each of the States signatory thereto, and shall have approved said compact without conditions save that of such six States approval and the President by public proclamation shall have so declared, as provided by the said "Boulder Canyon Project Act," the State of California as of the date of such proclamation agrees irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming as an express covenant and in consideration of the passage of the said "Boulder Canyon Project Act" that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado river for use in the State of California including all uses under contracts made under the provisions of said "Boulder Canyon Project Act," and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph "a" of article three of the said Colorado river compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

SEC. 2. By this Act the State of California intends to comply with the conditions respecting limitation on the use of water as specified in subdivision 2 of section 4 (a) of the said "Boulder Canyon Project Act" and this Act shall be so construed.

The CHAIRMAN. It may be appropriate to remark at this point that yesterday the House of Representatives passed the bill approving the upper basin compact. It would be a wonderful thing for this committee, I think, if the lower basin were able to imitate the example of the upper basin.

Mr. SHAW. May I remark, Mr. Chairman——

The CHAIRMAN. That does not require any comment from the witness.

Mr. SHAW. I only wish to say that we in California are very happy that the upper basin has been able to reach a compact. We wish that we could.

May I refer to my prepared statement, at the beginning of page 10, and summarize this section of the statement as briefly as I can?

Repeatedly in the reports of the Secretary of the Interior, the Director of the Bureau of the Budget, and the Commissioner of Reclamation, the proposition has been agreed upon that it is necessary to resolve the questions in dispute among the Colorado River Basin States, as a basis for, first, a formulation of a comprehensive plan of development of the basin, and, second, the execution of such plan.

The CHAIRMAN. What page are you reading from, Mr. Shaw?

Mr. SHAW. I am not reading, sir, I am attempting to summarize in accordance with your suggestion.

The CHAIRMAN. What page do you have before you?

Mr. SHAW. At the top of page 10.

The CHAIRMAN. Thank you, sir.

Mr. SHAW. The subject matter is the effect of the controversy on the development of the basin.

In pursuance of reports by the Secretary of the Interior, the Director of the Budget stated in one letter of July 23, 1947:

> The authorization of any of the projects inventoried in your report should not be considered to be in accord with the program of the President until a determination is made of the rights of the individual States to utilize the waters of the Colorado River system.

That broad statement should today be qualified to the extent that the upper basin has now resolved the questions existing among the upper basin States, as to the division of the upper basin water, and accordingly we take these broad declarations of the Director of the Budget as being now limited to the lower basin.

The next section of my statement, commencing at page 11, is a discussion of the interests of the United States in the determination of this controversy.

The Secretary of the Interior, in an extensive statement in his report to the committee last year, reviewed the variety of concerns which the United States has with the solution of these problems, referring to the works in which the United States has invested its money, the future projects possible, the protection of the Indians, and, of course, the duty of the United States to control navigable streams.

I remarked to you yesterday that in a hearing before the House Committee on Public Lands, California witnesses had showed the committee that the 600,000 acre-feet of water which was under consideration for use in the Gila project, just above Yuma on the Gila River, was the last noncontroversial water in the lower basin which could be expected to be used by Arizona without conflict.

The suggestion was then made that it was known that central Arizona desired and would demand a project—bills had been introduced at that time for that purpose—and that the State of Arizona should most carefully consider whether that 600,000 acre-feet should be applied to relieve its necessities in central Arizona, rather than to put it on a project which would mainly serve public lands, vacant and unoccupied, just above Yuma.

As a result of the hearings, the decision of the House Committee on Public Lands was a report on a bill reauthorizing the Gila project, in which, referring to this controversy between Arizona and California, the committee said—and I am referring now to page 13 of my statement:

> The committee feels the dispute between these two States on the lower Colorado River Basin should be determined and settled by agreement between the two States or by court decision, because the dispute between these two States jeopardizes and will delay the possibility of prompt development of any further projects for the diversion of water from the main stream of the Colorado River in the lower Colorado River Basin.
>
> Therefore, the committee recommends that immediate settlement of this dispute by a compact or arbitration be made or that the Attorney General of the United States promptly institute an action in the United States Supreme Court against the States of the lower basin and other necessary parties requiring them to assert and have determined their claims and rights to the use of the waters of the Colorado River system available for use in the lower Colorado River Basin.

It will be observed that having a block of what you might call noncontroversial water, and the last block which was admitted all around to be noncontroversial, Arizona chose to apply that water to a public-land project and to rely upon its ability to force through a bill which would require water that was in controversy between the two States.

In my statement, I next refer to the position of Nevada, Utah, and New Mexico.

Reading from page 13 of my statement:

A. M. Smith, State engineer of Nevada, phrased that State's problem as follows, in the hearings before the House committee last year:

I might explain that we are in a rather anomalous position as tenants in common on that river without knowing just how much any of the States in the lower basin are entitled to unless there should be an adjudication or a definite determination by the Court.

Senator MALONE. Or a compact.

Mr. SMITH. Or a compact.

Utah and New Mexico, of course, are in much the same relative position as Nevada with respect to their interest in the lower-basin water.

There is one qualification which should be made to that: Under section 5 of the Project Act, the State of Nevada has executed contracts with the Secretary of the Interior for an aggregate of 300,000 acre-feet of water. They have a paper, therefore, which is subject to availability for use in Nevada, as the standard phrase goes. It gives them something specific to lean on. Neither Utah nor New Mexico is in a position to have a contract with the Secretary of the Interior because those contracts are limited to water delivered at Lake Mead or below. The Utah and New Mexico projects are not susceptible of delivery of water from Lake Mead.

I have reviewed this subject, up to this point with the purpose of sketching how the development of the issues came about in the last Congress through the executive reports. I come now to the executive reports of this Congress.

Senator MCFARLAND. Where are you reading from now?

Mr. SHAW. Page 14, sir.

Senator MALONE. I would like to ask a question at this point, Mr. Chairman.

The CHAIRMAN. Senator Malone.

Senator MALONE. I notice that you carry the theme all the way through in your outline that this controversy is between California and Arizona. Now, realizing, perhaps, a lesser interest in the river, isn't this analogus to the controversy of about 20 years ago when California and Arizona dominated the picture for 5 years, Nevada finally got into it, and insisted on getting some of the power withdrawal there? It had never been asked for before, but Arizona and California were screaming about which one was going to get the water and the power. Finally, when we did take an interest in it, we divided up the power.

Now, if you still insist that the fight is only between Arizona and California, and that the other three States have no interest in this at all, except a sort of left-handed interest that you bring in after dominating the situation with the two States, I see no fair picture being presented to this committee at all.

Mr. SHAW. Senator Malone, in my brief of last year, and in the opening of my statement yesterday, I tried to make it plain that Nevada, Utah, and New Mexico have interests in this water which are parts of a complex whole and therefore cannot be regarded as defined or settled in any way until the whole picture is clarified by a decision of the Court.

Senator MALONE. But isn't this a common controversy between five States?

Mr. SHAW. It is a situation in which the outcome as to each of the States depends on the disposition of the entire controversy by the Court. I am sure that it is possible for the decision of the Court to affect the interests of any one of the five States adversely or beneficially.

Senator MALONE. Then why do you refer to it as "this controversy between California and Arizona"?

Mr. SHAW. Perhaps only because the States of California and Arizona have taken the most active part in debating it. The other States have been more or less on the side lines by their choice, I believe.

Senator MALONE. Well, we don't fight between rounds. Now we have come to the point where the bell has rung, so we are going to get into it.

You remember that in 1927 nothing had ever been said about Nevada's rights to power or revenue and taxes, but all at once we come in for that. We sat down with the committee, called then, I think, the Reclamation and Irrigation Committee and Nevada got the withdrawal privilege on 36 percent of the power, more than one-third of the power, and can get it now at any time they want it, although it is mostly being used in California. We did withdraw a certain amount of power, and will withdraw all of it. I think we will be short of power before we get through.

Now, relatively speaking, the amount of water we have demanded is small. But I want to ask you another question. Suppose you go ahead in your development; Arizona goes ahead in their development. Now, the projects from Senator Anderson's State, New Mexico, are likely to be relatively small; Utah's, Senator Watkins' State will be relatively small; in my own State of Nevada they will be relatively small and inexpensive. But after we have expended the money for your projects and the water is overappropriated—assuming this project was built now—and in view of the Secretary of the Interior's language that the feasibility of this project depends on the water supply to be determined even for the Arizona project, wouldn't it be a little difficult to get one of these other projects through afterward if it could be clearly shown that the water was needed to pay out the projects already constructed or under way? Wouldn't it be a little difficult to get an appropriation or an O. K. from the Secretary of the Interior for one of these smaller projects?

Mr. SHAW. I do think so; yes, sir. I believe that as soon as you create demands upon the river by the construction of projects which exceed the amount of water available in the lower basin, then you immediately jeopardize the interests of all the other States involved in the lower-basin picture.

Senator MALONE. My point is simply this: That once we vote as Senators and Congressmen to uphold the Secretary of the Interior in the fact that the water is available for the California and Arizona projects, then we come in with our small projects, and it clearly can be shown that the water is not there for them, if we are going to pay off the other investment. Then what attitude do you think the public generally might take toward further appropriations?

Mr. SHAW. I think it would be difficult, even though you showed an equitable claim to the water, to take the water away if it had already been overappropriated.

Senator MALONE. Don't you think, then, it is about time that California realized there are other States in the basin and simply discussed this matter as a basin affair?

Mr. SHAW. We have tried to do so, Senator. If we have laid too much emphasis on the differences of opinion between California and Arizona, it is because those States have been perhaps more vocal in discussing their ideas than the others. I do not mean to leave the others out of the picture in any sense.

Senator MCFARLAND. Mr. Shaw, hasn't it been true that both States have recognized the rights of these other States?

Mr. SHAW. In an indefinite way that is true, Senator.

Senator MCFARLAND. Well, how could it be done any more definitely? Do you dispute them?

Mr. SHAW. You may.

Senator MCFARLAND. Well, we haven't. We have absolutely recognized them.

Mr. SHAW. Well, not absolutely, Senator.

Senator MCFARLAND. I beg to differ with you.

Mr. SHAW. The Arizona contract, which was mentioned yesterday, does not define the quantities of water which are to be accorded to Utah or New Mexico. I am speaking of article 7 (g) of the Arizona contract, and I will supply the text for the record, if the Chair please. It said in substance that Arizona recognizes the rights of Utah and New Mexico to an equitable share of the waters of the lower basin. That is the substance of it. No one has defined what that equitable share may be, and you in the other States may have differences of opinion when it comes to that definition; I don't know.

(Article 7 (g) of the contract mentioned is as follows:)

EXCERPT FROM ARIZONA WATER CONTRACT EXECUTED BY THE SECRETARY OF THE INTERIOR, FEBRUARY 9, 1944

ARTICLE 7 (G)

7 (g). Arizona recognizes the rights of New Mexico and Utah to equitable shares of the water apportioned by the Colorado River compact to the lower basin and also water unapportioned by such compact, and nothing contained in this contract shall prejudice such rights.

Senator WATKINS. May I observe in connection with the thought suggested by Senator Malone, that if there is going to be any difficulty about these two States who are staging all the fighting, let them go on fighting, and let us build these smaller projects for Nevada, New Mexico, and Utah, and let them take what is left.

Senator MALONE. You may have an idea there, Senator, but my point is simply this: You can recognize the right——

Senator MACFARLAND. Let me interrupt there—pardon me for interrupting, go ahead.

Senator MALONE. Thank you. You can recognize the right, give us lip service, and put in all the separate briefs that they write, but at the same time go on and overappropriate the water and spend the Government's money to store this water that belongs to us. Even if Arizona and California were friendly there are still 46 other States in the Union besides those two. So, when we come in, they might say, "How can we spend the Government money now to build a project where the water must necessarily be utilized to repay what we have already spent?" That is the point I wanted to make.

Senator WATKINS. I would like to add, too, that Nevada could build its projects and Utah and New Mexico do the same, and we would not create any overdraft on the river in the lower basin. Maybe by the time we get those three projects built we would have this dispute settled. I just make that as a suggestion; maybe it is worth thinking about.

Senator ANDERSON. Mr. Shaw, may I just ask this:

In your memorandum which you filed you pointed out something that I have been anxious about, namely, that the water now flowing down the Colorado River, which appears to be ample, is an entirely false quantity.

Mr. SHAW. Yes, sir.

Senator ANDERSON. Because 5,000,000 acre-feet of it is water not yet used by the upper basin States.

Now, in the hearings of a year ago, at page 248, there is a table appearing thereon. Maybe you can help me with it. It is table No. 3. The first column is "Calendar years"; the second column is "Colorado River at Lees Ferry." Does that mean the amount of water that is passing by Lees Ferry where we are supposed to measure it?

Mr. SHAW. May I find out where this table came from and what it refers to, please?

It is a table put in by Mr. Debler.

Senator ANDERSON. He is with the Reclamation Service. Do you not have an engineer who would know whether that is water or not?

Mr. SHAW. Yes, sir. May I say this: I unfortunately did not hear Mr. Debler's testimony at last year's hearing. I would prefer to have an engineering witness evaluate this table.

Senator ANDERSON. Well, regardless, you recognize that that is the amount of water flowing by Lees Ferry, do you not?

Mr. SHAW. That is what it purports to be, table 3, column 2.

Senator ANDERSON. Well, whether it purports to be or not, that is the Bureau of Reclamation's calculation. Can I get that much of an agreement?

Mr. SHAW. I don't agree with that, because Mr. Debler is not with the Bureau of Reclamation.

Senator ANDERSON. He is not connected with the Bureau of Reclamation?

Mr. SHAW. I understand not.

Senator ANDERSON. Has he left the Bureau of Reclamation?

Senator MALONE. Yes.

Mr. SHAW. Some years ago. These are undoubtedly Bureau figures prepared by Mr. Debler according to his lights, and I assume that they are probably accurate. I do not mean to evade.

Senator ANDERSON. Well, regardless, they are the figures which he supplied and which went into record.

Mr. SHAW. Yes, sir.

Senator ANDERSON. Now, if you take 5,000,000 off of 8,000,000 you get 3,730,000 as all the water that flowed past Lees Ferry in 1945.

Mr. SHAW. That would be correct.

Senator ANDERSON. That would not go far toward filling in the 8,500,000 required, would it?

Mr. SHAW. No.

Senator ANDERSON. And it wouldn't go very far toward 10,550,000, would it?

Mr. SHAW. No, sir; and if you look at the top figure on that list for 1934, the picture is just half that good.

Senator ANDERSON. I have looked at all of them. I have tried to add them up and average them for the 13 years. The flow for 13 years is 147,000,000, roughly, if my arithmetic is not too bad. That leaves an average of about 11,000,000 flow by there per year.

Mr. SHAW. Yes.

Senator ANDERSON. Now, if the flow is 11,000,000 per year and 5,000,000 of that belongs to the upper basin States, about 6,000,000 has been delivered at Lees Ferry?

Mr. SHAW. That would be true.

Senator ANDERSON. What would your analysis as a lower basin State representative be? Are we obligated to deliver 8½ million on an average of 11 million, and thereby only have 2½ million or so left for the upper basin States?

Mr. SHAW. Well, sir, the language of article III (d) of the compact requires that the States of the upper division, the upper four States, shall not deplete the flow of the river at Lees Ferry below 75,000,000 acre-feet in each 10-year period, reckoned in continuing progressive series.

Senator ANDERSON. That is right, and what I am trying to find out here is——

Mr. SHAW. That is the minimum.

Senator ANDERSON. Then we do not have 7½ million in the upper States, do we? We have about 2½ million.

Mr. SHAW. No, sir. I can't regard it that way for this reason——

Senator ANDERSON. Well, if the average is 11 million, just slightly over 11 million which flows past Lees Ferry in that 13-year period, and you can take almost any 10 years out of that that you want—Let me put it this way: If 11 million is flowing past Lees Ferry in the 10-year period and it says we must not deplete it beyond an average of 7½ million a year, 75 million in 10 years, I do not care how you figure it, we are restricted to the remainder, are we not?

Mr. SHAW. You will be restricted to the remainder, plus, of course, the amount of water which is now being used in the upper basin, which is reckoned at about 2½ million more.

Senator ANDERSON. Two and a half million, all right. Now, you add to that the 3½ million remaining. Our share really is six million and not seven and a half; is it not?

Mr. SHAW. In extended, dry cycles, such as this has been since 1930, about 17 or 18 years, the effect is that there will not be present in the upper basin as much as 7½ million, unless storage is provided by which the above average flows of water can be preserved from wet cycles over into dry cycles. Then it is estimated, I believe, by upper basin engineers——

The CHAIRMAN. May the Chair interrupt to say that I have requested our staff representative, Mr. E. K. Nelson, an engineer, to go through all of our records. He has prepared a memorandum which I think will be available before the end of the day, showing the precise condition of the water supply, so far as the evidence thus far presented before this committee takes it. When we have that before us, it was the thought of the Chair that we could then have a session

with the engineers and determine the answer to the question which the Senator from New Mexico very properly asked the other day, that is, what is the water supply? Because it is obvious that on the answer to that question depends the policy which must be followed with respect to distribution.

Senator MALONE. Mr. Chairman, maybe I could clarify that if you would allow me.

Senator ANDERSON. Yes, indeed, sir.

Senator MALONE. Your upper basin States have a very large return flow. When you take 5,000,000 acre-feet of water you will use it more than once, a lot of it, so that the beneficial consumptive use of the 5,000,000 acre-feet may amount to considerably more than just 5,000,000 acre-feet. Now, engineers estimate those things, but they never can be sure. So you are only bound to turn down 7½ million acre-feet. The amount you hold up there you can use over and over consumptively until you do just turn down that amount.

Senator ANDERSON. Is there some controversy on that point between Arizona and California?

Senator MCFARLAND. Oh, yes, very much so, Mr. Chairman.

Senator ANDERSON. That is just what I thought.

Senator MCFARLAND. We do not contend, and I do not think the upper basin States will want to contend, that they would be charged with reused water.

Mr. SHAW. Nor do we.

Senator WATKINS. I understand Mr. Shaw to say neither do they, so there must be agreement at least on one point.

Senator ANDERSON. Now, we have started this argument between depletion, and so on.

Senator MCFARLAND. Well, we will go into that.

Senator MALONE. I could clarify that, I think, because they are only supposed to turn down, or are bound to turn down 7,500,000 acre-feet. What they do with the rest of it is their own business, and we have nothing to say about how many times they use it, or what.

Mr. SHAW. That is correct.

Senator MALONE. They are not even bound to turn that down every year. They are bound to turn down 75,000,000 acre-feet in every 10-year period. In other words, they could use it all theoretically if they had a large enough reservoir for a couple of years, and then make it up later out of their storage. So that we have nothing to do, Senator, with what they do with it at all. They may turn down 75,000,000 acre-feet every 10-year period, or 7,500,000 acre-feet every year, as they themselves may decide.

Senator MCFARLAND. No; it is a little bit more complicated than that. I think if we would get along with the testimony we would accomplish more, but there has been apportioned to the upper basin States 7,500,000 acre-feet per year. They are limited to that use, to the beneficial consumptive use of that. Now, if you use California's theory of beneficial consumptive use they are charged with the water whether it reaches the main stream or not. If you use Arizona's theory, the upper basin States get more water. I believe Mr. Shaw said it amounted, under Arizona's theory, to about 8,300,000 acre-feet, instead of 7,500,000. There is that much difference in this controversy on consumptive use.

Senator MALONE. Mr. Chairman, right at this point I would like to again say—and I want to listen carefully to Mr. Debler's testimony when he appears, because I have a high regard for Mr. Debler. He is one of the best men on water supply, on the stream systems, in the Nation, in my opinion. He also is very clever.

Senator KERR. You mean under that classification, Senator?

Senator MALONE. Yes, under that classification, because they all have to be analyzed, and in regard to Mr. Nelson we may have to have someone analyze his. 4,400,000 acre-feet belongs to California. That is according to the estimate made here. Arizona claims 2,800,000 acre-feet here, in addition to the 1,000,000 acre-feet that is supposed to come out of the Gila River. That is 3,800,000 acre-feet. We have given old Mexico 1,500,000 acre-feet by treaty, which is mandatory on both basins to turn down there. We have 300,000 acre-feet, according to everybody's testimony, and according to a prior engineering report we are entitled to 900,000 acre-feet while New Mexico and Utah have none. That equals 10,000,000 acre-feet, which is not in the river.

Now, figures can be manipulated. Let us just go right on, now.

Senator ANDERSON. You mean that our equitable share in New Mexico is zero?

Senator MALONE. It is zero, right at the present moment, if we pass this bill, since there has been no agreement.

Senator ANDERSON. I am quite well persuaded of that.

The CHAIRMAN. The Chair wishes to suggest again that we have a lawyer on the stand, and not an engineer.

Senator MALONE. I would suggest, Mr. Chairman, that we analyze some of it as we go along.

The CHAIRMAN. Yes, it is very helpful, but we came to a practical agreement that in order to conserve the time of the committee we would invite the witnesses to summarize their testimony as much as possible. There are seven other witnesses waiting to speak for California, so that I think—and I suggest this most respectfully as the chairman—that when we get the analysis of the computations already before us, we can concentrate our attention on this most important problem of water supply. The Senator from Nevada and the Senator from Arizona has raised, I think, the most important issue before the committee.

Senator MALONE. I would suggest respectfully to the Chairman that I have been in this fight now for 25 years, and California and Arizona never did have less than 15 or 20 witnesses at a meeting.

Senator MCFARLAND. Well, Mr. Chairman, I think that is a somewhat unfair statement.

The CHAIRMAN. That was just a facetious remark.

Senator MCFARLAND. We presented our evidence in chief in 1 hour.

Senator WATKINS. Mr. Chairman, I think we at least have to take advantage of the observation that now we have an admission from the engineers that we have to have engineers recheck the engineers, and recheck, and recheck.

Senator MALONE. That is right.

Senator WATKINS. I don't know how far they want to go with that recheck.

Senator MALONE. That is correct.

Senator WATKINS. I thought that was confined to lawyers, but it apparently exists in the engineering profession.

Senator ANDERSON. Mr. Chairman, I do feel that I am going to have to ask some questions of witnesses as they come along, because I do not know who is going to answer the question as to where and how it is ever going to be possible for New Mexico to get 1 acre-foot as a lower-basin State. We are supposed to take it out of the Gila and we are barred by a Federal court decision from taking any out of the Gila. I just want a witness to tell me what he believes our equitable share to be. So far I think they all agree the equitable share is zero.

The only reason I am asking questions about the upper-basin States is that I don't want to get that equitable share down to zero.

Senator MCFARLAND. I could not let that statement stand, Mr. Chairman. We have conceded the amount of supplemental water that is needed to irrigate the lands which have been irrigated in the past, or are presently being irrigated on the Gila by New Mexico. I could not let that statement go.

Senator ANDERSON. I realize that they have agreed as to the amount that is going to be necessary, but there is no present way that we can get that amount.

Senator MCFARLAND. Not unless we pass this bill.

Senator ANDERSON. That is right.

Senator MCFARLAND. That is the only way you can get it.

Senator WATKINS. In other words, do I understand that New Mexico is interested in getting this bill passed so that it can get its share of the water; is that what you mean?

Senator MCFARLAND. That is the only way they can get it.

Senator WATKINS. That is an interesting development, because I would like to know if that is the fact.

Senator MALONE. I have not heard that, and I would like an explanation of it.

Mr. SHAW. That is not our understanding of it.

Senator MCFARLAND. Well, it is on account of the physical impossibility of—not as an upper-basin State, but as a lower-basin State. The only way they can get any water is through the exchange of mainstream Colorado River water for Gila water because they are too high and it is physically impractical, I would say, to divert the mainstream water over into New Mexico.

Senator WATKINS. Then do I understand that this water which New Mexico has, the equitable amount from zero up to whatever they will let them have, is involved in the project now proposed under this bill before us?

Senator MCFARLAND. It has to be, Senator.

Senator WATKINS. Well, isn't it? Whether it has to be or not, is it? That is what I want to know.

Senator MCFARLAND. Well, most certainly.

Senator KERR. Does the Senator refer to the central Arizona project bill, or to Senate Joint Resolution 4?

Senator WATKINS. I am referring to the central Arizona project bill.

Senator MCFARLAND. I refer to this project. The only way New Mexico can get additional Colorado River water under this decree which Senator Anderson mentions is through an exchange of water which would be delivered to the lower users for water which has been decreed to them.

Senator MALONE. Senator, I do not understand that at all, and I am going to say why.

Senator MCFARLAND. Excuse me, I got off a little wrong here. Here you are down here [indicating]. Here is your Hooker Dam site. There must be an exchange from the lower users. That is part of the plan.

Senator WATKINS. Is there anything in your bill that provides that New Mexico is to get part of this water out of this development if it finally goes through?

Senator MCFARLAND. Oh yes; it provides for the exchange. The bill makes it possible to work it all out.

Senator WATKINS. Does it say so in the bill?

Senator MCFARLAND. Oh yes.

Senator WATKINS. I have not read it recently.

Senator MALONE. Are you now saying, Senator, that you would refuse any such exchange if that storage were to be built under any other condition except under this bill?

Senator MCFARLAND. Which other condition?

Senator MALONE. Any other condition under which the storage might be constructed, like the main stream storage of your dam on the Colorado River, if it were to be constructed for any other purpose, and they were to construct their dam on the Little Colorado. Do you mean to say you would refuse the exhange?

Senator MCFARLAND. I don't think it would make any difference if the users below could get the water, but it is kind of human nature that people who have a right, or are decreed a right to the use of water, do not give it up unless they get something in place of it.

Senator MALONE. In other words, you have them over a barrel.

Senator MCFARLAND. Well, I would not say we have them over a barrel. That is an unfair statement, Mr. Chairman. I resent it.

The CHAIRMAN. Well, let us proceed.

Senator KERR. I would like to ask this witness a question or two if and when it is agreeable, Mr. Chairman.

Senator WATKINS. Anything is agreeable.

Mr. SHAW. As far as I am concerned, any time is agreeable, gentlemen.

Senator KERR. I want to ask it at a time when you will be free to listen to it and when I will be free to question you.

How many times has this issue been in court, or how many times has there been an attempt to get it in court?

Mr. SHAW. There have been three attempts to bring suits concerning one phase or another of the relationship between the States.

Senator KERR. Now, that is Arizona and California?

Mr. SHAW. And all the other States in the basin.

Senator KERR. Who brought those motions?

Mr. SHAW. Arizona brought all three of them.

Senator KERR. What was California's position in those cases?

Mr. SHAW. In each of them California either moved to dismiss or objected to the filing of the bill. In each case, in California's opinion, and in the opinion of the other States, the case was not properly presented.

Would you like to go into detail on that, Senator?

Senator KERR. I would be glad if you would answer my question, and then you can do whatever you want to about going into detail,

if you have a further statement. The only thing I am interested in is in getting some information that I am going to ask you about.

Senator MALONE. What were the cases?

Mr. SHAW. The first case, if you please, was an action brought by Arizona to restrain the building of Boulder Dam on the chief ground that the Boulder Canyon Project Act was unconstitutional. The bill was filed and responses were filed by all of the basin States resisting the claim of Arizona and moving to dismiss. The Court dismissed the bill.

The second case was an action sought to be filed by Arizona to perpetuate testimony of certain persons who were present at conferences of the Colorado River Compact Commission in 1922. The testimony sought to be preserved was testimony to—as the Court found—vary the meaning of an unambiguous provision of the Colorado River compact. California and Nevada resisted the filing of the bill and objected to the petition for leave to file. The Court denied leave to file the bill and announced its decision that the provision of the compact, on which oral testimony was sought to be preserved, was unambiguous and that the testimony would be irrelevant to any future litigation.

Senator KERR. Now, is that the same compact which California is now asking to take into court and have the court interpret?

Mr. SHAW. Yes, sir; the same compact.

Senator KERR. But in that case the Court refused to consider it on the petition of California because it was clear and unambiguous?

Mr. SHAW. In the particular respect about which Arizona sought to preserve evidence.

Senator KERR. Well, that was with reference to the division of water, was it not?

Mr. SHAW. Yes, sir.

Senator MALONE. What particular division?

Mr. SHAW. Arizona sought to convert, by the proposed oral testimony, a provision that the lower basin is entitled to increase its use of water by 1,000,000 acre-feet of water under article III (b) of the compact; convert that provision into a provision that that 1,000,000 acre-feet of water was reserved for Arizona alone. The Court held it could not be done; that in that respect the language of the compact was unambigous, that the water belonged to the lower basin and not to Arizona alone.

Senator MCFARLAND. And that it was apportioned water.

Mr. SHAW. The Court said that it appeared from the briefs to be agreed by the parties that the water was apportioned. That happened to be an inaccurate statement of fact.

Senator MALONE. Now, when you say it was unambiguous, you mean the language was clear; is that what you mean?

Mr. SHAW. Yes, sir. I might point out that at that time Arizona was not a party to the Colorado River compact, and had not ratified it.

Senator KERR. Well, the compact was in controversy with Arizona at that time?

Mr. SHAW. Yes, sir.

Senator KERR. And the waters of the river were in controversy at that time.

Mr. SHAW. Yes, sir.

Senator KERR. Now, what was the other case?

Mr. SHAW. The third action was an action sought to be filed by Arizona for equitable apportionment of the waters of the Little Colorado River which would involve a prohibitory decree prohibiting the other States from appropriating water beyond certain limits, that is, water that the Court may conclude——

Senator KERR. Now, what is the difference between that lawsuit and the one you now seek to file?

Mr. SHAW. No. 1, Arizona was not a party to the compact.

Senator KERR. But the water was the same and the controversy was the same?

Mr. SHAW. Yes; the water was the same, but the controversy was not. No. 2, Arizona had not attempted to appropriate the water of the river.

No. 3, there was water available for appropriation.

Now, those three circumstances are each changed at the present time. Arizona has now adopted an act ratifying the compact. Arizona, I suppose, has made appropriations; third, there is no water free for appropriation. The water is overappropriated, in our view, so that the picture is entirely changed.

Senator KERR. So the effort at that time was to get into the Court to adjudicate the rights to the same waters that you are now seeking to get into the courts to adjudicate?

Mr. SHAW. That is correct, but on an entirely different factual foundation.

Senator KERR. Well, if the rights have been adjudicated they would have been just as thoroughly adjudicated as if they were adjudicated now; is that not true? The same rights and the same conflicting claims were with reference to the same water; were they not?

Mr. SHAW. The Court concluded that the United States had interests here which prevented the court from adjudicating the case.

Senator KERR. I say, was it the same water?

Mr. SHAW. The same water; yes, sir, that is the same river.

Senator KERR. Well, we understand that it was the flow of water in the same river.

Mr. SHAW. Yes, sir.

Senator KERR. And the allocation of certain parts of that flow?

Mr. SHAW. Yes, sir.

Senator KERR. The same controversy that still exists, was it not?

Mr. SHAW. No; I think not. There are other circumstances beyond those that I have spoken of which have intervened.

Senator KERR. But it was the same controversy, was it not?

Mr. SHAW. The controversy has been sharpened up since that time, by reason of the Mexican treaty which took a million and a half acre-feet out of the pot for Mexico, and by reason of developments in the States.

Senator KERR. It was the same river, was it not?

Mr. SHAW. Yes, sir.

Senator KERR. And the same Arizona and the same California?

Mr. SHAW. Yes, sir.

Senator KERR. And the same conflicting claims with reference to the allocation of water from the river?

Mr. SHAW. Somewhat the same, Senator. I will say that Arizona's position on some of these issues has switched around 100 percent from what they were originally.

Senator KERR. But she has not switched—you mean she has switched in her claim for water?

Mr. SHAW. Yes; I think so.

Senator KERR. You mean she now claims water that she did not claim then?

Mr. SHAW. No; I do not think so.

Senator KERR. Then why did she go into court?

Mr. SHAW. I mean in the first Arizona case, and the second Arizona case, the position taken by Arizona was diametrically opposite to the positions taken on these three questions that I brought to your attention.

Senator KERR. Was the position or the objective different? The objective was the same, was it not?

Mr. SHAW. No. Arizona has changed her objective from time to time and has changed her legal views along with the objectives.

Senator KERR. In other words, she wanted water then?

Mr. SHAW. She wanted to block the building of Boulder Dam in the first instance.

Senator KERR. I am asking about Arizona with reference to the allocation of the water. I am talking about the controversy with the allocation of the water.

Mr. SHAW. The third case.

Senator KERR. Was she claiming water then?

Mr. SHAW. Yes; for future use, not for any present appropriation or project.

Senator KERR. Was she claiming water then?

Mr. SHAW. Yes, sir.

Senator KERR. And the same thing is now in controversy?

Mr. SHAW. Yes. sir.

Senator KERR. The division of the water?

Mr. SHAW. Yes, sir.

Senator WATKINS. May I ask a question at this point?

Senator KERR. If I can get through, Senator—if you want to take over I will come back to this.

Senator WATKINS. There is one point which occurred to me. I can see a difference there with respect to parties. All the necessary parties, I understand from what Mr. Shaw said, were not in the case. The United States was a necessary party and that was one of the reasons for rejection.

Senator ANDERSON. Can't the United States get in very easily?

Senator WATKINS. I don't know how easy it is. We have been trying here, apparently, for 3 years to get the United States, in somebody said.

Senator KERR. I am going to ask the man that now.

Mr. SHAW. That is the point of this resolution.

Senator MILLER. Mr. Shaw, you stated that Arizona attempted to block the location of Boulder Dam or Hoover Dam, and did not join the compact in the first instance.

Mr. SHAW. That is correct, did not join the compact for 22 years after it was formed.

Senator MILLER. Now, that was due in the first instance, was it not, to the fact that Arizona was seeking what was then spoken of as a high-line canal?

Mr. SHAW. That high-line canal was projected sometime prior to 1922, and was definitely abandoned by the State in an engineering report of 1924, I believe. It has been revived, kept alive in one form or another since then.

Senator MILLER. Well, wasn't it very active in 1925 and 1926, in attempting to block, as you stated, the construction of the Hoover Dam?

Mr. SHAW. I think that is true. That group in Arizona which were actively in support of the high-line project were, I believe, active in the opposition to the building of the Hoover Dam.

Senator MILLER. And, of course, the purpose of that high-line canal was to afford opportunity for pumping plants, I take it, on the land itself, such as you have down around Blythe, or did have at one time, before you pumped it all out?

Mr. SHAW. My recollection does not quite jibe with the Senator's statement. My recollection is that the high-line project as originally contemplated, was for the irrigation of something like 6,000,000 acres of land, with something like 16,000,000 acre-feet of water; a gravity delivery of water of tremendous proportions, and not a pumping project.

Senator MILLER. Well, that project was carried down through what we might speak of as Wickenburg, down through Salome, and that section of the country?

Mr. SHAW. I think that is true.

Senator MILLER. And that is the same water, or that would have been the same water that is being spoken of now, so far as the beneficial use is concerned, by the Senator from Oklahoma?

Mr. SHAW. Yes, sir.

Senator MILLER. Thank you, Senator.

Senator KERR. There is a controversy, or difference of opinion, as to whether or not there is a so-called justiciable issue in this matter, is there not?

Mr. SHAW. We affirm that there is. Some people disaffirm that; yes, sir.

Senator KERR. Does that constitute a difference of opinion?

Mr. SHAW. That constitutes a difference of opinion, I am quite clear.

Senator KERR. Then there is controvery with reference to that point?

Mr. SHAW. Yes, sir. Those two opinions have been expressed before this committee.

Senator KERR. If there is a justiciable issue, is an act of Congress necessary to permit a State to get into the Supreme Court?

Mr. SHAW. An act of Congress is only necessary to permit the United States to be sued, not to create a justiciable issue.

Senator KERR. Now, if the United States has an interest, do they need an act of Congress to enable them to protect that interest?

Mr. SHAW. I would say that the Executive could direct the Attorney General to commence or defend any litigation he chose.

Senator KERR. Doesn't the Constitution put a responsibility on him generally to protect the interests of the United States?

Mr. SHAW. I think so.

Senator KERR. Without a special act of Congress, with reference to the protection of a certain interest in a certain controversy?

Mr. SHAW. I believe so.

Senator KERR. Then if there is a justiciable issue between California and Arizona, or the other States, California could get into the Supreme Court with reference to that issue, could it not?

Mr. SHAW. Not without the consent of the Congress to the joinder of the United States as a party.

Senator KERR. But they could not make the United States a party to that action?

Mr. SHAW. That is right.

Senator KERR. But if there was a justiciable issue between them and California, they could get into court on that issue, could they not?

Mr. SHAW. Not without the United States as a party, because that was the decision of the Supreme Court in the third Arizona case.

Senator KERR. If the United States has an interest, though, they could make themselves a party, could they not?

Mr. SHAW. They could intervene; yes, sir; but they did not intervene in that case.

Senator KERR. As a matter of fact, the Executive has a direct responsibility, under the Constitution, to protect any interest it has, does he not?

Mr. SHAW. That is true, and it has been rather surprising, considering what the Secretary of the Interior has said about the interest of the United States, that the Executive has not done something about it.

Senaor KERR. Then let me ask you this question: If there is no justiciable issue, can Congress create one?

Mr. SHAW. I think not.

Senator KERR. That is all.

Senator WATKINS. Let me ask a question there.

Suppose Congress approved this act. I understood someone to say they had the theory here that all we had to do to create one was to approve this Arizona project and then we would have one.

Senator KERR. Here is that theory, Senator, for your information: The theory of one side in this case is this: That the rights of California are not endangered because there is no project, either in existence or authorized, that would use any water.

Senator WATKINS. I understand that.

Senator KERR. Now, then, if a project were authorized that would contemplate the use of water, then that could create a situation where, if they had a right it would be jeopardized and therefore the justiciable issue would be created.

Senator WATKINS. I understood that was the theory and that was what I was calling your attention to.

Senator ANDERSON. Now if California wants to get into court possibly the best way would be to help pass Senate bill 75; is that right?

Mr. SHAW. I explained yesterday, Senator Anderson, the views we had as to this bill. It is what I might describe as a phony authorization act. It would be an act by which Congress would authorize the project, knowing full well that it did not know whether there was a water supply for it or not, and knowing full well that it did not want to have appropriations made under that authorization. That is what I call a phony act, a phony authorization.

Senator KERR. Would it not be possible——

Mr. SHAW. Pardon me, Senator.

Senator KERR. Certainly.

Mr. SHAW. Which I believe the Supreme Court would disregard as having no essential or substantial importance in the situation. I believe we have just as much a threat here without the authorization as with it.

Senator ANDERSON. Then if the bill is passed, and we also pass the resolution, the Court would throw that out, too?

Mr. SHAW. I think the authorization act would have nothing to do with the situation, because the Court would regard it as purely a fictitious authorization which the Congress obviously did not intend should be effective.

Senator MALONE. Mr. Chairman, along the line of Senator Kerr's remarks, for controversy——

Senator KERR. I want to ask one more question about his answer, if you are going to take up a new matter.

Senator MALONE. Go ahead, then I will ask you later.

Senator KERR. The rights of the parties, if we can refer to them as such, have been defined in whole or in part by acts of Congress, have they not?

Mr. SHAW. I think not, Senator. I would say rather that they have been to some extent defined by a compact——

Senator KERR. That would be in part, would it not?

Mr. SHAW. By contract, and so on, but I do not believe it is competent for the Congress to apportion water among the States. I believe that is the function of the States.

Senator KERR. Did not Congress first pass an act ratifying the Colorado River compact?

Mr. SHAW. Yes, sir; that is the Boulder Canyon Project Act.

Senator KERR. Then didn't the Congress pass the Boulder Canyon Project Act.

Mr. SHAW. That is the same act.

Senator KERR. Does that act not contain language which either sets forth or recognizes the rights of various States, or various groups of States, to certain quantities of water?

Mr. SHAW. No, sir. May I explain the answer to you?

Senator KERR. I think the act would probably be the best evidence of it.

Mr. SHAW. Yes.

Senator KERR. Does it not refer to a certain number of acre-feet of water for California?

Mr. SHAW. The act does not grant anything to anyone, it does not apportion anything to anyone. It requires a limitation of use by California.

Senator KERR. Then you would say that it does not in whole or in part either define or recognize rights of the States to portions of water?

Mr. SHAW. Correct.

Senator KERR. Well, I want to disagree with your answer, and I will ask the question in another way. The act does set forth certain limitations upon California and permits the compact to become a reality when California passes an act limiting herself to certain quantities of water, does it not?

Mr. SHAW. That is very close to the situation, Senator.

Senator KERR. Well, for practical purposes, could you get much closer without reading the act verbatim?

Mr. SHAW. There was a limitation stated in the act.

Senator KERR. Do you have a copy of the act there?

Mr. SHAW. Yes, indeed.

Senator KERR. Suppose we just look at it.

Mr. SHAW. That is section 4 (a), Senator. May I read the whole section for the record?

Senator KERR. Let me see if I can find what I am thinking about here.

I read here, and I would like to know if this is part of the act:

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide;

(1) That 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of article III, of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona, 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity; and

(2) That the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact; and

(3) That the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State; and

(4) That the waters of the Gila River and its tributaries, except return flow after same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise, to the United States of Mexico, but if, as provided in paragraph (c) of article III of the Colorado River compact it shall become necessary to supply water to the United States of Mexico from water over and above the quantities which are surplus, as defined in said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and

(5) That the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three states shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses; and

(6) That all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact; and

(7) Said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

Now, that is a part of the Boulder Canyon Project Act?

Mr. SHAW. Yes, sir.

Senator MALONE. Could I interject at this point?

Senator KERR. Senator, if you will just let me finish. I am right up to the point.

Senator MALONE. I will answer it for you.

Senator KERR. I did not ask you.

Senator MALONE. All right; but I am going to answer it when you get through.

Senator KERR. That will be wonderful, and if you want to interrupt here, I will wait until you get through.

Senator MALONE. No, go right ahead; I will wait, but this must be cleared up, and I am glad you are going to follow it through.

Senator KERR. That is language that the Congress wrote; is it not?

Mr. SHAW. Yes, sir.

Senator KERR. Do you suppose it is possible that the Congress itself might feel that it not only was authorized, but had a responsibility to carry out legislation in accordance with its interpretation of its own language?

Mr. SHAW. No, sir.

Senator KERR. You don't think so?

Mr. SHAW. No; that language is utterly nugatory, Senator, because the compact could never have been made——

Senator ANDERSON. What was that word?

Senator MALONE. "Nugatory."

Mr. SHAW. It could not have been made. The provision was so radically defective that it did not even mention Utah nor New Mexico at all. That is just one reason why the compact could not have been made.

Senator KERR. I did not ask you if the compact could have been made, I asked you if the Congress had either the privilege or the responsibility of passing legislation in furtherance of its interpretation of its own language.

Mr. SHAW. I do not comprehend the question, but if I do understand it at all, I do not think that——

Senator KERR. Well, the other Senators here do, and it will not be necessary. I am sorry I could not make it clear.

Mr. SHAW. I do not think Congress has authority to interpret language. The Court has.

Senator KERR. I did not ask you that.

Mr. SHAW. I have misunderstood you, sir.

Senator KERR. I asked you if they had either the power or the privilege to pass legislation in accordance with its interpretation of its own previous acts.

Mr. SHAW. Then I misunderstood you, sir. I think Congress has the power to pass any legislation that it chooses within its constitutional field.

Senator MALONE. Senator Kerr, this is simply for the information of the committee and it is going to be in language as plain as I can make it. I was here when that was passed. I was not in the Senate. I was the State engineer of Nevada and sat in the committee where this was made up. So did Carl Hayden.

The thing that was put down there was the best information available. That was done more on the suggestion of Senator Hayden—and I do not want to speak for him because he will no doubt appear before the committee—but it was Senator Hayden and Senator Ashurst, who was here in Congress until he retired because of ill health, who wanted to suggest a method for division of the water. It was not a division, but the suggestion of a division for another purpose.

I am not a lawyer but I understand the Senate can give advance approval of a compact, an interstate compact, if the compact is later made word for word without any change. If an agreement is made and signed it becomes effective. If there is any change it comes back to the Senate.

In other words, it was all right for the Senate of the United States to approve it in advance, but to be effective the State must agree.

Senator KERR. Senator, did not California pass the Self-Limitation Act in the same identical language that the National Congress had used?

Senator MALONE. All right.

Senator KERR. Did they or did they not?

Senator MALONE. What I am trying to say, Senator, is that this had no effect and it gives Nevada no right, it gives New Mexico no right, it gives Utah no right and the only place where it affects

California is where they limit themselves. It does not give us any right. The Congress of the United States, if I understand the situation at all, does not have any right to divide the water between the States of the lower basin. But it could approve it after such a compact is made, or it must approve it to make it effective. It could then give its approval to a compact which was made exactly as the conveyance of approval was written.

But it has never been approved and it is my considered judgment that it never will be entered into because I sat in those conferences for many years when they were attempting to get approval. Mr. Tom Smith took over my job when I left it. He had worked for me previous to that and he has carried on. He has kept me informed all the time, so that the situation has not changed.

If this division of water influences any one here to any extent he simply does not take into account the facts of the case. Now, that is my considered opinion.

Senator KERR. Well, Senator, did not the acts of the Congress suggest two ways of doing it? You seem to have taken the place of the witness.

Senator MALONE. I took his place because I thought he was through.

Senator KERR. Did not the acts of the Congress lay down two ways in which the compact could become a reality under the national legislation?

Senator MALONE. This was not one of them, not advance approval.

Senator KERR. I say, did not the Congress lay down two ways by either one of which the compact could become a reality?

Senator MALONE. What were the two ways? I want to see if they are understood.

Senator KERR. Well, Senator, if you do not know that the Congress did do that it would be well for us to take the time to enlighten you on that. That is right, of course, is it not, Mr. Witness?

Senator MALONE. Go ahead and take the time to enlighten me.

Senator KERR. I can do that without taking the time of the committee.

Senator MALONE. If Arizona had signed the compact it would have become immediately effective.

Senator KERR. Where is that part in this compact?

Senator MALONE. There is no use in my telling you this if you are not going to listen.

Senator KERR. I am willing to listen but there is no use in either one of us telling the other because the record is the best witness.

Senator MALONE. When California limited itself to 4,400,000 whether this was ever signed, or not, it could go ahead. In the meantime, if Arizona came into the compact it could go ahead.

The CHAIRMAN. I wonder if the Chair might very well make a remark.

Senator MALONE. Yes; you very well may.

The CHAIRMAN. Without giving offense to either of the Senators. The debate going on here now is a debate which may very well be carried on in the executive sessions of the committee.

Senator MALONE. I think not, Mr. Chairman, because this is part of the evidence that is being taken down and it must be clarified.

The CHAIRMAN. Of course, I cannot and do not intend to attempt to control any member of the committee, but I do submit if we permit the

witnesses to give their testimony and have the Senators inquire of the witnesses, instead of questioning one another for the record——

Senator MALONE. I was not questioning anybody I was simply making a statement.

The CHAIRMAN. We shall proceed much more rapidly. There will be plenty of time after the witnesses have been heard for the members of the committee to discuss the matter.

Senator MALONE. Mr. Chairman, I am not sure that speed is the thing we need here. We need a little understanding of the subject.

The CHAIRMAN. I think you are quite right. The attempt of the Chair is to compile a record which will facilitate understanding of the subject.

Senator KERR. Mr. Chairman, the witness answered the questions I had in mind. I was only attempting to enlighten the Senators with reference to the provisions of the act.

Senator MALONE. Will you read it?

Senator KERR. I concur in the statement, Mr. Chairman, that it can be done when the whole committee will not be required to give time to it.

Senator MALONE. I want to submit at this point in the record, if the Senator does not care to read those two provisions, that the amount of water——

Senator KERR. With the Chair's permission I would be glad to read them to you.

Senator MALONE. Go ahead and read them. I think you would have his permission.

Senator KERR. I would be glad to do it.

The CHAIRMAN. I said at the opening of this hearing the chairman is only the servant of the committee. He must assume the responsibility of facilitating the progress of the hearing. Anything and everything that the chairman says is designed for that purpose and not to shut off any Senator or to prevent the development of any evidence.

There has been presented to the chairman a list of eight witnesses. The Senator from California who handed me this list told the chairman that he would endeavor to conserve the time of this committee and that the witnesses would be urged to submit their evidence as rapidly as possible.

My only point is that we can present a much better record if we will let the witness present his testimony in a consecutive manner, then thereafter engage in the arguments and debates among the members of the committee. But of course I have no desire to impose that. I cannot impose it upon the members. I merely make it as a suggestion.

This present witness has been on the stand for 2 days, all day yesterday morning and now it is half-past 11.

Senator ANDERSON. Mr. Chairman, there is not a thing in his presentation which gives me a bit of evidence about this case and there is a great deal in the questions which the Senator from Oklahoma is asking that would help me.

The CHAIRMAN. I know that, but if we could just get through with this witness and get him off the stand then we could develop these other matters.

Senator KERR. It might be very pertinent to read this provision of the act, these points.

Senator MALONE. I think it would.

The CHAIRMAN. The Senator may proceed.

Senator KERR (reading):

SEC. 4. (a) This act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this act, and no water rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claims to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, mentioned in section 13 hereof, and the President by public proclamation shall have so declared, or (2)—

and here is the alternative method that I referred to, Senator.

Senator MALONE. Correct.

Senator KERR (continuing):

if said States fail to ratify the said compact within 6 months from the date of the passage of this act then, until six of said States, including the State of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and shall have approved said compact without conditions, save that of such six-State approval, and the President by public proclamation shall have so declared, and further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this act and all water necessary for the supply of any rights which may now exist, shall not exceed 4,400,000 acre-feet of the waters apportioned to the lower-basin States by paragraph (a) of article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such u es always to be subject to the terms of said compact.

Now, then, Senator, as I understand it by the terms of that paragraph, there were two ways set forth in which this compact could become effective and binding.

Senator MALONE. That is right.

Senator KERR. Now, as I understand it—and if my good friend would assist me—the President later issued a proclamation on the 25th of June 1929—by the President of the United States—public proclamation:

Pursuant to the provisions of section 4 (a) of the Boulder Canyon Project Act, approved December 21, 1928, it is hereby declared by public proclamation:

(a) That the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming have not ratified the Colorado River Compact mentioned in section 13 (a) of said act of December 21, 1928, within 6 months from the date of the passage and approval of said act.

(b) That the States of California, Colorado, Nevada, New Mexico, Utah, and Wyoming have ratified said compact and have consented to waive the provisions of the first paragraph of article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and that each of the States last named has approved said compact without condition, except that of six-State approval as prescribed in section 13 (a) of said act of December 21, 1928.

(c) That the State of California has in all things met the requirements set out in the first paragraph of section 4 (a) of said act of December 21, 1928, necessary to render said act effective on six-State approval of said compact.

(d) All prescribed conditions having been fulfilled, the said Boulder Canyon Project Act, approved December 21, 1928, is hereby declared to be effective this date.

In testimony whereof I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done in the city of Washington this 25th day of June, in the year of our Lord one thousand nine hundred and twenty-nine, and of the independence of the United States of America, the one hundred and fifty-third.

HERBERT HOOVER.

In other words, one of the methods of complete vitalization having been followed, the President found that it had been complied with and issued that proclamation which put it into effect and which, therefore, as I understand it, makes the language of the law itself and of the statute of California, passed in accordance thereto, things which are before us and which, as the witness has stated, we do have the privilege and authority to pass further legislation with respect to, in accordance with our interpretation and understanding of the meaning of that language.

Senator MALONE. The Senator did not get my point, and I am sorry. But I think it is a very good thing that you have put all this in the record, because looking back on it, 25 years on this thing is a long time and you have just come into it, Senator, so it is not an easy thing.

In the first place it was simply advance permission given by the Senate of the United States for an interstate compact which was never made, therefore it has no effect whatever. It is still open, however, if the five States, including New Mexico and Utah, should enter into a compact. It is still open, just as it was 10 minutes after the President signed the bill.

But until it is signed by the States themselves, it has no effect, any more than if it were not included in the bill at all.

But the two things you enumerated necessary to make the Boulder Dam project effective—as I said just before you read it, and I think it is a very fine thing that you read it—are that the seven States, including Arizona, which up to that time had not signed the compact—if seven States signed it it would immediately become effective when the President put out his proclamation which was necessary in either case. But if Arizona did not sign it, then six States must sign it, and California must limit their amount of water. The latter thing was done.

But the particular part as to the division of the water, the Senate of the United States has always recognized that they have no right to divide water between the States. They had made no attempt to divide the water between the States, since it is not the Senate prerogative to do that. But by putting this in, the Arizona Senators were willing to go ahead and either vote for the bill or keep quiet. I don't know which it was now. I think they just did not vote.

Senator KERR. The record of the hearings is here, and while I have not been in it for too long, or at least for 25 years, I think I understand it.

Senator MILLER. Mr. Chairman, I would like to ask the witness a question. I am very much interested in the controversy, if such it is.

Senator KERR. I have no controversy with the Senator.

Senator MALONE. I have no controversy with the Senator. But I am going to insist on making that statement every time there is a muddying of the water.

Senator MILLER. The point I desire to make through this witness is this, because he knows whereof he talks, being the district attorney—is that right?

Mr. SHAW. Assistant Attorney General.

Senator MILLER. Assistant Attorney General; good.

I take it that the purpose of this hearing now is to either pass or refuse to pass Senate bill 75.

Mr. SHAW. The hearing, as I understand it, sir; is upon both S. 75 and Senate Joint Resolution 4.

Senator MILLER. Yes. Well, we will not go into that because we do not have the time. But you have stated—and I think the record so states, even in the bill—that the Supreme Court of the United States has held in substance and effect, that the State of Arizona, in the suit, at least the last one it filed, had no justiciable controversy with these other States.

Mr. SHAW. At that time.

Senator MILLER. Yes. Now, to get right squarely to the meat in the coconut, and what I want to know—I regret I have not been able to be in attendance all the time this hearing was going on. I might say that I have been relieved from one committee I was on, so that will sort of lighten my services a little from here on out, and perhaps I can be a little more punctual.

But the Constitution of the United States, as I remember it, as well as the constitution of the State of California, and every other State that I know of in the West—they might not do it this side of the Mississippi River, but in the West they do—provides that departments of Government be divided into three departments.

Mr. SHAW. Yes, Senator Miller.

Senator MILLER. The policies, or whatever you want to term them, are divided into three departments: the judicial, executive, and legislative.

Mr. SHAW. Yes, sir.

Senator MILLER. This committee here now, and the entire membership thereof, belongs to the legislative department of Government.

Mr. SHAW. That is my understanding, sir.

Senator MILLER. Now, I am wondering—and I will also add that, so far as departments are concerned, there is always the injunction in the Constitution that the members of one department will not encroach upon the rights and privileges of the other departments.

Mr. SHAW. Yes, sir.

Senator MILLER. Now, I am wondering if here and now, this committee and the Congress of the United States, for that matter, is not being made—if this carries on through this committee—a judicial body, instead of a legislative body.

Mr. SHAW. That is just what we think it should not be made to be.

Senator MILLER. Yes; well, that is what I would say.

If this bill will do anything at all with respect to determining legal status as between these various States, shouldn't we pass it? If you say that is a phony bill, that will come up when a suit is filed, will it not? I do not know that you said it is phony, but——

Mr. SHAW. I did; and I mean that, too, sir.

Senator MILLER. Well, if it is a bad bill you will attack it whenever a suit is filed in which it is made the subject matter of the controversy? You would attack it then?

Mr. SHAW. Yes, sir.

Senator MILLER. So why would it not be the proper thing, instead of all this record we are making, which appears to me to be exclusively on

legal matters and not legislative—we are citing the various decisions; what do we know about those things? We cannot make it effective, because we would be exceeding our jurisdiction and entering into a field that the Constitution has prohibited us from entering into, in other words, the judicial.

So why would it not be the sensible thing to pass this bill and the accompanying resolution and leave it to the courts to decide, which the courts ultimately have to do?

Now, that is my speech, Mr. Chairman.

Senator ANDERSON. Would it be a phony bill if it should develop that Arizona really had rights to those waters?

Mr. SHAW. The answer would be "no." The answer would be that if Arizona does not have those rights, then obviously it is improvident and the imprudent thing to do, to authorize a project that you do not mean to have built.

Senator MILLER. But whether it is or is not resolves itself right back to the proposition of whether we are legislating, or whether we are acting as a judicial department.

Mr. SHAW. May I say, Senator Miller, we do not ask this committee or the Congress to decide what we consider to be the judicial questions involved in this situation. We do ask that this Congress permit us to have the Court, which has that function, decide those questions. We believe that that is the thing which is at the threshold of this whole matter. The first thing is to get the issue decided as to whether there is a water supply, because obviously you do not intend to authorize a project which has no water.

Senator MILLER. You would get that in this cause of action if it was ever allowed to go through; would you not? The Court would appoint a referee or master in chancery, or whatever you call him, to take the testimony; would he not?

Mr. SHAW. What we are trying to lead to is a suit in which no testimony would be required, but where the legal questions can be determined by the Court promptly, and without years of testimony.

Senator MILLER. It looks to me like that is what this committee is being called upon to do, to pass upon legal questions rather than a legislative matter.

Senator ANDERSON. If we pass this bill we will really help you get into the courts, will we not?

Mr. SHAW. I think not.

Senator ANDERSON. You think not?

Mr. SHAW. I have expressed the opinion that I think this bill would not change in any substantial manner the right of any State to litigate the matter in the Supreme Court.

Senator ANDERSON. It would not help you get a justiciable issue?

Mr. SHAW. I do not think the Congress can create a justiciable issue where none exists. I do not believe the Congress can change the jurisdiction of the Supreme Court.

Senator ANDERSON. An act of Congress might create it, might it not?

Mr. SHAW. Some consequences of the act might.

Senator ANDERSON. That is what I am trying to say.

Mr. SHAW. I do not believe that Congress can enlarge the jurisdiction of the Supreme Court.

Senator ANDERSON. If we pass this bill, California would hurry to get into court, would it not?

Mr. SHAW. It couldn't get into court without a resolution.

Senator ANDERSON. Well, suppose we passed them both. I may only be interested in getting it litigated so I get my——

Senator KERR. Equitable interest.

Senator ANDERSON. Equitable interest.

Mr. SHAW. Well, you arrive at that point, Senator, without the passage of the act, I believe.

Senator ANDERSON. But the court might say there is no justiciable issue. Why not make it dead sure there is one?

Senator DOWNEY. Mr. Chairman, I wonder if I could intervene to clarify my understanding of Senator Anderson's remarks.

Is the Senator suggesting that the Congress of the United States should not determine the feasibility and propriety of this project, but passing that over, should approve the project with the clear declaration that it is only doing it for the purpose of creating a justiciable issue?

Senator ANDERSON. Not at all, and I have been hoping the testimony would take an entirely different direction from what it has taken. It is pretty hard on those of us who are not lawyers to understand what is going on here.

I would like to have started out, if I could have suggested it, by trying to determine whether there was any water in the Colorado River that might be subject to appropriation by the State of Arizona, or likely to be; and if there was water, then is the project which they have proposed for it a feasible project. Twenty-five hundred dollars an acre, $1,750 an acre, or any such sum might cause some of us to wonder whether it is feasible. On that there should be expert testimony.

If we determine that there is water in the river, if we then determine that the project is feasible, we would then pass a bill, and by the passage of that bill we would probably create the very situation that has been referred to, and might create a justiciable issue, in which case perhaps the resolution might follow.

But I do not see where the resolution comes first, because there is grave doubt that without the passage of the Central Arizona project you have any reason to go into court, unless you are trying to get something else.

Mr. SHAW. Senator, I presented you yesterday with the language of the Supreme Court in its last decision which we consider to be so closely parallel to this present situation as to be directly applicable. Under that decision in the case of Nebraska against Wyoming, it appears to us that without anything further being done by the Congress there is a justiciable cause of action.

The only thing which is required to get into the Supreme Court is to have the immunity of the United States waived.

Senator ANDERSON. Do you have more basis to get into the court than Arizona had when it tried those three times?

Mr. SHAW. Oh, yes, the situation has so radically changed since that time that I can say that positively.

Senator MCFARLAND. Mr. Shaw, is it not a fact that in the case you just mentioned there was an authorization of the project?

Mr. SHAW. What project?

Senator McFARLAND. In *Wyoming* v. *Colorado*.

Mr. SHAW. There was no authorization of the project involved that I am aware of, sir.

Senator McFARLAND. Well, we will cover that. This is more of a legal argument. I think we could show that, or it has been shown by the testimony.

Senator MALONE. Mr. Chairman, I could not let this opportunity pass without making it very plain that I want no connection with any claim that Arizona's project is phony. It is hard to convince me that it is a phony project to try to irrigate dry land.

But I think the Senator from New Mexico put his finger right on the subject, and that is that the only evidence that would influence my vote, at least, on the committee for the project itself, would be first, the availability of the water for the project; next, the cost and the benefits. On that, of course, we would take expert testimony of engineers and economists who have been spending all their time on this thing. None of that has been presented.

Senator ANDERSON. Not a word of it.

Senator MALONE. Neither water supply, nor cost and benefit.

Senator McFARLAND. Let me say to both the Senators, Mr. Chairman: We have not presented it in detail. I asked that it be made a part of the record, either yesterday or the day before. I now ask that it be made a part of the record.

The CHAIRMAN. It has been made a part of the record.

Senator McFARLAND. I only briefed this testimony because I thought I was conforming to the desire of the committee to submit it in brief. But the evidence is referred to, by reference to pages in the report and the previous testimony. It is before the committee.

As I say, I used 1 hour in presenting our case in chief. Necessarily, I could not go into detail, but it is all in there.

Senator MALONE. Mr. Chairman, I would just want to say in that regard that the Secretary's letter and report is very clear. He says in his opinion it should be approved if it is established that the water is available for the project. I could read his exact words again. I think I read them in the record the first day. But that is the thought: He approves this project, although it does look rather expensive. Everything looks expensive ahead of time in the West where you need water to irrigate land.

But he said it is subject to the water supply. Now, there are two ways in which that water supply can be determined. One is by compact. I am only one of the committee, and I have been away from the negotiations for some time, but I have watched them to the best of my ability. In my considered judgment there will be no compact. I have sat so many hours in the lower basin compact conferences, that in my own mind I have decided that is true.

The next way, and the only other available way that I know of—Congress has no jurisdiction to divide the water in the lower basin States, I think that is axiomatic—but a court of competent jurisdiction could do it.

Senator ANDERSON. I thought you said only the States could do it.

Senator MALONE. Only the States could do it by compact.

Senator ANDERSON. I see.

Senator MALONE. But a court of competent jurisdiction can apportion water once it goes into court. That is what I am advised by the

attorneys. We have been through a lot of litigation and I learned enough to know what the legal set-up might be.

There are two ways to do it that can be worked out. The project hinges on that. If the water supply is established, then I would like to see the project in Arizona built; I would like to see the Nevada project built, the projects in New Mexico and Utah, and more in California, if there is any water left.

But it is so clear that the project itself depends, first, in the Secretary's mind, on the supply of water and, second, on our judgment as to the figures of cost and the benefits. We have no evidence as to the supply of water yet.

Senator ANDERSON. The Senator has stated my situation entirely. I say that we might take a look at the availability of water from some source; maybe the Department of Interior will be able to help us. And in the determination of that water, I do not know whether we take California's water as 4,400,000 acre-feet, something that was in the Limitation Act, or 5,362,000 which has been required by contract of the Secretary of Interior, or some wholly different figure. But if there is water, that fact, I think, might be established for us.

If there is not, I am not interested in the feasibility of the project, I am not interested in the justiciable issues and other things that are being raised. I am ready to adjourn, as far as I am concerned, if there is no water.

The CHAIRMAN. Of course, the Senator is quite right. The Chair indicated his concurrence in the views of the Senator from New Mexico on the opening day of this session. The Senator from Nevada is quite right. Because the two Senators raise this question as to the supply of water, I asked Mr. Nelson to examine all of the material before us—and Mr. Nelson is an engineer—to find out the answers as best he could to the questions raised by the Senator from New Mexico. I sought to have him develop the facts, not only with respect to the supply, but also with respect to the present use, so that we might reasonably come to some determination as to how much water was left over to be used in the future, considering, of course, the various statutes which have been passed.

Mr. Nelson has supplied a partial answer to these original questions. I am going to ask him to distribute copies to the members who are present. I handed one to Senator Watkins before he left. I recognize that this is not complete, and if the committee will bear with me, I suggest that this is not a matter to be discussed now at this hearing. It can be more effectively discussed, more efficiently presented to the committee after this has been examined by the Senators in their offices and after the engineers have had an opportunity to go over it. Then we can present this matter in an orderly way.

The Senators will bear with me if I say that I think it is utterly disorderly to try to mix argument with the presentation of facts.

Now, there are before us these two proposals. One is the resolution to grant consent to the appearance of the United States in a litigation. Whether or not we shall pass that depends upon our judgment, as it appears to the chairman, first, as to whether or not there is in fact a justiciable issue as the case now stands. It also depends, it seems to me, upon the judgment of the committee as to the extent of the issues to which it desires to give its consent.

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Now, it was with respect to the later phase of the question that the Chair, at the opening session, inquired of the California Senators and then on yesterday's questioning of this witness, as to precisely what the issues were which it hoped to have decided in this suit. Those questions, I think, have been substantially answered, and the Senators, I think, will find them in the record.

This morning the present witness laid his answers with respect to that question before the committee in less than a page and a quarter.

Now, the other question, whether or not the committee should make a favorable report on the bill authorizing the central Arizona project, depends upon this question of the supply of water, the cost, and all of the other questions that enter into a consideration of any irrigation project. But since the water supply for the Central Arizona project is, as the Chair sees it, inextricably mixed with the issues which we would be sending to the Court if we pass this resolution, it seemed a desirable and orderly thing to do to have the two matters presented at the same hearing in order to save the time of the committee and the time of the witnesses.

Now, the list of witnesses which has been presented here by Senator Downey of California includes Mr. Shaw and three others who are to talk upon the resolution, plus four witnesses who are to talk on the central Arizona project, bill No. 75.

Senator ANDERSON. Would the Chair pardon me to ask just this one thing?

The CHAIRMAN. Certainly.

Senator ANDERSON. I do not know who those witnesses are; I do not know what they are going to testify to.

The CHAIRMAN. Neither do I.

Senator ANDERSON. Would it be possible for the Chair to so arrange the order of appearance of the witnesses so that starting at least next Monday we could begin to get engineering data on this? Or starting tomorrow, if possible, so that we begin to get testimony relating to this.

The CHAIRMAN. It was precisely in an effort to do that we called upon our staff member, who is an engineer, to provide at least the initial information. Here it is.

Senator ANDERSON. Which I deeply appreciate.

The CHAIRMAN. Now, let the members of the committee and the engineers—I am not an engineer; I do not know that there is an engineer around here except the Senator from Nevada, who has intimate and long acquaintance with these issues. So after this is examined, we can go to the presentation of that basic question.

Senator MALONE. Mr. Chairman, could I add to what the Senator from New Mexico has said? We have, no doubt, a very capable engineer in Mr. Nelson, but he is not thoroughly familiar with this basin. However, there are engineers in the Bureau who are familar with it.

The CHAIRMAN. He consulted the engineers of the Bureau in preparing this.

Senator MALONE. But I would like very much to have—speaking as one member of the committee—their views. There is an engineer down there somewhere who prepared this, and there is a well-prepared table. But there are many ways to set up a table. They are probably honest, but they are setting them up on a certain basis. First you decide what your premise is, and on that premise you can set it up.

We could have this man here and question him for half an hour and then clear this up, along with Mr. Nelson. Mr. Nelson could listen and then interpret it and help us clear it up later. The figures Mr. Nelson has given us are very meaningless without details behind them.

The CHAIRMAN. The chairman is quite aware of that.

Senator MALONE. Could we have that witness down here?

The CHAIRMAN. That is exactly the purpose of the chairman in submitting this memorandum. But the chairman cannot pull these witnesses out of the open air. I want to know who they are.

Senator MALONE. I could get them down here in 2 hours.

The CHAIRMAN. But we have the gentleman we want.

Senator MALONE. All right; you determine who you want.

The CHAIRMAN. No; I want the members of the committee to determine who they want on the basis of this thing. I cannot act for the Senator. I cannot act for the committee. I want the committee to determine what particular witnesses they want to get this information.

Senator MALONE. I agree with the Senator from New Mexico; there is nothing before the committee to question anyone about until we get the water supply from a man who thoroughly understands it, and who has provided that water supply for this report.

The CHAIRMAN. Will the members of the committee be good enough to suggest to the Chair the witnesses whom it is desired to call?

Let us bear in mind also, that we have before us here two other members of the committee, the Senator from California and the Senator from Arizona, who are just as much entitled to call for witnesses as any of the rest of us. The Chair is merely trying to bring order out of chaos. He would appreciate the cooperation of the other members of the committee in doing that.

Senator MCFARLAND. Mr. Chairman, may I state this: Probably it would have been better if we had detailed it more in our opening statement. Of course, Senator Anderson was not here. But these matters as to the amount of water, the amount of water in the river, were gone into very thoroughly in the other hearings. There was a detailed examination on it. It is also set forth on pages R–24 and R–25 of the report, and along through there.

Now, Mr. Larson is here. It was only for brevity that we summarized instead of going into detail. Mr. Larson of the Reclamation Service would be glad, I am sure, to give any information he placed in the report, and be questioned in regard to it. We have Mr. Debler here who worked for the Reclamation Service for years, and who will also be glad to go into this again, if the committee wants to again go into detail in this matter.

Senator MALONE. Is Mr. Larson presently the engineer supervising such reports for the Department of the Interior, or not?

Senator MCFARLAND. He is the one who did more to prepare it than anyone.

Senator MALONE. Is he still with them?

Senator MCFARLAND. Oh, yes; he is still with them.

Senator MALONE. Where is he?

Mr. LARSON. Right here. [Standing.]

Senator MALONE. Well, he is the man.

Senator ANDERSON. Mr. Chairman, I wish to cooperate with the Chair in whatever he desires to do. But if it is possible to put on a witness from the Bureau of Reclamation, and then if Arizona desires

to add engineering data in contradiction or in support of whatever the Bureau may say, we might hear that. If California then desires to have some rebuttal testimony to what Arizona said on this phase of it, I would appreciate that.

The CHAIRMAN. The Chair will be very happy to present that matter to the Senator from California who is not here.

This will be off the record.

(Discussion off the record.)

The CHAIRMAN. Then I will ask that you gentlemen please state your names for the record.

Mr. NIELSEN. I am E. G. Nielsen, regional planning engineer, Bureau of Reclamation, Boulder City, Nev.

Mr. LARSON. V. E. Larson, assistant regional planning engineer, Bureau of Reclamation.

The CHAIRMAN. And you are stationed where?

Mr. LARSON. Phoenix.

Mr. BENNETT. N. B. Bennett, Jr., Assistant Director, Branch of Project Planning, Bureau of Reclamation, Washington, D. C.

The CHAIRMAN. Any other member of the Bureau of Reclamation here?

Mr. DEBLER. E. B. Debler, consulting engineer for the State of Arizona.

Senator MALONE. You are not with the Bureau now?

Mr. DEBLER. No.

Mr. BAKER. R. Gail Baker, consulting engineer for the State of Arizona.

Mr. LANE. W. W. Lane, consulting engineer, Phoenix, Ariz.

Mr. MATTHEW. Raymond Matthew, chief engineer of the Colorado River Board of California.

Mr. CONKLING. Harold Conkling, consulting engineer, Los Angeles.

Mr. PETERSON. William S. Peterson, assistant chief electrical engineer, Department of Water and Power, Los Angeles.

Mr. MATTHEW. Mr. Chairman, may I mention one other name, M. J. Dowd, consulting engineer of the Imperial irrigation district?

The CHAIRMAN. Now, may I ask this question: Would it be possible for these gentlemen who have just given us their names, and any others who may be interested, to meet this afternoon and agree upon a statement of facts with respect to water supply——

[Laughter.]

Senator MALONE. Now it is beginning to make some sense.

The CHAIRMAN. In line with the questions asked by the members of this committee?

Senator ANDERSON. Why not find out if there are any areas of agreement?

The CHAIRMAN. Let us get the answer to that question first. Do I hear any response from the engineers with respect to that?

Mr. PETERSON. May I suggest, if I am not out of order, Mr. Chairman——

The CHAIRMAN. You are certainly not out of order.

Mr. PETERSON. In a matter of this kind the committee is the one that should have the benefit of the discussion. There is a very thin line of distinction sometimes between facts and the interpretation of facts. I believe that you will make the most progress by having the

respective representatives present their facts and interpretations and let the agreement develop as you have it in your actual testimony, then the differences will be brought out in the discussion. I think you will make better progress and become better educated by that procedure.

The CHAIRMAN. Well, I will acknowledge the necessity for education, certainly, but I do not know what a repetition of this morning would do to serve that purpose.

Senator MALONE. Mr. Chairman, may I suggest that if you do throw the three groups together the insurance companies might raise their rates.

The CHAIRMAN. Do I understand the engineers now to say that there is no possibility of such an agreement on the statement of facts, or any statement of facts?

Mr. MATTHEW. Mr. Chairman, as far as California is concerned we have not been in agreement with the figures on water supply that the Bureau of Reclamation has set forth in their official reports, for the reason that it is our considered opinion that the water supply should be set up on the basis of the amount of water that is available for actual use, and therein we do differ and have differed in past hearings on the Gila bill and on S. 1175, on the water supply that is available, as indicated by the best figures now published in the comprehensive report of the Bureau of Reclamation.

The CHAIRMAN. I would say to Mr. Matthew that that was precisely the answer that the chairman anticipated. I felt, however, it was necessary to ask the question in order to lay the ground for the next question which I should like to ask. That is, that the engineers of California prepare their statement with respect to water supply, a written statement; that the engineers of Arizona prepare their statement of water supply; that the engineer of Nevada, with such assistance as he may desire from any other engineer, prepare a statement, if he so desires.

Senator MALONE. Mr. Chairman, I am sitting with you on the committee.

The CHAIRMAN. Very good, but I thought you might want to testify. Other Senators are testifying here.

Senator MALONE. I am sorry.

The CHAIRMAN. And then let the Bureau of Reclamation engineers prepare their statement with respect to water supply. Now, I do not know whether I want to ask anybody representing the upper basin States to prepare a statement, but in view of the testimony which has been given here so far perhaps we may leave that out, at least for the present.

Senator ANDERSON. Do you not think there would be some benefit in the suggestion you made about trying to correlate some of these facts? While California may differ as to how much is available can we not agree on how much has gone by Lees Ferry, for example? Can we not agree as to how much is now being dumped?

The CHAIRMAN. I think those agreements probably will appear from the preparation of these three statements.

Senator ANDERSON. I appreciated very much the way the Senator from Arizona tried to boil down his statement and get rid of it in an hour. But you can see that we have been two days with Mr. Shaw—and I am as much responsible for it as anyone, I will agree—but it is

going to take too long. We all have other assignments and other work.

The CHAIRMAN. That is right.

Senator ANDERSON. And while the point was made here about having the committee examine it all—which was a fine suggestion—there is a physical limitation as to how long a person can spend doing a certain specific thing.

The CHAIRMAN. Is it agreeable to the members of the committee here present that these engineers will be requested to present these statements as outlined? Is that agreeable to the members of the committee, first, let me ask?

Senator KERR. It is certainly agreeable to me.

Senator ANDERSON. Can you put a limit on the length of the statement? I understand that Mr. Jesse Jones used to make them put it on one page when they brought him an item. Could we confine it to 5 or 10 pages?

The CHAIRMAN. I think we could confine this to a matter of two pages since it seems to be only a matter of figures.

Senator MCFARLAND. Mr. Chairman, let me make this suggestion. I do not believe any engineers will be long in their statements. But if you confine it to two pages I do not believe that will be sufficient. For instance, there are two pages of tables here. They have to set forth their tables and their data. If it is going to be accurate it may require considerably more space than that.

The CHAIRMAN. I think that suggestion is right, but the basic information with any supporting tables they desire will be satisfactory.

Mr. HOWARD. I am James H. Howard, representing the Metropolitan Water District of Southern California. You will note in reading the report of the Bureau of Reclamation that the figures are set up on the assumption that the claims of Arizona with respect to compact interpretation are correct. May I suggest that the Bureau of Reclamation, in addition to reporting on that basis, be requested to report as to water supply on the assumption that the assertions of California are correct?

Senator MCFARLAND. It is my understanding, Mr. Chairman, that this is to be physical data as to the amount of water in the river. It would not have any particular reference to interpretations. It is along the line of the figures Mr. Nelson prepared as to how much water there is there.

The CHAIRMAN. That was the Chair's understanding of these questions.

Mr. HOWARD. But, Mr. Chairman, if I may speak again, starting in with the same physical measurements of water supply, the water running in the river, just wet water, different conclusions are reached by different interpretations. It is there that the area of disagreement arises.

The CHAIRMAN. All right, Mr. Howard. The Chair regards this as a preliminary matter. If we can get something to start on, then your interpretations can be made afterward. It would be very helpful to the committee if, as Senator Anderson suggested at the beginning, we could find the area of agreement amongst all you engineers. If we could get a statement of agreement as to that, then the progress of the education of the members of the committee, I think, might be facilitated.

Mr. SHAW. Mr. Chairman, might I make a very brief remark?

The CHAIRMAN. Yes, Mr. Shaw.

Mr. SHAW. That is, that when you have these figures together and the thing boils down in your mind you will find that the figures do not make any difference. The question is, to whom does the water belong.

Senator ANDERSON. Do you not think we are the best judges of that?

Mr. SHAW. The question is, To whom does the water belong? Those questions are legal questions, they are the legal issues that we have to settle and can only settle in court.

The CHAIRMAN. That is another question. Let us get these figures first. Then after we have the figures the questions as to interpretation of the meaning of the figures and the interpretation of the law as to who owns how much and where, will also arise.

Mr. Bennett wanted to say something.

Mr. BENNETT. I am with the Bureau of Reclamation. We in the Bureau have never interpreted the various documents. We do not think it is our position to do so, but we will be very happy to furnish you the information we have as to the physical data and our derivation of that physical data. We will be very happy to do that. I think we can have that for you by tomorrow morning.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will now stand in recess until 10 o'clock tomorrow morning when it will meet in executive session. The public hearing will begin at 11 o'clock.

(Whereupon, the hearing was adjourned until 11 a. m., Saturday, March 26, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

SATURDAY, MARCH 26, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman), presiding.

Present: Senators O'Mahoney (chairman), McFarland, Downey, Anderson, Miller, Kerr, Malone, Millikin.

Also present: Representative Murdock.

The CHAIRMAN. The hearing will be in order.

We have the three statements of the engineers. If there is no objection, we shall proceed first with the presentation of the statement on behalf of the Reclamation engineers. Who will present that?

Mr. NIELSEN. I will.

The CHAIRMAN. Take the seat right opposite the reporter, please.

STATEMENT OF E. G. NIELSEN, BUREAU OF RECLAMATION

Mr. NIELSEN. My name is E. G. Nielsen. I am regional planning engineer with the Bureau of Reclamation at Boulder City, Nev.

This is a statement by N. B. Bennett, Jr., E. G. Nielsen, and V. E. Larson on the lower Colorado River Basin water supply.

At the close of the March 24 hearings before the Committee on Interior and Insular Affairs of the Senate on S. 75 and Senate Joint Resolution 4, the chairman of the committee requested Messrs. N. B. Bennett, Jr., Assistant Director, Branch of Project Planning, Bureau of Reclamation, Washington, D. C.; E. G. Nielsen, regional planning engineer, Bureau of Reclamation, Boulder City, Nev.; and V. E. Larson, assistant regional planning engineer, Bureau of Reclamation, Phoenix, Ariz., to prepare for the information of the committee a condensed summary of information with respect to the supply of water available for use in the lower basin of the Colorado River and the claims thereon of the States of that basin.

The attached table has been prepared in response to that request.

In any such statement, physical data and their legal significance are necessarily tied together. The Department of the Interior has consistently taken the view that it cannot authoritatively resolve the pronounced differences of opinion that exist between Arizona and California as to their respective rights in the waters available for use in the lower basin under the Colorado River Compact. The attached

table, therefore, sets out a comparative statement, in terms of acre-feet, of the results to which contentions made publicly by spokesmen for Arizona and California appear to lead. The figures used in this table have, almost without exception, been taken directly from or have been derived from the long-run estimates placed before the Committee on Irrigation and Reclamation of the House of Representatives by spokesmen for those States at the hearings on H. R. 5434, Seventy-ninth Congress, or from such estimates appearing in the comments of the States on the interim report of the Department of the Interior on the Colorado River (H. R. 419, Eightieth Congress) which comments are published in the introductory pages of that report. Citations to the sources will be found in the notes to the table. It may be added that the basic long-run physical estimates used by Arizona and California appear to have been derived for the most part from those of the Bureau of Reclamation. Apparent differences in some of the these estimates—that is, in line (1) of the table—result from a rounding of the figures by one State or the other.

The CHAIRMAN. May I interrupt you there, Mr. Nielsen, to say that throughout this paragraph you have referred to long-run estimates.

Mr. NIELSEN. That is right.

The CHAIRMAN. And to the adoption by other engineers of the estimates of the Bureau of Reclamation. Therefore, the long-run estimates which were placed before the Committee on Irrigation and Reclamation of the House were derived from the estimates of the Bureau of Reclamation.

Now, on what are the estimates based?

Mr. NIELSEN. The estimates are based largely upon the virgin flow of the Colorado River at Lee Ferry, which is made up of the two components, the natural flow of the stream, or the measured flow of the stream at that point, plus an estimate of the upstream depletions which together would make up the flow of the stream, had not man intervened.

The CHAIRMAN. Now, so that it is clear in the record, how is this flow measured, and by whom?

Mr. NIELSEN. The flow at Lee Ferry, the discharge of the Colorado River, and the Paria River, which together make up the flow at Lee Ferry, are measured by the United States Geological Survey by recording gages, which measure the stage of the river. The stage of the river is correlated against frequent measurements of discharge. Those measurements are made by a man in a cable car actually crossing the stream, putting a current meter into the stream at intervals and measuring the velocity of the current.

The CHAIRMAN. How long has this system of measurement been in progress?

Mr. NIELSEN. The Lee Ferry actual record extends back to about 1921. I would have to consult the record as to the exact year.

The CHAIRMAN. But it was initiated about 1921?

Mr. NIELSEN. That is correct.

The CHAIRMAN. And how often during each year are measurements taken?

Mr. NIELSEN. There is a continuous recording of the stages of the river. At intervals the correlation of the stage of the river against the discharge of the river——

The CHAIRMAN. When you speak of intervals, in what terms are you talking now, intervals of space or of time?

Mr. NIELSEN. Of time. As frequently as may be necessary, as the stage changes in major degree, let us say in times of flood, or as the control below the station, that is the natural barrier in the stream channel which serves to fix the elevation of the stream at that point changes. If that changes, a measurement is made. I would guess they gage the stream at Lee Ferry probably on an average of once a month.

The CHAIRMAN. Now, is this method of measuring stream flow accepted by scientists as the most acceptable and accurate method know now?

Mr. NIELSEN. I think it is; yes, sir.

The CHAIRMAN. Do you have any doubt about it?

Mr. NIELSEN. No, sir.

The CHAIRMAN. Thank you. You may proceed.

Senator MALONE. Mr. Nielsen, I note that almost this entire discussion is a comparison between what the States of Arizona and California claim. Have you made a direct statement of your own, that is, the Bureau of Reclamation, without regard to what anyone claims?

Mr. NIELSEN. No, sir. We find that once we get away from our estimate of the virgin flow at Lee Ferry, we are immediately involved in an interpretation of the Colorado River compact.

Senator MALONE. I wondered if engineers are entirely neutral? I know you are neutral and perhaps better trained. I say that with the qualification that you have had more experience in water measurement than private engineers, but why would it not be feasible for you to disregard all of California, Arizona, Nevada, Utah, and New Mexico calculations, and make your own set-up. You would then make a picture of your own as to the supply of water on the river?

You may not remember this, but A. P. Davis, one of the outstanding engineers of your Department—for another example, Dr. Mead—never did include other State figures. They made their own estimates of the supply of the river. Of course, I thought that was what you were going to do today.

Mr. NIELSEN. I think every engineer could make his own——

Senator MALONE. You are a neutral one, and we have the highest regard for you. Then when someone starts making a case for himself let him take your figures or say why he does not take them, you see. Maybe he has more experience, or thinks he does, and may have information not available to you. Therefore, he does not adopt your figures. But then we here could understand why he does not adopt your figures.

I will say the Bureau of Reclamation, in my opinion, has the men with the most outstanding experience in the world. We all know that Jack Savage is probably the most experienced man in dam construction in the world today. They are calling on him in China and India. He was just in India before I arrived there. It is not that he is a better technical man, but he had the opportunity of having more experience. Therefore, we are depending on you as a neutral organization, set up and financed by the Congress of the United States, like the Army engineers with respect to flood control. You are not to try to coordinate figures on the part of someone we hardly know, but to give a series

of data as you see it, with respect to the virgin supply of the river, and forget that there is a contract.

Mr. NIELSEN. There are so many questions of law involved there, Senator, as to make any estimate or any set of figures which we might develop prejudicial, it seems to me, to one side or the other.

Senator MALONE. I do not see how. We only have so much water in the river. That is what we started to talk about in 1922. Then when 1927 came around and we began to get some place, we always accepted the figures put out by Davis and Dr. Mead and others who headed the Bureau of Reclamation. They never were prejudiced, I am sure, in favor of Nevada, Arizona, or California, and I am sure you are not.

But if we are to get involved here, to start a controversy, and try to interpret it—that would come later. We might discard the other two entirely and take yours.

Mr. NIELSEN. We could, of course, tell you that water which is physically in the river, yes.

Senator MALONE. That is right, yes. You make your assumptions when the Gila River is included and when it is excluded, when the Verde River is included and excluded, and as to the source of water you are our dictionary, I would say.

Mr. NIELSEN. We can do that easily, because we have published it, in effect, in the Colorado River report.

Senator MALONE. Do you have that with you?

Mr. NIELSEN. Yes, sir. I am sure that Mr. Nelson has a copy of the report.

Senator MALONE. I do not want to divert you from what you are doing now, but it seems to me what was asked for was your figures on the available water supply of the river. Now that one project has been constructed we are talking about other projects.

Senator MCFARLAND. Senator Malone, if I may make a suggestion, I believe that California asked for this comparison.

Mr. NIELSEN. That was my understanding.

Senator MALONE. It was not California they were dealing with, they were dealing with the committee.

Senator MCFARLAND. That is true, but I just wanted you to understand why they brought in the comparison.

Senator MALONE. I think it is a very good thing, but that would probably be a subsequent thing.

Senator DOWNEY. Mr. Chairman, I would like to be advised on that. I thought what the Chair had asked for was a statement as to the amount of water in the Colorado River and not a discussion from anyone of these figures as to the rightfulness or wrongfulness of California's and Arizona's interpretation. I do want to say this—I hesitate to say it—but it does seem to me that the Bureau here is displaying partisanship, not in the statement as to the amount of water, but in the way the statement is gotten up. It is a partisan interpretation of Arizona's contention, it seems very clear to me. I did not think the chairman asked for that. I thought the chairman wanted a straight, factual, objective basis upon which we could work, and I do not think the Bureau has given it to us.

Senator MALONE. I think, Mr. Chairman, this would be a very good thing, after we had the three statements, then have the Bureau, or some neutral organization interpret the differences of the three statements.

Senator McFARLAND. I want this understood—because I thoroughly understood it—that Mr. Howard here suggested figures had been presented on the assumption of the correctness of Arizona's theory. He asked that they prepare some figures on the assumption that California's theory is correct. It is not partisanship for them to comply with the request of Mr. Howard.

Senator MALONE. Mr. Howard is not a member of the committee. What he suggested was that they had and would supply their interpretation. But I understood the chairman to ask for—and that is what I want as one member of the committee—an impartial estimate of the supply of water in the Colorado River.

The CHAIRMAN. What the committee sought, and this, I think, was the clear meaning of everything that was said here the other day by members of the committee, and by the chairman, was the closest approximation that would be possible to an agreed statement of facts with respect to the supply of water in the river. That is why I asked if it were possible for all of the engineers, no matter what their employment or association, to agree when it was apparent they could not agree. I had no failure to understand why they could not agree because, of course, legal interpretation is involved, and we are dealing, apparently, largely with estimates.

But since the three groups could not agree, then I requested each group separately to present the plain facts.

Throughout this hearing the Chair has been endeavoring to have the facts presented without debate so that thereafter we could have the debate and the interpretation. When facts are presented mixed with argument and interpretation, it only promotes confusion, as I see it. I do hope it will be possible for the engineers to state the facts as they see them.

Senator MALONE. Mr. Chairman, I am going to make a suggestion here, and I think it will save the time of the committee. As you know, we are extremely busy at this time because of the debates going on on the floor, on other matters that are important to the country. I am going to make a suggestion and do it simply in the interest of the Bureau itself, because I am sure they must have misunderstood the chairman, and I am sure they did. I have a high regard for the Bureau of Reclamation. As a matter of fact, the Army engineers are one source of information for flood control and water conservation and development, and one is the Bureau of Reclamation. They are unbiased and they are good engineers.

But I believe what we need here—and I am speaking as only one member of the committee—is a supply of the water in the Colorado River with no reference to other engineer figures. They should not mention the compact at all, but go ahead and give us the entire supply of the water in the Colorado River, including its tributaries, with the assumptions clear in each case upon which it is based so it does not take an engineer to understand the figures they give us.

I am going to make a suggestion that we meet Monday morning at 10 o'clock and have that information here. I do not believe we can move forward until we have it.

Senator DOWNEY. Mr. Chairman, if I may be heard, I have not examined the report——

The CHAIRMAN. If you will pardon me for just a moment please. I have an important telephone call.

(A short recess.)

The CHAIRMAN. The committee will be in order.

Senator Downey, you were about to make a remark.

Senator DOWNEY. Well, Mr. Chairman, if it is the suggestion of the chairman and the Senator from Arizona that Mr. Nielsen be allowed to complete his statement without further questions or comments, I think that is a wise policy to pursue. I do have certain comments I might make at this time, but I would be willing to defer them, if everybody else defers their comments.

The CHAIRMAN. Let me make this suggestion:

I would like to know whether the members of the committee concur in this. Glancing over this statement I feel there is in it the material which we want, although there are these other comparisons. I am sure that Mr. Nielsen can present it to us in the manner in which the committee desired in the first place, namely, give us first these estimates that the Bureau of Reclamation has made with respect to the water supply and let us see how that stands up. Then, if it were possible for the members of the committee to let him make his statement without interruption, holding questions until the end, I think we will at least have that much in the record.

You may proceed, Mr. Nielsen.

Mr. NIELSEN. With the statement as prepared?

The CHAIRMAN. I would like to have you first put in the basic facts without any interpretation.

Senator DOWNEY. Mr. Chairman, I wonder if I could make a suggestion. California's statement seems to be exactly what the chairman wants. I might say these figures were taken from the Bureau of Reclamation figures themselves. Here, first, is the water available, according to the Bureau, in the whole basin. Here is that available in the lower basin. And this is merely a factual statement of existing requirements and commitments as authorized.

The CHAIRMAN. That may be, Senator Downey, but what the committee desired first was the statement of the Bureau of Reclamation itself, so that it will be speaking for itself, in an impartial manner, then the California statement, the Arizona statement, and any other statements that may be desired can be accepted.

I do not have a doubt in the world but what the Senator has just said is correct, but it would be obviously much better for the record if it came directly from the lips of the representative of the Bureau of Reclamation.

Senator DOWNEY. Mr. Chairman, as always, I immediately accede to the wisdom of our chairman, but I just wanted to point this out: In view of the fact that the witness seems to have a rather confusing partisan statement—at least that is my interpretation—in view of the fact that we do have one very simple factual statement made, in accordance with the instructions of the chairman, I thought it might be the simplest thing for the witness to take this statement and point out whether he considers it accurate. But I will withdraw any other comment.

Senator MALONE. Mr. Chairman, I do not say this is a partisan statement, I want to withhold that, I am not a party to that, because I think these boys would do a neutral job and the best they could by way of interpretation, which we would ask them to do after all the other statements are in.

The CHAIRMAN. I quite agree with the Senator from Nevada, and I do think that Mr. Nielsen can give us this basic information without interpretation by any of the contending parties.

Mr. NIELSEN. I think, Mr. Chairman, if I may proceed, and if you will bear with me as I turn pages, I can tell you pretty well what you are seeking.

The CHAIRMAN. Very well.

Mr. NIELSEN. Starting at Lee Ferry, for the period 1897 to 1943, there were in the river an average of 14,400,000 acre-feet flowing.

Senator MALONE. Now, Mr. Chairman, could we have this understood: That the Bureau will prepare in concrete table form, and have it by Monday morning when we reconvene, what he is about to say now? I think you are going to have to get that out of several tables and interpret the figures as you go along.

Mr. NIELSEN. I have it very largely here.

Senator MALONE. But could we have a consolidated table by Monday morning, with the comments that he makes here, so that we can study it in a few minutes and know what it means?

The CHAIRMAN. Very good, that will be done.

Senator DOWNEY. Mr. Nielsen, will you repeat that statement, please?

Mr. NIELSEN. The past discharge of the Colorado River, the recorded and measured discharge of the Colorado River at Lee Ferry——

Senator MALONE. Do you have extra copies of this?

Mr. NIELSEN. No; I am afraid we did not bring extra copies. There may be some in the files.

Senator MALONE. I do not know how we are going to follow this. I still think it would be a better thing if we come back Monday morning with a concrete table, such as we suggested in the beginning, so that all of us could follow it carefully, as we intend to follow California's and Arizona's interpretations.

I sincerely believe that every member around this table is looking for the truth in this thing.

The CHAIRMAN. If the Senator will bear with the chairman for just a little bit, I think at least one member of the committee will get some benefit out of the presentation by Mr. Nielsen; and, as you say, we are all here looking for information. After Mr. Nielsen has made his presentation, then members of the committee may ask for any additional information or additional tables that they desire, and they will be made available.

I would greatly appreciate it if I could be permitted to get a few basic facts for my own guidance.

Senator MALONE. That is what we are trying to get it for. He does not have it now.

The CHAIRMAN. Well, let us see whether he does.

Senator MILLER. May I ask one question of the witness?

Are those figures you are about to give the same as those contained in the report of Debler, consulting engineer, or from the water data compilation by the engineers of Arizona?

Mr. NIELSEN. I think you would get some element of interpretation in both the statements.

Senator MILLER. I say, are those you are about to give the same as these?

Mr. NIELSEN. They will be based upon the same data; yes, sir.

Senator MILLER. That is what I wanted to know.

The CHAIRMAN. Proceed, please.

Mr. NIELSEN. So we start again with the historical flow of the Colorado River at Lee Ferry being 14,400,000 acre-feet on an average.

Senator MCFARLAND. Which page are you on?

Mr. NIELSEN. This is page 281.

Senator DOWNEY. For what period?

Mr. NIELSEN. For the period 1897-1943.

The effects of man's operations in the basin above Lee Ferry during that same period are estimated to have depleted the flow by an average of 1,870,000 acre-feet. The sum of those two elements would then represent the flow which would have been experienced at Lee Ferry had not man intervened or, in other words, the virgin flow.

That figure is 16,270,000 acre-feet, the average of the virgin flow of the Colorado River at Lee Ferry.

Senator MALONE. And that is about for 34 years?

Mr. NIELSEN. That is for 46 or 47 years, I think.

The in-flow between Lee Ferry and Hoover Dam is estimated to average 406,000 acre-feet for the same period.

Senator DOWNEY. Is that a historical figure?

Mr. NIELSEN. That necessarily is an estimate, because the Geological Survey does not measure all of the in-flow sir.

Senator DOWNEY. But I mean, is that the normal flow of the virgin flow of the river, or is that the figure as it is depleted?

Mr. NIELSEN. That is the net gain.

Senator MALONE. Where does that figure appear?

Mr. NIELSEN. That appears on page 281, second column, about half-way down the page.

Senator DOWNEY. That is how much again, now?

Mr. Nielsen. I am sorry. The depleted in-flow is 406,000 acre-feet. The average virgin gain to the Boulder Dam site or Hoover Dam site is 1,060,000 acre-feet.

Senator MALONE. Where is that?

Mr. NIELSEN. That is found on page 282, the first column, about one-third of the way down.

Senator MALONE. What was the amount of that figure?

Mr. NIELSEN. 1,060,000 acre-feet.

Senator MALONE. That is the center figure of the three figures given on page 282, in about the third paragraph?

Mr. NIELSEN. That is right. That permits you to develop a virgin flow at Hoover Dam of 17,330,000.

Senator MALONE. That is the third figure in the third paragraph on page 282?

Mr. NIELSEN. That is right.

Now, going downstream to Laguna Dam, which is immediately above the mouth of the Gila River, you will find on page 283, the first column, about three-fourths of the way down, a similar three-lined table, which accounts for the tributary in-flow between Hoover Dam and the mouth of the Gila.

Senator MALONE. That is the center figure there given on page 283, about three-quarters of the way down?

Mr. NIELSEN. That is right. Less the natural channel losses, which enables you to derive an estimate of the virgin flow of the Colorado River at Laguna Dam of 16,450,000 acre-feet.

Now, turning next to page 284, the table which appears in part on the bottom of page 284, and on page 285, you will find that the natural or virgin flow of the Gila River at the mouth——

Senator MALONE. In what column?

Mr. NIELSEN. That is the farthest to the right column, the last column, sir—develops a virgin flow of the Gila River at its mouth of 1,272,000 acre-feet.

Senator MALONE. That is given in thousands of acre-feet?

Mr. NIELSEN. Yes, sir. But the elements of that virgin flow are given in the table in terms of measured flows in the Phoenix area and on down the river, the uses and the natural losses of the stream.

Senator MALONE. In a paragraph or two, what does that amount to, to coordinate what you have said?

Mr. NIELSEN. If I may make one more point. On page 284 in the second column, under the heading "Virgin flow, Colorado River at international boundary," you find the three elements again, the average annual virgin flow of Colorado River at Laguna Dam, which is immediately above the mouth of the Gila River——

Senator MALONE. What column is that?

Mr. NIELSEN. That is right here, sir. [Indicating.] The average annual virgin flow of the Gila River at the mouth, which combined with the flow at Laguna gives you the average annual virgin flow of the Colorado River at the international boundary.

Senator MALONE. That is found on page 284 in the second column, just above the table?

Mr. NIELSEN. Yes, sir.

Those are basic facts.

Senator DOWNEY. What is that figure?

Mr. NIELSEN. That figure is 17,720,000 acre-feet.

Senator MALONE. That is the entire virgin flow of the Colorado River, then, including the Gila from top to bottom, the entire system?

Senator DOWNEY. You say that is the entire flow of the entire Colorado River system?

Mr. NIELSEN. Oh, not at all, sir.

Senator DOWNEY. You are talking about the Colorado River, and not the Colorado River system?

Mr. NIELSEN. I am talking about the Colorado River at the international boundary only.

Senator MALONE. That is the virgin flow without any depletions anywhere.

Mr. NIELSEN. By man. There have been many natural depletions, of course.

Senator DOWNEY. What I am asking you is, Is that the virgin flow of the system, or just of the Colorado River?

Mr. NIELSEN. That is the contribution of the system to the flow at the international boundary, sir. It is not the sum of all the elements that flow into the Colorado River, because there have been channel losses.

Senator DOWNEY. What figure did you give for the Gila?

Mr. NIELSEN. 1,272,000 acre-feet.

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Senator McFARLAND. I believe it is 1,270,000 here, is it not?

Mr. NIELSEN. Yes, sir; that has been rounded from this table which I read, which is 1,272,000.

Senator DOWNEY. What is the actual consumptive use on the Gila?

Mr. NIELSEN. The consumptive use?

Senator DOWNEY. Yes.

Mr. NIELSEN. I am not prepared to tell you what the consumptive use is, because I do not know what consumptive use is.

Senator DOWNEY. What is the total amount, then, measured at Phoenix?

Mr. NIELSEN. The total natural in-flow to the Phoenix area, as computed in this table and shown in column 5, is 2,279,000 acre-feet.

Senator DOWNEY. Have you any lower-down-the-stream measurements than that?

Mr. NIELSEN. Yes, sir; we can proceed down, if you like.

Senator DOWNEY. On the virgin flow of the Gila?

Mr. NIELSEN. Yes; to develop the virgin flow.

Senator McFARLAND. What column is that, Mr. Nielsen?

Mr. NIELSEN. If you will count the date column as No. 1, Senator——

Senator McFARLAND. On which page?

Mr. NIELSEN. On page 285, and then proceed to column 5, counting the date column as 1, you will find a column headed, "Total natural in-flow to Phoenix area."

Senator MALONE. That is the natural loss in the Phoenix area.

Mr. NIELSEN. I was afraid you would do that. I asked that you count the date column as column 1.

Now, answering your question——

Senator McFARLAND. May I ask you just one question on that?

Mr. NIELSEN. Yes.

Senator McFARLAND. That does not mean that that much water ever reaches the Gila River?

Mr. NIELSEN. No, not necessarily at all.

Senator McFARLAND. It just falls in the watershed?

Mr. NIELSEN. That is right.

Senator DOWNEY. What did you say was the measurement at Phoenix?

Mr. NIELSEN. The measurement at Phoenix is found in column 1.

Senator DOWNEY. And what is that?

Mr. NIELSEN. The flow of the Salt River at Granite Reef, 1,508,000 acre-feet.

Senator DOWNEY. And what is the measurement on the Gila?

Mr. NIELSEN. At what point, sir?

Senator DOWNEY. Well, at whatever point you want to give it, above the mouth. I do not want it at the mouth.

Mr. NIELSEN. I think the best answer is this column which purports to be the total natural in-flow to the Phoenix area.

Senator DOWNEY. All right, what is that?

Mr. NIELSEN. That is 2,279,000 acre-feet. It is made up of many elements, not all of which are measured and not all of which reach the Gila River.

Senator DOWNEY. Well, do you not consider that flow in the Colorado River system? Isn't the Gila River a part of the Colorado River system?

Mr. NIELSEN. As it is defined in the Colorado River compact and as I understand it, it is.

Senator DOWNEY. Well, I thought these figures you were giving us were for the Colorado River system. Why don't you use that figure you have just given there instead of the smaller figure at the mouth?

Mr. NIELSEN. I was careful, I think, to say that the figure I gave you was the flow as estimated at the mouth. Necessarily the Gila River loses water in going to the mouth; the Gunnison River, and almost every stream is depleted as it flows.

Senator MALONE. In other words, the natural evaporation in its virgin state would deplete it that amount?

Mr. NIELSEN. That is right.

Senator DOWNEY. Well, it is not only that, but there is some consumed in irrigation, is there not?

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. You are now allowing for that in your figures, are you? You are just allowing for the amount that reached the Colorado River under virgin conditions?

Mr. NIELSEN. That is the figure I gave you, yes, sir.

Senator DOWNEY. And you are not allowing for the amount that actually is available around the Phoenix area and which is there consumed in part, is that right?

Mr. NIELSEN. I am sorry, I did not understand your question.

Senator DOWNEY. I say, you are not taking into consideration the flow of the river at Phoenix and the amount that is consumed in that area?

Mr. NIELSEN. Only in a secondary way, because that flow might have existed at Phoenix in order to discharge water into the Colorado River system and there be counted at the international boundary.

Senator DOWNEY. But you are not including the additional amount that is consumed in irrigation or otherwise does not reach the mouth of the Gila river?

Mr. NIELSEN. I tried to make it plain that the flow at the international boundary cannot be the sum of all the component parts of the stream.

Senator DOWNEY. Mr. Nielsen, are you purporting to give here a statement of the flow of the Colorado River or the flow of the Colorado River system?

Mr. NIELSEN. This is the flow of the Colorado River at designated points, as nearly as we can estimate it.

Senator DOWNEY. Then I understand you are not purporting to give the flow of the Colorado River system?

Mr. NIELSEN. That would be an entirely hypothetical figure.

Senator DOWNEY. But anyway, you are not attempting to give the flow of the Colorado River system, are you?

Mr. NIELSEN. That is correct.

Senator DOWNEY. And you do not include in your figures the amount of water consumed in the Phoenix area that did not reach the mouth of the Gila under virgin conditions?

Mr. NIELSEN. No, sir.

Senator DOWNEY. No. But the Gila river is a part of the Colorado River system, is it not?

Mr. NIELSEN. As I understand it, yes, sir.

Senator DOWNEY. That is all.

Senator MCFARLAND. Well, Mr. Nielsen, just one more question.

As I understand your statement, that 2,279,000 acre-feet average was the amount of water that fell in that area, that reached that watershed?

Mr. NIELSEN. That is the in-flow.

Senator MCFARLAND. Yes, the in-flow. Now, if you take that same system of measurement on the Gunnison and every tributary, you would get a much larger figure of water, would you not?

Mr. NIELSEN. Well, we would have to, but it would be a hypothetical figure entirely.

Senator MCFARLAND. Yes.

Senator DOWNEY. Now, Mr. Nielsen, perhaps I misunderstood Senator McFarland's question and your answer. You don't mean to say in the figures you are giving us on the flow at Phoenix that you are figuring all of the precipitation?

Mr. NIELSEN. No, sir, I was careful to avoid that implication.

Senator DOWNEY. I thought you stated to Senator McFarland that that is what you were doing.

Mr. NIELSEN. No, sir.

Senator DOWNEY. All right, then tell us what you are doing.

Mr. NIELSEN. That 2,279,000 acre-feet, sir, is the total natural in-flow. The precipitation which fell in the area would have been dissipated in part, and evaporated and transpired in part by the consumptive use of trees and vegetation in the area.

Senator DOWNEY. And you do not include that in these figures, do you?

Mr. NIELSEN. No, sir.

Senator DOWNEY. And what you are including is the actual measurable in-flow of the river there in the Phoenix area, isn't that right?

Mr. NIELSEN. Yes, sir. This table is headed, "Total natural in-flow to Phoenix area."

Senator DOWNEY. I at least understand you.

Senator MCFARLAND. I do not want this to be misunderstood. But all of that water never reached the Gila River?

Mr. NIELSEN. No, not necessarily.

The CHAIRMAN. If the chairman might intervene for a moment.

Mr. Nielsen, I want to see if I correctly understand your figures. I followed them as carefully as I could and this is what I understand you to be testifying. You are giving us the average annual virgin flow of the Colorado River at certain points.

Mr. NIELSEN. That is right.

The CHAIRMAN. So that whatever points you take you necessarily give us the flow at that point, from whatever source it may come?

Mr. NIELSEN. That is right.

The CHAIRMAN. It is the flow in the stream?

Mr. NIELSEN. That is right.

The CHAIRMAN. There is delivered at Lee Ferry 16,270,000 acre-feet?

Mr. NIELSEN. In its virgin state; yes, sir.

The CHAIRMAN. In the virgin state.

No. 2: From Lee Ferry to Bright Angel, 406,000 feet are added?

Mr. NIELSEN. That is at Boulder Dam.

The CHAIRMAN. Well, I am taking the figures that you gave.
No. 3, Lee Ferry to Boulder Dam is 1,060,000?
Mr. NIELSEN. Yes, sir.
The CHAIRMAN. Now, do you question it at Bright Angel?
Mr. NIELSEN. No, sir; that is the net gain.
The CHAIRMAN. These are the figures that you gave.
No. 4 is the flow at the Boulder Dam site, 17,330,000.
Mr. NIELSEN. That is correct.
The CHAIRMAN. No. 5, the Colorado River flow at Laguna Dam just above the mouth of the Gila, 16,450,000 feet?
Mr. NIELSEN. That is correct.
The CHAIRMAN. No. 6, the flow of the Gila River at its mouth, 1,270,000?
Mr. NIELSEN. Yes, sir.
The CHAIRMAN. No. 7, the flow of the Colorado River at the international boundary, 17,720,000?
Mr. NIELSEN. That is correct.
The CHAIRMAN. Do I understand that in each of these cases you are giving the average annual flow as determined by measurements of the Geological Survey as closely as they can be made?
Mr. NIELSEN. Plus necessarily estimates of man's depletion above those points.
The CHAIRMAN. When you say "plus estimates of depletion," you mean less estimates of depletion?
Mr. NIELSEN. I don't believe so, sir. The recorded flow represents the residual flow after man has depleted the stream.
The CHAIRMAN. That is what I thought, so that is less the depletion.
Mr. NIELSEN. Well, perhaps we are not talking about the same thing.
The CHAIRMAN. Well, is it or is it not?
Mr. NIELSEN. The virgin flow of the stream is made up of the two component parts, the natural flow plus the depletions.
The CHAIRMAN. Oh, I see, you are right.
Senator MALONE. I think, Senator, that I might be able to contribute something there. I think what he is trying to do is to set up the virgin flow of the river without any depletions whatever.
Mr. NIELSEN. That is right.
Senator MALONE. Now, then, Senator McFarland is exactly correct that much of that has never reached that point, especially since the development Arizona started many, many years ago, and it has been used continuously since that time. But he is setting up the virgin flow at a particular point to show the amount of water available, including all tributaries, is that correct, Mr. Nielsen?
Mr. NIELSEN. That is right.
Senator KERR. Well, as I understand it, your figure here shows how much water reached the mouth of the Gila and therefore the Colorado in its virgin stage, does it not? That is the 1,270,000, on page 284?
Mr. NIELSEN. That is right.
Senator KERR. Unimpeded and unrestricted and unused by man?
Mr. NIELSEN. That is correct.
Senator MCFARLAND. But this other figure includes all of the water that hits all these tributaries, and it is used up after it hits them by evaporation, seepage, and everything else, irrigation, and all the uses?

Mr. NIELSEN. Not all of which necessarily reach the Gila River.

Senator MCFARLAND. Yes, that is what I wanted distinctly understood.

The CHAIRMAN. Now, these are estimates of the virgin flow?

Mr. NIELSEN. That is right.

The CHAIRMAN. Uninterrupted by man?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. Do you have any figures giving the actual flow?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. What are they? That would eliminate your estimate as to depletions.

Mr. NIELSEN. I think I would rather have the time to prepare that for you.

The CHAIRMAN. Well, I would like to have you take the time to do it.

Mr. NIELSEN. Now?

The CHAIRMAN. Oh, no.

Senator MALONE. Mr. Chairman, could I interrupt again at that point? The reason I made the original suggestion was that I have heard this tried so many times that it confuses everybody, including me.

Senator MILLIKIN. A little louder, please, Senator.

Senator MALONE. I say it confuses everybody, including myself, and I have sat in on all the conferences for 25 years.

Therefore, if he were given time—and I think he could do it by Monday morning—to give us on a couple of pages the assumptions he makes, and on each case the figures, in about 30 minutes you could run over it and then go to someone else.

The CHAIRMAN. I think, so far as I am concerned, I have profited by listening to Mr. Nielsen so far.

Senator MALONE. No doubt about it; but you will not get the entire story until, as he says, he has an opportunity to put it down.

The CHAIRMAN. Of course, we have not finished it. Now he will give us the other material.

Senator DOWNEY. Mr. Chairman, before we go into that: Mr. Nielsen, I think we all understand the conditions in the Gila River, and I think you understand the point I am trying to make. I would like to have the record merely clarified on that. I am not arguing for California's interpretation, or Arizona's; I just want the facts.

Now, Mr. Nielsen, you have given us here the figure as to the flow of the Gila River in its virgin condition at its mouth, as estimated by your Bureau; is that correct?

Mr. NIELSEN. That is correct.

Senator DOWNEY. Now, is it not true that there is a greater flow of the Gila system, that is measurable in the streams and available for consumption by Arizona, than the figure you have given?

Mr. NIELSEN. Yes. The answer to that is——

Senator DOWNEY. Well, just yes or no.

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. And how much greater is it in acre-feet?

Mr. NIELSEN. The total natural in-flow to the Phoenix area, as we compute it, is 2,279,000 acre-feet, sir.

The CHAIRMAN. How much is that greater than the figure you have given as to the virgin flow at the mouth of the Gila?

Mr. NIELSEN. That is a million—by my arithmetic—1,009,000 as I compute it.

Senator DOWNEY. Now, Mr. Nielsen, just one further question.

Does not that larger figure represent the flow of the Gila system?

Mr. NIELSEN. Well, you have to qualify that, because the flow of the Colorado River system——

Senator DOWNEY. All right, at Phoenix, then.

Mr. NIELSEN. No, sir; not of the system.

Senator DOWNEY. I am talking about the Gila now.

Mr. NIELSEN. That is right, but it represents the residual flow which reaches there. The Gila River extends upstream into New Mexico. There it experiences depletions, natural and otherwise, so that it cannot be the flow of the system.

Senator DOWNEY. Well, I mean in its virgin condition, isn't that what we are talking about?

Mr. NIELSEN. It is the flow which reached the area in the virgin state.

Senator DOWNEY. All right; that larger figure.

Mr. NIELSEN. That is right.

Senator DOWNEY. And it is there available for diversion and consumptive use, is it not?

Mr. NIELSEN. No; not necessarily, sir.

Senator DOWNEY. Why not?

Mr. NIELSEN. Because some of it does not reach the stream.

Senator ANDERSON. You cannot irrigate with water that is lost, in other words.

Mr. NIELSEN. That is right.

Senator MALONE. In other words, Senator, I think what you are trying to point out is like the Muddy River in Nevada. It does not reach there, but we use it for irrigation.

Senator DOWNEY. Thank you, Senator, that is the very point I wanted to develop.

But it is available for irrigation in the streams flowing into the Gila, is it not?

Mr. NIELSEN. Not in its entirety; no, sir.

Senator DOWNEY. All right, then, how much is it, Mr. Nielsen?

Mr. NIELSEN. That is impossible to determine, sir.

Senator DOWNEY. You mean you do not know that?

Mr. NIELSEN. I do not know it; no, sir.

Senator DOWNEY. Can you not approximate it?

Mr. NIELSEN. Not without very substantial study, sir.

Senator DOWNEY. Well, Mr. Nielsen, I think we all know these facts. I am just trying to get them in the record for the Senators who may not be familar with them. Under the virgin flow there was a large amount of water that was available in the Phoenix area in the Gila River that was not available at its mouth, because it was lost in the desert sands.

Mr. NIELSEN. That is correct, sir.

Senator DOWNEY. And there is a large amount of that water that is available if it is used in the Phoenix area that did not reach the mouth, is there not?

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. All right. Now, what I am asking you—and I have already asked this twice and have had two different answers; I

will now try to rectify it: Do you consider in these figures you have given to the committee that you are giving the measurable flow of the Colorado River system that is available for irrigation, or are you giving it for the Colorado River?

Mr. NIELSEN. This is for the Colorado River at specified points only.

Senator DOWNEY. Not for the system?

Mr. NIELSEN. And not for the system.

Senator DOWNEY. And if you did give it for the Colorado River system, you would have to include at least several hundred thousand feet more because of the condition in the Phoenix area at the Gila, would you not?

Mr. NIELSEN. I could not do it for the Colorado River system, sir.

Senator DOWNEY. All right, but if you were attempting to. You would have to add several hundred thousand acre-feet, approaching a million, for the measurable flow that is capable of irrigation use in the Phoenix area that did not reach the Gila in its virgin condition at its mouth?

Mr. NIELSEN. You are talking about something that I just do not conceive of, sir, because it means measuring each of the streams of the system at perhaps its point of maximum flow. I do not know, that may be a point. But that would be a physical impossibility.

Senator DOWNEY. Mr. Nielsen, I think you understand my point very well, and what I am trying to get before the committee.

Senator MCFARLAND. Mr. Nielsen, may I ask just one more question to see if I understand you.

This 1,279,000 acre-feet is all of the water that reaches any small tributary of the Gila River and its tributaries, such as the Salt River?

Mr. NIELSEN. And thereafter reaches the mouth of the stream?

Senator MCFARLAND. Yes.

Mr. NIELSEN. That is right.

Senator MCFARLAND. Now, you would have to be able to divert that water at these various points and not lose any of it at all in bringing it down in order to have it available for irrigation; would you not?

Mr. NIELSEN. Let me have that again, please.

Senator MCFARLAND. What I am getting at is this: The figure given here never reaches the points of diversion.

Mr. NIELSEN. The 1,270,000?

Senator MCFARLAND. No; the 2,279,000.

Mr. NIELSEN. Not all of it; no, sir.

Senator MCFARLAND. That is the point I was making.

The CHAIRMAN. Now, Mr. Neilsen, may I direct your attention to the table on pages 284——

Senator DOWNEY. Mr. Chairman, before we leave this, may I ask another question?

The CHAIRMAN. We are not leaving it.

Senator DOWNEY. I beg your pardon.

The CHAIRMAN. May I direct your attention to pages 284 and 285. This is the table and the report of the Secretary on the Colorado River water supply entitled, "Estimated Virgin Flow of Gila River at Mouth, 1,000 Acre-Feet." This table is composed of several different columns headed as follows: The first colum is "Flow of the Salt River at Granite Reef." At what point on the Salt River is Granite Reef?

Mr. NIELSEN. That is just below the mouth of the Verde River, below all the reservoirs and essentially at the head of the irrigation.

The CHAIRMAN. That is above Phoenix?

Mr. NIELSEN. Above Phoenix, essentially above all of the irrigation in Phoenix.

The CHAIRMAN. Then at Granite Reef the flow of the Salt River, on the average for this period, 1897 to 1943, is 1,508,000 acre-feet?

Mr. NIELSEN. That is correct.

The CHAIRMAN. Then the next column is entitled, "Flow of the Gila River at Kelvin." Now, where is Kelvin?

Mr. NIELSEN. Can you tell me, Mr. Larson, exactly where Kelvin is?

Mr. LARSON. That is just downstream from Coolidge Dam.

Mr. NIELSEN. That is just downstream from Coolidge Dam, Mr. Larson says, on the Gila River.

Senator MCFARLAND. It is not pointed out here, but it is right close to Ray, Ariz.

The CHAIRMAN. Just below the Coolidge Dam. Now, the flow of the Gila River at Kelvin is given in this table as 527,000 acre-feet.

Mr. NIELSEN. That is right.

The CHAIRMAN. The next column is entitled, "Unmeasured Natural Inflow to Phoenix Area."

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. 244,000 acre-feet.

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. Now, what is that?

Mr. NIELSEN. That is our best estimate of the inflow which arises out of local streams, some of which are dry runs, some of which are live streams. It is simply our best estimate of the tributary inflow which is not measured at those two points.

The CHAIRMAN. The next column, then, is entitled, "The Total Natural Inflow to the Phoenix Area." That is given as 2,279,000 acre-feet. Where, in the Phoenix area, is that measurement taken?

Mr. NIELSEN. That, I think you will find, is a figure which is made up of the first three.

The CHAIRMAN. I assumed so.

Mr. NIELSEN. It is not measured.

The CHAIRMAN. Why do you call the other column, "Unmeasured Inflow"?

Mr. NIELSEN. Because there are not gages on all of the tributary streams, sir.

The CHAIRMAN. So it necessarily is an estimate?

Mr. NIELSEN. That is right.

The CHAIRMAN. Then the next column is entitled, "Natural Loss in Phoenix Area." That again is an estimate?

Mr. NIELSEN. That is an estimate.

The CHAIRMAN. 527,000 acre-feet.

The next column is entitled, "Natural Flow of the Gila River at Gillespie Dam." Where is the Gillespie Dam?

Mr. NIELSEN. That is immediately below Phoenix.

The CHAIRMAN. So this is the measuring point?

Mr. NIELSEN. You can see it on that map. We speak of Phoenix as the whole irrigated area.

The CHAIRMAN. But for the purpose of the record, this is a point on the Gila River below each of the other points which we have so far mentioned?

Mr. NIELSEN. That is right; yes, sir.

The CHAIRMAN. And this figure 1,752,000 acre-feet purports to give the natural virgin flow at that point?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. The next column is entitled, "Natural Loss of Gillespie Dam to the Gila River at the Mouth," 480,000 acre-feet; that is an estimate?

Mr. NIELSEN. That is an estimate.

The CHAIRMAN. The sum of all these figures, the in-flow and the losses, results in the figures given in the last column, "The Natural Flow of the Gila River at the Mouth," 1,272,000?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. Now, this again is a figure which does not include the uses which are made all along the line?

Mr. NIELSEN. That is right. We have a parallel situation on the Gila and the Colorado Rivers, as a matter of fact. The Colorado River has a loss of about 1,030,000 acre-feet between Hoover Dam and Laguna, a natural loss. The Gila has about 1,000,000 acre-feet of natural loss between the Phoenix area and the mouth. Those figures are not, necessarily, represented in our estimates of virgin flow.

Senator DOWNEY. Mr. Chairman, I thank you for very clearly developing those figures. Now that they are out, I then ask Mr. Nielsen this question:

How much of the virgin flow, as you developed it in the Phoenix area, is available for irrigation in Arizona?

Mr. NIELSEN. Something approaching the 2,279,000 acre-feet, sir.

Senator DOWNEY. I thank you.

Senator MCFARLAND. Mr. Nielsen, in order to use that you would have to have dams down there, would you not?

Mr. NIELSEN. Yes; you would have to have dams.

Senator MCFARLAND. And there are no locations for dams?

Mr. NIELSEN. Not for it in its entirety; no, sir.

Senator MCFARLAND. That is what I wanted.

Senator DOWNEY. Mr. Nielsen, what is the consumptive use from the Gila River in Arizona now?

Mr. NIELSEN. Well, sir, I don't know what consumptive use is.

Senator DOWNEY. Oh, well——

Mr. NIELSEN. I think you will agree with that.

Senator DOWNEY. I will agree with that, Mr. Nielsen; I doubt if you do. Let me ask you this: How much water is actually taken out for use on the land?

Mr. NIELSEN. Can you give me that figure, Mr. Larson. How much water is actually put on the land, about 2,000,000 acre-feet?

Senator MCFARLAND. That is use and reuse water?

Mr. NIELSEN. Use and reuse.

Senator DOWNEY. Yes, I understand that, but you actually get the use of 2,000,000 acre-feet, don't you?

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. That is used up?

Senator MCFARLAND. No, use and reuse.

Senator DOWNEY. Actually, according to the statement just made to you there is approximately 2,000,000 acre-feet of water actually used up?

Mr. NIELSEN. No.

Senator DOWNEY. If you will permit me to use the word, "consume" in Arizona from the Gila.

Mr. NIELSEN. The 2,000,000 acre-feet is the water applied to the land, as I understood Mr. Larson to give it to me. Is that correct? The 2,000,000 acre-feet figure you gave me is the water applied to the land, is that right?

Mr. LARSON. That is the diverted water——

The CHAIRMAN. Mr. Larson, will you please stand up and speak so that the reporter and the rest of us can hear you?

Mr. LARSON. The 2,000,000 acre-feet is water that is diverted above Gillespie Dam. Any return flow is rediverted. The total would amount to slightly under 2,000,000 acre-feet.

The CHAIRMAN. In giving this figure, Mr. Nielsen, do you take into account the return flow?

Mr. NIELSEN. Yes, sir. That is, the figure of the 2,000,000?

The CHAIRMAN. Yes.

Mr. NIELSEN. Yes. That is the reuse of which Mr. Larson speaks.

The CHAIRMAN. I mean the total after all these reuses have been finished.

Mr. NIELSEN. The total diversions add up to slightly less than 2,000,000 acre-feet.

Senator DOWNEY. That is all I have.

Senator KERR. What is the present flowage into the Colorado River from the Gila River at the mouth of the Gila River?

Mr. NIELSEN. On an average I think it runs about 135,000 acre-feet, but it is dry for many years at a time, sir.

Senator KERR. An average of about 135,000 acre-feet?

Mr. NIELSEN. That is as I recall the figure.

Senator KERR. Then if the virgin flow, according to this figure on page 284, is 1,270,000 acre-feet, the actual reduction, by whatever is done in Arizona to the flowage of the Gila into the Colorado, as distinguished from what it would be if nothing was done and nothing used, is 1,100,000 acre-feet?

Mr. NIELSEN. Yes, sir.

Senator KERR. Approximately?

Mr. NIELSEN. On that order, sir.

The CHAIRMAN. Senator Anderson, have you any questions?

Senator ANDERSON. The figures you refer to on page 281 of the historical flow at Lee Ferry, are they based on actual measurements?

Mr. NIELSEN. From 1921 on, sir.

Senator ANDERSON. How were the figures ahead of 1921 obtained?

Mr. NIELSEN. They were developed from several sources; the flow of the Colorado River at Yuma. I think there was some correlation with the stages of Great Salt Lake. I can supply that for you.

Senator ANDERSON. Well, when you say correlation with Great Salt Lake, you are basing it on what the actual measurement was on Great Salt Lake?

Mr. NIELSEN. On the stage of Great Salt Lake as influencing their thinking.

Senator ANDERSON. They are purely hypothetical figures, are they not, ahead of 1921?

Mr. NIELSEN. They are derived figures: hypothetical in the sense that they are not based upon immediate measurements; yes, sir.

Senator ANDERSON. What I am getting at is, you did not have any knowledge what was actually flowing past Lee Ferry? You merely took marks that were developed at Great Salt Lake and figured that the same amount of water must have fallen on the upper reaches of the Colorado and therefore flowed past Lee Ferry?

Mr. NIELSEN. That element was only an influencing element. Basically they went to the Colorado River at Yuma, substantially downstream.

Senator ANDERSON. But if you had to testify as to what was known of the flow at Lee Ferry, you would have to start in 1921, when you established a gaging station?

Mr. NIELSEN. That is right.

Senator ANDERSON. And that average is way below the average that is given, is it not? What is the average flow based upon actual knowledge at Lee Ferry, since 1921?

Mr. NIELSEN. I would have to develop that for you. I do not have it in my head.

Senator ANDERSON. Well, you would take the figures from 1921 to 1946, or whatever it is, and divide, would you not?

Mr. NIELSEN. I think we have them through 1948; now, sir.

Senator ANDERSON. If you have it through 1948, have you not averaged that?

Mr. NIELSEN. No; we have not averaged that for that specific term of years.

Senator ANDERSON. Is it below or above 16,000,000?

Mr. NIELSON. I do not know, sir. I always suspect the 1920's as being the period of rather high flow.

Senator ANDERSON. Well, looking at the chart where you do not have any figures that are large from that time on on actual measurement, would you guess that?

Mr. NIELSEN. I would guess that would run a little lower; that would be a pure guess. I am going to develop that for you, sir; as well as those 10-year averages you were asking about.

Senator MALONE. Are you through?

Senator ANDERSON. Yes; but I simply wanted to point out it is possible to set up an estimate of what ought to have been there, based upon the amount of water in Great Salt Lake. The amount of water that is in the Mississippi River Valley does not exactly measure the amount of water in the Sacramento. We would like to know what the actual figures are, when you can measure at Lee Ferry, because the compact does not call for measurements at Great Salt Lake, it calls for measurements at Lee Ferry.

Mr. NIELSEN. The engineers just used the best available data at that time.

Senator ANDERSON. I am not objecting to that data at all, except to point out it is not necessarily historically accurate.

Mr. NIELSEN. That is correct.

Senator MALONE. Mr. Nielsen, is this a fact, that when engineers go back of actual measurements, then after they do get actual measurements on the same system and have the results of lower measurements that were taken perhaps prior to the time they are trying to estimate, and having the evaporation estimates, that they do take many factors into consideration in estimating at a specific point where they have no actual measurements?

Mr. NIELSEN. That is right.

Senator MALONE. Sometimes they even go back to tree rings, do they not?

Mr. NIELSEN. Yes, sir. They are developing that theory now.

Senator MALONE. The periods of heavy rainfall develop greater growth in the trees.

Mr. NIELSEN. Yes, sir.

Senator MALONE. And the engineers, over a period of time, have been able to coordinate what they actually know of the tree-ring growth in that period, and to use that as just one of the factors; is that right?

Mr. NIELSEN. That is right.

Senator KERR. There is one more question I would like to ask, Mr. Chairman.

How far below Lee Ferry is the mouth of the Gila River, approximately?

Mr. NIELSEN. Oh, I would have to make a wild guess and say perhaps as many as 350 river miles.

Senator KERR. In other words, any water referred to as being deliverable to the lower basin at Lee Ferry would not possibly comprehend any of the flow of the Gila or its tributaries?

Mr. NIELSEN. No, sir.

Senator DOWNEY. Senator, I am advised that distance is 600 miles. Is that correct?

Mr. NIELSEN. Six hundred and fifty-eight miles.

Senator DOWNEY. So you have a stronger point than the 300 miles would indicate.

Mr. NIELSEN. I am informed it is 658 miles.

Senator MALONE. When you go back to tree rings you really are guessing, but that is the way it is done.

Senator MILLIKIN. Mr. Chairman, may I ask a question?

The CHAIRMAN. Certainly, Senator.

Senator MILLIKIN. In your opinion, is there any additional feasible development possible on the Gila River system?

Mr. NIELSEN. Additional feasible development on the Gila system?

Senator MILLIKIN. Yes.

Mr. NIELSEN. No. Without studies as to feasibility, there are lands available for irrigation. How much it would cost to reach those lands, I am not prepared to say, except in very general terms.

Senator MCFARLAND. Mr. Nielsen, I think what the Senator had in mind was this: You have set up here some additional development of water in this project on the Gila River.

Mr. NIELSEN. That is right.

Senator MCFARLAND. That is, the Buttes Dam and a dam in New Mexico, at least.

Senator MILLIKIN. What I am getting at, Mr. Chairman, is this: If I understood the remarks of Senator Downey, they are to the effect that there is a vast amount of water coming into the Phoenix area which—am I correct in this, Senator Downey—is not being subjected to use and which might be subjected to use?

Senator DOWNEY. No; quite the contrary. We figure there is 2,200,000 acre-feet of water available there, and that that is all used and consumed, Senator.

Senator MILLIKIN. I see; I am sorry. I misinterpreted your remarks, and I am sorry.

The CHAIRMAN. Mr. Nielsen, these figures to which you referred on page 281, showing the estimated virgin flow of the Colorado River at Lee Ferry, are derived from estimates of various kinds, from 1897 to 1920.

Mr. NIELSEN. That is right.

The CHAIRMAN. But from 1921 on they are based upon actual measurements, such as you have described in the opening of your testimony; is that right, sir?

Mr. NIELSEN. That is right, sir.

The CHAIRMAN. The Colorado River compact was signed in 1922?

Mr. NIELSEN. That is right.

The CHAIRMAN. It contained estimates based upon such data as were availabe to those who negotiated at the time, as to the supply of the river at that time?

Mr. NIELSEN. That is right.

The CHAIRMAN. This table from which we have been quoting goes no further than 1943. Therefore, five additional years may be added to this table.

Mr. NIELSEN. That is right.

The CHAIRMAN. I will ask you to add those years for the record.

Mr. NIELSEN. We have those figures.

The CHAIRMAN. Now, what is your opinion, as an engineer, as to what these figures from 1921 on, to date, show, with relation to the accuracy of the figures which were used when the Colorado River compact was signed, as to the flow at Lee Ferry?

Mr. NIELSEN. That is the material which we helped Mr. Nelson develop the other day. As I remember, that data indicated that the compact framers might very well have had in mind a virgin flow of 16,450,000 acre-feet. That is the figure, as I recall it. It was 16,406,000.

Senator MILLIKIN. Average for that year?

Mr. NIELSEN. That was average, on the basis of the information I had available at that time.

As of 1943, the compact commissioners would have had an expectation of an average virgin flow of 16,270,000 acre-feet.

The CHAIRMAN. Now, let me have your estimate. Do you think the Colorado River is today, on the basis of these figures, delivering as much water at Lee Ferry as it was when the compact was signed?

Mr. NIELSEN. I cannot find evidence of a long-time trend either that our supply is going down or increasing, sir.

The CHAIRMAN. You cannot find any such evidence?

Mr. NIELSEN. No, sir.

The CHAIRMAN. Do I understand you correctly?

Mr. NIELSEN. You understand me correctly, sir.

The CHAIRMAN. Now, then, it is stated that the water supply in this general area is gradually going down. It is stated that Salt Lake is not as large now as it used to be years ago. One hears statements—I do not know on what authority—that the water supply in this great area is gradually diminishing. The Bureau of Reclamation has been operating there throughout this period. I think it is probably not too much to ask for an informed opinion from the engineers of the Bureau as to whether or not there is any basis for those reports, in your judgment.

Mr. NIELSEN. We find no basis to be alarmed over a decline in water supply; no, sir.

The CHAIRMAN. Does that mean, in your judgment, the water supply in the Colorado system is not declining?

Mr. NIELSEN. I would say so; yes, sir.

Senator ANDERSON. Mr. Chairman, may I ask him three questions right there:

One, is the precipitation in the area going down or up?

Mr. NIELSEN. I do not know as to precipitation, sir. I am basing my judgment on tree rings.

Senator ANDERSON. Well, regardless of tree rings, the Weather Bureau keeps track of precipitation, and their records show it is going down, do they not?

Mr. NIELSEN. I could not answer that for you, sir.

Senator ANDERSON. Who could answer that?

Mr. NIELSEN. We could, if we were given some time to study.

Senator ANDERSON. The Geological Survey has records showing that, do they not? Do you know Mr. Paulson?

Mr. NIELSEN. Yes, sir.

Senator ANDERSON. Chief Hydrographic Engineer.

Mr. NIELSEN. Yes, sir; I know Mr. Paulson very well.

Senator ANDERSON. If Mr. Paulson stated that it is going down, would you be inclined to believe it?

Mr. NIELSEN. I would respect his figures; yes, sir.

Senator ANDERSON. Could you supply us with a figure indicating that?

Mr. NIELSEN. Indicating what, sir?

Senator ANDERSON. The decline in precipitation. I am trying to get three facts to comment on the answer you gave. Certainly run-off in the river has some relation to precipitation, does it not?

Mr. NIELSEN. Yes, sir.

Senator ANDERSON. If I could show you by figures that the precipitation was gradually going down, and had been for a period of 30 years, would that indicate that there might be some changes in the supply in the Colorado River?

Mr. NIELSEN. It would not indicate to me necessarily a long-time trend; no, sir. Thirty years is rather short as we reckon climate.

Senator ANDERSON. Yes; but as we try to reckon water it is not too short, is it? All right, if I cannot get an answer——

Mr. NIELSEN. No; I will agree with you.

Senator ANDERSON. All right, will you supply records showing what the precipitation has been. I submit to the chairman that records will show the precipitation is going down. I am going to ask him three questions. My second question is: What about temperature in the Rocky Mountain area, is it going up or down?

Mr. NIELSEN. I have not investigated temperatures, sir.

Senator ANDERSON. Well, the Geological Survey knows that answer, do they not?

Mr. NIELSEN. I would assume so.

Senator ANDERSON. That answer would show the temperature is going up. Would you supply the figures? I will not ask you to supply figures showing they are going up, but if you will supply the actual figures, they will show it is going up.

Mr. NIELSEN. Yes, sir.

Senator ANDERSON. Now, if precipation is going down and temperature is going up, my third question is: What is the actual figure as to the measurements at Lee Ferry since 1921? Is it below or above 16,000,000? Does it average something in the neighborhood of 13,000,000?

Senator KERR. Senator, if you will average the figures on that page you will find they are approximately 15,290,000 for that 23-year period recorded since 1921, and including 1921.

Senator DOWNEY. We did not hear that, Senator. What did it amount to?

Senator KERR. According to my calculations, which are subject to all of the inaccuracies of human error, it is 15,290,000 per year for that 23-year period.

Mr. NIELSEN. That checks with what has been handed me.

Senator KERR. Well, that is wonderful.

Senator MCFARLAND. I am glad we can agree on something.

Senator ANDERSON. Would you repeat that?

Mr. NIELSEN. 1921 to 1943, the average virgin flow of the Colorado River at Lee Ferry, as figured from this table, is 15,290,000 acre-feet.

Senator MALONE. Let me ask one more question. Why are these figures not separated and explained as to what is estimated and what is actual use? When you bring in your report Monday will you separate them?

Mr. NIELSEN. Yes, sir.

Senator MALONE. And determine for the committee what is actual and what is estimated?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. Have you asked your three questions, Senator Anderson?

Senator ANDERSON. Yes, I have asked three questions. May I ask then if there has been steadily a discussion of trends and run-off over the western part of the United States?

Mr. NIELSEN. We try to keep abreast of the literature on that, sir.

Senator ANDERSON. Does that literature indicate there is a change in run-off in the Western States?

Mr. NIELSEN. I do not think there is positive evidence of a long-time change.

Senator ANDERSON. Well, is there superficial evidence by actual facts?

Mr. NIELSEN. Yes, of course, sir. The 1930's would lead us to worry, certainly.

The CHAIRMAN. Senator Miller, did you want to ask a question?

Senator MILLER. Mr. Nielsen, how long have you been familiar with the Gila River?

Mr. NIELSEN. Well, I have been engaged in work——

Senator MILLER. Oh, just approximately.

Mr. NIELSEN. Well, let's say 15 years in investigation work and with the Bureau of Reclamation.

Senator MILLER. Now, the question I want to ask is this, since there was a good deal of examination on the subject by Senator Downey: What term would you use in your own vocabulary different from that of "consumptive use"? "beneficial use"? That would be a close approximation of it, would it not?

Mr. NIELSEN. Beneficial use——

Senator MILLER. Well, that would be the use of water put to a beneficial purpose, would it not?

Mr. NIELSEN. Yes, sir.

Senator MILLER. All right. Now, you spoke about the number of acre-feet at the mouth of the Gila. During the time you have been acquainted with the Gila River if there had been no beneficial use—which, as you stated, meant it did not reach the river—or consumptive use, as the term may be applied, is there not a number of years when there would have been no water even at the mouth?

Mr. NIELSEN. Yes, sir.

Senator MILLER. A number of years?

Mr. NIELSEN. I think that is right. I would want to check that but that is my guess that there would be several years.

Senator MILLER. That is the point I wanted to get.

Senator MALONE. Could you supply us the information by years, from your own information, as to the amount of water that would have reached there over the years you utilize here, in determining the flow of the Colorado River?

Mr. NIELSEN. That is as to the Gila?

Senator MALONE. Yes, the years in which there would have been no flow, or what flow there would have been over the years you are interpreting there.

Mr. NIELSEN. You will give me time for that? We cannot do all of these things by Monday morning.

Senator MALONE. Yes, of course, we can give you time. But, Mr. Chairman, I want to make this general statement: For 30 years the Bureau of Reclamation has been working on the Colorado River. It seems like that is a good deal of time, especially when we have appropriated, that is, the Congress has appropriated considerable money from time to time and right at this moment there are several million dollars going into the funds of the upper basin States from the Boulder dam project income to study this matter. It seems to me that information should be available.

Senator MCFARLAND. I would call attention, if I might, to the natural flow of the Gila River at its mouth. There are periods when you might say there was practically no flow there. In the last column on page 285—1924, 583,000 acre-feet; 1925, I believe, is 421,000 acre-feet. In another year there were 357,000 acre-feet. It is getting down pretty close to nothing.

Senator ANDERSON. Mr. Chairman, I desire to return to the statement made a minute ago about 15,000,000 being the average there. Would you ask one of your assistants to total those figures from the time you have had a station there? If you can get 15,000,000 out of those figures you are a wizard.

Mr. NIELSEN. That is the virgin flow, sir?

Senator ANDERSON. The flow at Lees Ferry by actual measurements was the question I asked you and you said you had just been given a figure showing the flow was 15,000,000.

Mr. NIELSEN. I am sorry, I gave you the virgin flow.

Senator ANDERSON. You certainly did. You took out all the irrigation and losses from other things. I asked you how much water went by Lees Ferry.

Mr. NIELSEN. I misunderstood your question, sir. Will one of you gentlemen develop that, please.

Senator ANDERSON. I have here a statement from the United States Department of the Interior, Geological Survey, in which they refer to the Grand Canyon. I do not know what they mean by the flow at Grand Canyon.

Mr. NIELSEN. That is the Bright Angel station.

Senator ANDERSON. Well, that is 13.570,000. That would be a little larger than at Lees Ferry, would it not?

Mr. NIELSEN. Yes.

Senator ANDERSON. Well, I tried to get into the record that we were dealing with a river which we thought had 16,000,000 feet in it at Lees Ferry. You, yourself, testified that they dealt with a figure of 16,407,000, was that the figure you used?

Mr. NIELSEN. Virgin flow; yes, sir.

Senator ANDERSON. Virgin flow?

Mr. NIELSEN. Yes, sir.

Senator KERR. 16,270,000.

Senator MCFARLAND. There are uses above that point.

Senator ANDERSON. That is right. I would like to get this into the record somewhere. You established your gaging station in 1921. The first record you have is for the year 1922, is it not?

Mr. NIELSEN. That is my recollection.

Senator ANDERSON. On page 281, the second column, Senator Kerr has just called my attention to the fact that it is 12,582,000 acre-feet at Lees Ferry.

Mr. NIELSEN. That is right.

Senator ANDERSON. That is the average over these years?

Mr. NIELSEN. That is right.

Senator ANDERSON. And 2,000,000 feet, roughly, was being used upstream?

Mr. NIELSEN. Right; roughly, somewhat in excess of that.

Senator ANDERSON. So it is a stream that has 14,500,000 acre-feet in it. If you are to get 7,500,000 acre-feet for the upper basin and 8,500,000 acre-feet for the lower basin, you are certainly faced with a problem, are you not?

Mr. NIELSEN. You are faced with the requirement for storage in the upper basin; yes, sir.

Senator ANDERSON. Well, stored or not, if it averaged only 14,500,-000 you cannot increase that amount by storing it, can you?

Mr. NIELSEN. In a previous, more prosperous period; yes, sir.

Senator ANDERSON. No storage exists for it now, does it?

Mr. NIELSEN. That is right.

Senator ANDERSON. If there might be a rise in temperature, a decrease in precipitation and a decrease in rainfall it might be that there would not be too much water held in storage?

Mr. NIELSEN. That is right.

Senator KERR. If you had all of the storage there this year and with the terrific precipitation would that make a difference for a few years?

Mr. NIELSEN. In meeting the obligations of the upper basin to the lower basin; yes, sir. We do not know yet whether we will actually waste water in the Colorado River system this year from Lake Mead.

Senator KERR. If you had the storage facilities in the upper basin this year you could get enough water to build the average up for a number of years, could you not?

Mr. NIELSEN. They could lay some aside for the dry period; yes, sir.

Senator DOWNEY. Mr. Chairman, if I might make this comment for the benefit of Senator Anderson: We went through long hearings on this very issue when the Mexican water treaty was up. I certainly reached the conclusion—and I think many others did—that on the basis of past records of the river we were already on a very precarious balance, and with the additional 750,000 acre-feet allowed Mexico, in my opinion it became critical. I must admit, Mr. Chairman, that on the basis of the figures I had I am very much inclined to agree with the viewpoint of Senator Anderson that the whole balance between our water and the claims upon it is already quite precarious.

The CHAIRMAN. The Chair desires to ask Senator McFarland whether he desires to question this witness.

Senator MCFARLAND. Just this question: Mr. Nielsen, was this system of estimation of the amount of water developed by Mr. Debler when he was regional director there?

Mr. NIELSEN. Which system of estimation?

Senator MCFARLAND. That you have been giving here.

Mr. NIELSEN. Yes, sir; but he was only one of many employed. He worked directly with it for many years. But as to this particular application; yes, sir.

Senator MCFARLAND. I was just going to suggest that if at some time we wanted any more information Mr. Debler is available and would be glad to give it.

The CHAIRMAN. Now, Mr. Nielsen, may I ask you if you have now clearly in mind the questions which have been addressed to you for additional material to be presented to the committee in tabular form on Monday?

Mr. NIELSEN. I am sure we have as a group, sir. I am sure my people with me will have gotten it.

The CHAIRMAN. It is not necessary for me to ask for a restatement of those matters?

Mr. NIELSEN. No, sir.

The CHAIRMAN. Now, then, Mr. Nielsen, is there any further statement that you care to make at this point, assuming that all the members of the committee present have asked all the questions they desire to at this point? Is there any further statement that you think should be made to the members of the committee now, for the education of the chairman, let me say?

Mr. NIELSEN. We had thought that the last point we made in this statement was of some interest to the committee.

The CHAIRMAN. Without objection you may proceed to make that statement.

Mr. NIELSEN (reading):

Since the committee has before it copies of the table to which this statement is a preface, it is unnecessary for me to do more than point out its net conclusions. These conclusions appear in line (27) of the table. As there appears, a consistent application of the views of California would mean that there are available 400,000 acre-feet of mainstream water for use in Arizona and a consistent application of the views of Arizona would mean that there are available for use in Arizona 2,273,000 acre-feet of main-stream water.

Senator MALONE. I think that is a very good statement, after we have heard Arizona and California, to be broken down and show why the difference exists.

Senator KERR. I think that appears in the tables attached to this.

Senator MALONE. I think it does but it makes no sense now since we have not heard the others.

The CHAIRMAN. The witness, with his associates, has prepared this complete statement at the request of the committee. Is there any objection to having it made a part of the record, since it has been distributed to all the members of the committee, for whatever weight it may have?

Senator MALONE. I do not think there should be any particular objection except that it is meaningless.

The CHAIRMAN. Subject to all qualifications.

Senator MALONE. Well, could it be? In other words, it is the only thing before us and it takes into account something that is not before us. Therefore, why not withhold it until we get the others?

The CHAIRMAN. You see, Senator, the three statements were submitted at the same time.

Senator MALONE. Well, until we get the information upon which it is based.

Senator MCFARLAND. Mr. Chairman, I think it is for the members of the committee to determine whether it is meaningless. It has been prepared and submitted; and we have discussed it here. I see no reason why it should not go into the record for what it is worth.

Senator KERR. I am quite anxious that it go into the record, together with any additional questions or explanatory notes.

The CHAIRMAN. Without objection it may be made a part of the record.

Senator MALONE. I will withdraw my objection with the comment that I think it is entirely meaningless until we get the statements upon which it is based.

The CHAIRMAN. Very well.

(The document above referred to is as follows:)

STATEMENT OF N. B. BENNETT, JR., E. G. NIELSEN, AND V. E. LARSON ON THE LOWER COLORADO RIVER BASIN WATER SUPPLY

At the close of the March 24 hearings before the Committee on Interior and Insular Affairs of the Senate on S. 75 and Senate Joint Resolution 4, the chairman of the committee requested Messrs. N. B. Bennett, Jr., Assistant Director, Branch of Project Planning, Bureau of Reclamation, Washington, D. C.; E. G. Nielsen, regional planning engineer, Bureau of Reclamation, Boulder City, Nev.; and V. E. Larson, assistant regional planning engineer, Bureau of Reclamation, Phoenix, Ariz., to prepare for the information of the committee a condensed summary of information with respect to the supply of water available for use in the lower basin of the Colorado River and the claims thereon of the States of that basin.

The attached table has been prepared in response to that request.

In any such statement, physical data and their legal significance are necessarily tied together. The Department of the Interior has consistently taken the view that it cannot authoritatively resolve the pronounced differences of opinion that exist between Arizona and California as to their respective rights in the waters available for use in the lower basin under the Colorado River compact. The attached table, therefore, sets out a comparative statement, in terms of acre-feet, of the results of which contentions made publicly by spokesmen for Arizona and California appear to lead. The figures used in this table have, almost without exception, been taken directly from or have been derived from the long-run estimates placed before the Committee on Irrigation and Reclamation of the House of Representatives by spokesmen for those States at the hearings on H. R. 5434, Seventy-ninth Congress, or from such estimates

appearing in the comments of the States on the interim report of the Department of the Interior on the Colorado River (H. Doc. 419, 80th Cong.), which comments are published in the introductory pages of that report. Citations to the sources will be found in the notes to the table. It may be added that the basic long-run physical estimates used by Arizona and California appear to have been derived for the most part from those of the Bureau of Reclamation. Apparent differences in some of these estimates—e. g., in line (1) of the table—result from a rounding of the figures by one State or the other.

In one or two instances it has been necessary, in the absence of any explicit statement of a position by spokesmen for one or the other State, to rely on an undocumented understanding of that position. If in these instances, or indeed in any instance, the position of the State is misinterpreted by the table, correction will be welcomed. Correction will also be welcomed if the views of Nevada, Utah, or New Mexico are not fully or accurately portrayed.

Apart from the large discrepancy which appears in line (7), a discrepancy which arises from the fact that Arizona's statement of natural losses is based upon present stream conditions, California's upon stream conditions under ultimate development, the four major differences whose consequences this table illustrates arise from the varying answers which Arizona and California would, it seems, give to the questions set out in the report of the Secretary of the Interior on Senate Joint Resolution 145, Eightieth Congress. Those questions are:

1. Are the 1,000,000 acre-feet of water for which provision is made in article III (b) of the Colorado River compact "surplus" or "apportioned" within the meaning of section 4 (a) of the Boulder Canyon Project Act? That is, is or is not California entitled to share in the use of III (b) water?

2. Is the flow of the Gila River, for purposes of determining the water supply of the Colorado River Basin, to be measured at the mouth of the stream or elsewhere? And, as another aspect of the same problem, is beneficial consumptive use by Arizona of the waters of the Gila to be measured, in terms of diversions from the Gila River less returns to that river, or in terms of the depletion of the virgin flow of that river at its mouth?

3. Is the water required for delivery to Mexico under the treaty with that nation to be deducted from "surplus" water prior to determination of the amount available for use in California under section 4 (a) of the Boulder Canyon Project Act, or is California entitled to use a full one-half of the "surplus" diminished only by so much of the Mexican requirements as cannot be supplied from the other half?

4. Is the burden of evaporation losses at such reservoirs as Lake Mead to be borne by California and Arizona in proportion to the waters stored there for each of them, or is the burden of these losses to be fixed in some other fashion?

Since the committee has before it copies of the table to which this statement is a preface, it is unnecessary for me to do more than point out its net conclusions. These conclusions appear in line (27) of the table. As there appears, a consistent application of the views of California would mean that there are available 400,000 acre-feet of main-stream water for use in Arizona and a consistent application of the views of Arizona would mean that there are available for use in Arizona 2,273,000 acre-feet of main-stream water.

(Bureau of Reclamation Chart, March 25, 1949, is as follows:)

The lower Colorado River Basin's long-run average water supply and the distribution thereof among the States of the basin according to views expressed by California and Arizona

[Unit, acre-feet]

Line		California	Arizona	California	Arizona
1	There is available for lower basin use from the long-term average flow at Lee Ferry	8,800,000	8,770,000		
	Which is made up of—				
2	Virgin flow at Lee Ferry			16,300,000	16,270,000
3	Minus the amount allocated to the upper basin			−7,500,000	−7,500,000
4	To this must be added water below Lee Ferry in the amount of	2,030,000	1,450,000		
	Which is made up of—				
5	Lee Ferry-Hoover Dam water			1,100,000	1,060,000
6	Hoover Dam-Gila River (Imperial Dam) water			100,000	200,000

The lower Colorado River Basin's long-run average water supply and the distribution thereof among the States of the basin according to views expressed by California and Arizona—Continued

Line		California	Arizona	California	Arizona
	Minus—				
7	Natural losses below Hoover Dam, except Gila			−600,000	−1,080,000
8	Reservoir losses			−870,000	
9	Gila River water			2,300,000	1,270,000
10	Hence there is a total to be distributed among the lower basin States of	10,830,000	10,220,000		
11	Of the "apportioned" waters of the Colorado River system which total	7,500,000	8,500,000		
	There is available for use in—				
12	Arizona			2,670,000	3,353,000
13	California			4,400,000	3,883,000
14	Nevada			300,000	264,000
15	Utah and New Mexico			130,000	130,000
16	Plus reservoir losses distributed among the States				870,000
17	Hence there is a "surplus" of	3,330,000	1,720,000		
18	Of this surplus, there is needed to meet the terms of the Mexican Treaty			1,700,000	1,500,000
	And the remainder goes to—				
19	Arizona			0	55,000
20	California			1,630,000	55,000
21	Upper basin			0	110,000
	The "apportioned" and "surplus" waters of the system, then, total:				
22	Arizona	2,670,000	3,408,000		
23	California	6,030,000	3,938,000		
24	Nevada	300,000	264,000		
25	Utah and New Mexico	130,000	130,000		
26	There is now being used by Arizona from the Gila River and its tributaries	2,270,000	1,135,000		
27	Hence, there is available for use in Arizona from the Colorado River system, exclusive of the Gila River	400,000	2,273,000		

NOTES ON THE TABLE

1, 2, and 3: Both parties apparently accept the Bureau's figures on average long-term virgin flow at Lee Ferry (H. Doc. 419, 80th Cong., pp. 17 and 32). There is, of course, no disagreement about the amount allocated to the upper basin States by the Colorado River compact.

4: The discrepancy is explained in the individual items following.

5: There is susbtantial agreement between the parties on this figure (H. Doc. 419, pp. 17 and 33). California has rounded the value, apparently for convenience in use in the computations.

6: California's figure comes from page 33, House Document 419. Arizona's figure has been rounded from 195,000 as given on page 463 of the hearings on H. R. 5434, Seventy-ninth Congress.

7: It is clear that these two figures are not comparable. The California figure is that given for the estimated "annual channel loss that would occur in Colorado River under conditions of full development" (see p. 33, H. Doc. 419). Arizona's figure is rounded from the 1,075,000 given on page 17, House Document 419, for "losses natural and reservoir," or, as it was put at the hearings on H. R. 5434, page 464, "a loss, which is the natural loss from Boulder Dam to Imperial Dam." Apparently the latter definition is correct.

8: This figure is from page 40, House Document 419. It includes an estimated 90,000 acre-foot loss at Bridge Canyon and Marble Canyon. For the comparable Arizona figure, see line 16.

9: California's figure comes from page 32, House Document 419. Arizona's figure comes from page 463 of the hearings on H. R. 5434, and checks very closely with the 1,466,000 given on page 17, House Document 419, when the Boulder Dam-Imperial Dam water of line 6 is subtracted from it. California uses total virgin flow near Phoenix, while Arizona uses virgin flow at mouth.

10: These figures follow from those above, but do not appear in the studies of California in exactly this form.

11: It is California's contention that only III (a) waters are apportioned; Arizona's that both III (a) and III (b) waters are apportioned.

12: The difference between the California and Arizona figures arise from subtracting the sum of lines 13, 14, and 15 and 16 from line 11 and is the direct result of the differences in contention on the matter of apportioned water.

13: Arizona's position is that California is chargeable with her pro rata share of main stream evaporation losses. Arizona computed her share as 317,000 acre-feet in the hearings on H. R. 5434 at page 463; distribution of the balance (553,000 acre-feet) between California and Nevada has been computed at 517,000 acre-feet to California and 36,000 acre-feet to Nevada.

14 and 15: There is no apparent difference of opinion as to Nevada's being entitled to 300,000 acre-feet of apportioned water; presumably in Arizona's view she is chargeable with a proportionate share of main stream reservoir losses. This share is computed to be 36,000 acre-feet under Arizona's views. Apparently California and Arizona are agreed as to Utah and New Mexico's entitlements.

16: This figure does not appear in Arizona's comments. See, however, the discussions on pages 463, 480, 680, and 681 of the hearings on H. R. 5434.

17: These figures represent the differences between lines 10 and 11.

18: It is California's contention that 1,700,000 acre-feet of water have to be set aside to meet the 1,500,000 that are required to be delivered to Mexico, that river regulation can never be more exact than this (see p. 36, H. Doc. 419). Arizona's views are given on page 17, House Document 419 and on page 463 of the hearings on H. R. 5434.

19, 20, and 21: We understand California's contention to be that Mexican treaty water must come first from the half of the surplus water that is not secured to California by section 4 (a) of the Boulder Canyon Project Act and the State Limitation Act (see p. 681 of the hearings on H. R. 5434). It is apparently Arizona's belief that treaty obligations come out of lower basin waters, to the extent that there is surplus water available, generally (see pp. 463 and 470 of the hearings); the effect of this is to prorate the burden of the treaty between Arizona and California and it was so understood by California (see p. 681 of the hearings). The distribution of surplus given in the Arizona column is our understanding, crudely put, of Arizona's views of a proper tentative distribution of this water, the ultimate distribution of which must, in her view, necessarily await proceedings under article III (f) of the Colorado River compact; we are unable to furnish documentary references.

22: These figures are the sum of 12 and 19.

23: These figures are the sum of 13 and 20.

24 and 25: See 14 and 15 above. Arizona recognizes, additionally, Nevada's entitlement to one-twenty-fifth of the surplus waters. See, also, the comments of the State engineer of Nevada, dated February 27, 1948, on the central Arizona project report.

26: California's figure is from page 40 of House Document 419, Arizona's figure is shown on page R-25 of the Bureau of Reclamation's report on the central Arizona project.

27: The result of subtracting line 26 from line 22.

Mr. NIELSEN. May I ask one thing: This information you have asked for over the week end, I am not sure we will have clerical help so that we can get it all ready by Monday morning.

The CHAIRMAN. Do the best you can.

Mr. NIELSEN. Yes; we will.

The CHAIRMAN. Do the members of the committee desire any further information from this witness?

Senator MALONE. I would like to ask one more question; maybe I have overlooked it. Is there a map, data, or did you include in your statement New Mexico's interest in the Gila River?

Mr. NIELSEN. Yes, sir.

Senator MALONE. Or will that be in your statement Monday?

Mr. NIELSEN. That is in this statement, sir. What you wanted from us particularly was the physical facts?

Senator KERR. Senator, if you would read these statements you would find that it is in there and you would find that its meaning is apparent.

Senator MALONE. I am glad you called my attention to that. I did not hear the witness say anything about it.

The CHAIRMAN. Mr. Nielsen, we are very grateful to you. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess until 10 o'clock on Monday morning.

(Whereupon, a recess was taken at 12 o'clock until 10 a. m., on Monday, March 28, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

MONDAY, MARCH 28, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in Room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman), presiding.

Present: Senators O'Mahoney, McFarland, Downey, Anderson, Kerr, Malone, Millikin, Ecton.

The CHAIRMAN. The committee will please come to order.

Mr. Nielsen, what luck did you have with the preparation of the additional material?

Mr. NIELSEN. Over the weekend we did prepare a statement of the material which I tried to give extemporaneously on Saturday. We tried to be responsive to Senator Anderson's request for information as to long trends. We expect momentarily to have certain charts, which are being reproduced just now, brought to us.

The CHAIRMAN. It is not ready for presentation yet?

Mr. NIELSEN. If you are ready to go into my narrative presentation, yes. The charts should be here momentarily.

The CHAIRMAN. Very well.

STATEMENT OF E. G. NIELSEN—Resumed

Mr. NIELSEN. The first portion of my material is a summary of the material which I gave on Saturday, except that we have provided tables which extend the tables that appear in the Colorado River Basin report, for Lee Ferry, through the calendar year 1948.

Senator KERR. May I make an inquiry? Is Senator Anderson to be with us?

The CHAIRMAN. He has been summoned and he sent word that he would be here.

Senator KERR. Off the record.

(Discussion off the record.)

The CHAIRMAN. Proceed, Mr. Nielsen.

Mr. NIELSEN. Would you prefer that I go over again the material I presented extemporaneously on Saturday?

The CHAIRMAN. Not unless you have made some changes.

Mr. NIELSEN. For the changes, I can refer you to the tables which appear at the back of this.

The CHAIRMAN. This statement will appear in the record.

Mr. NIELSEN. We have it ready, yes, sir.

The CHAIRMAN. It will appear in the record, but you do not need to read it. Now give us the changes, please.

Mr. NIELSEN. The changes appear in the tables in that we have extended those tables for Lee Ferry through 1948.

Table 137 is the first of those tables and gives the recorded and estimated historical discharges of the Colorado River at Lee Ferry, for which we strike an average at the bottom of 14,180,000 acre-feet.

Senator MALONE. What page is that on, Mr. Nielsen?

Mr. NIELSEN. The page is not numbered, but it follows page 7.

That table gives the basis of the derivation of the Lee Ferry discharges; the estimated and measured discharges at Lee Ferry, and the new average for the long-term, 1897–1948 period, of 14,180,000 acre-feet.

The CHAIRMAN. As compared with the old average.

Mr. NIELSEN. Fourteen million four hundred thousand.

Senator KERR. Is that after up-stream depletion?

Mr. NIELSEN. That is after up-stream depletion. That is the flow which is estimated to have occurred at Lee Ferry, actually to have occurred.

Senator MALONE. Then, Mr. Nielsen, the annual depletions would have accrued gradually over those years? The flow now would more accurately reflect what the true depletion is now, but if the depletion, as it now occurs, had occurred over all these years, then this would have been a much lower average, is that correct?

Mr. NIELSEN. If I get your question correctly——

Senator MALONE. What does this average of 14,180,000 mean at Lee Ferry on an average, when there has been a slow increase of diversions upstream, so that at this moment it is the maximum it has ever been? It started at a very small amount in, say, 1897. So what does this mean when it is all corrected for the total maximum diversions at the present time?

Mr. NIELSEN. It is purely a matter of a historical record, sir.

Senator MALONE. As a historical record it means nothing, so far as available water is concerned?

Mr. NIELSON. It is only a part of the picture in developing the picture of available water.

Senator MALONE. It seems to me it is not a true picture. Now, let us take a figure of 2 or 2½ million depleted now above Lee Ferry. Then you would have to correct it back to 1897 in order for the average to mean anything?

Mr. NIELSEN. We have that developed in the next table.

Senator MALONE. All right.

Mr. NIELSON. The next table is table 140 from the Colorado River Basin report, also extended through 1948, and if you will notice, column 1 is the data which appears in the last column of the previous table, the "Historical Flow of the Colorado River at Lee Ferry."

Senator KERR. That is column 1 after the column of dates?

Mr. NIELSEN. That is correct, sir.

The CHAIRMAN. Mr. Nielsen, on page 2 of table 140, I observe some data at the bottom of the table under the heading "Averages."

Mr. NIELSEN. Yes, sir.

Senator MALONE. The pages are numbered, and there is no number of the table.

Mr. NIELSON. The table number appears at the top of the table in roman numerals, sir.

Senator MALONE. Oh, excuse me.

The CHAIRMAN. May I direct your attention to the figure which appears opposite the date line 1922 to 1948, bearing in mind your testimony before the committee last Saturday that the actual measurement of the flow at Lee Ferry began in 1921.

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. This figure of 12,628,000 acre feet is an actual measurement figure?

Mr. NIELSEN. That is correct, sir.

The CHAIRMAN. So we have from 1922 to 1948 the measured average?

Mr. NIELSEN. That is right.

The CHAIRMAN. Namely, 12,628,000.

Mr. NIELSEN. That is right.

The CHAIRMAN. Now, the three lines above that reading upward respectively 1897–1921, 1897–1943, and 1897–1948, we have this curious variation, it seems to me; 1897 to 1921, which is the unmeasured historical record—that is to say, these are averages determined to the best ability of those who are estimating the flow—am I right?

Mr. NIELSEN. That is correct, sir.

The CHAIRMAN. It is estimated that the average for that period before the actual measurements began, was 15,856,000 acre-feet. The combination of those estimates and the measurements from 1921 to 1943, appear in the line next above under the heading, "1897–1943," and that gives us a lower figure, 14,400,000 acre-feet.

Then the top figure, which is the latest, the average for the years 1897 to 1948, gives us a still lower figure, 14,180,000. Now, what inference, in your judgment, should the committee draw from the fact that these figures show a decline?

Mr. NIELSEN. I should say that the 1922–48 period reflects a period of very serious drought during the 1930's, sir, a period which we think is one of the very serious droughts in the history of the Colorado River.

The CHAIRMAN. That is brought out in line 1931 to 1940?

Mr. NIELSEN. That is correct, sir.

The CHAIRMAN. Which shows the actual measured flow of the river 10,171,000?

Mr. NIELSEN. That is correct.

The CHAIRMAN. Now, 1922 to 1948, which gives a measured flow of 12,628,000, is below the figures I first cited, 1897 to 1921, because in your opinion it included this period of extraordinary drought?

Mr. NIELSEN. It gave undue weight to that period of unprecedented drought, yes, sir.

The CHAIRMAN. Now, have you anywhere at any time made an estimate of the amount of water which can be stored in years of high flow to be used in years of low flow? Let me explain why I ask that question. Not being an engineer perhaps I would have to explain a little bit more. My theory about this water supply business is that dams are built in order to conserve the high flow in prolific years to be distributed in drought years, is that right?

Mr. NIELSEN. That is correct, sir.

The CHAIRMAN. Now, what estimates do you have as to first, the amount of water presently being stored, and therefore likely to increase the flow of the river, the supply; and what figures do you have about possible estimated storage which would have the effect of balancing the supply?

Mr. NIELSEN. I think the storages sir, available in the upper basin presently, would have little effect upon the river at Lee Ferry. The Bureau of Reclamation is developing plans for the upper basin of the Colorado River, and we are in very close touch with those plans. They estimate that they will require in the upper basin from 27,000,000 to 34,000,000 acre-feet of storage to meet their obligation at Lee Ferry. They think they will be able to justify that amount of storage in terms of costs and benefits.

Senator MALONE. What was the amount of the storage?

Mr. NIELSON. Twenty-seven million to thirty-four million.

Senator KERR. Over and above what now is there?

Mr. NIELSEN. That is correct, sir

Senator MALONE. That is in the upper basin?

Mr. NIELSEN. Yes, sir.

Senator MALONE. Do you have the dam sites estimated for that amount?

Mr. NIELSEN. Oh, perhaps twice that amount of capacity, sir.

Senator MALONE. But that amount could be justified?

Mr. NIELSEN. That is the present thinking. The details remain to be devloped.

The CHAIRMAN. Now, may I ask you, when the Colorado River Compact Commission settled upon this figure of 7½ million actual flow at Lee Ferry, or 75 million for every 10-year period, was it taking into consideration possible storage, or only the historical flow?

Mr. NIELSEN. I would say that certainly the upper basin States must have had in mind——

The CHAIRMAN. I am not talking about what the upper basin States had in mind, but what the Commission had in mind.

Mr. NIELSEN. Well, as those upper basin States' representatives were a part of the Commission, they must have realized that in order to develop fully the potentialities in the upper basin they must have storage reservoirs.

The CHAIRMAN. That is right, but when they agreed to deliver 7½ million acre-feet per year, were they counting on storage to enable that to be done, or were they counting upon the normal flow?

Mr. NIELSEN. Oh, I would think they would have been counting upon storage.

The CHAIRMAN. Well, do you have any evidence before you to show that?

Mr. NIELSEN. No, sir; but I think I can find some for you.

The CHAIRMAN. You must have formed that opinion on some sort of evidence.

Mr. NIELSEN. I just cannot conceive of engineering planners for the upper basin not having in mind storage.

The CHAIRMAN. Now, how about storage in the lower basin? What will the effect of that be on the water supply?

Mr. NIELSEN. That again will be a matter of construction of the language of the compact. Of course, we have developed Lake Mead

with a very substantial storage, and, as I understand it, it must function for agriculture to equate the flow of the stream at that point.

The CHAIRMAN. How much of that storage is in Lake Mead?

Mr. NIELSEN. That is 32,000,000 acre-feet gross, and about 23,000,000 acre-feet active or usable capacity.

The CHAIRMAN. Over how long a period would you expect that storage to be distributed to the benefit of the lower basin, without running into a great diminution of water supply because of a dry period?

Mr. NIELSEN. Well, sir, if the requirement of the lower basin were of the order of a million acre-feet over and above that which is delivered by the upper basin at Lee Ferry under the 7,500,000 rule, it would appear that they might draw on Lake Mead for 20 years.

The CHAIRMAN. So that you have the possibility, if I understand you correctly, of storing enough water in Lake Mead to equalize the flow for a period of 20 years, so that during that time one could normally anticipate another cycle of wet years which would keep the reservoir full?

Mr. NIELSEN. Well, I think we would have to say that on the basis of past experience there is the possibility that the lower basin might have to be shorted in some degree through lack of full storage at Lake Mead.

The CHAIRMAN. Are there any other possibilities for storage?

Mr. NIELSEN. Within the lower basin there are possibilities of storage, but not of major consequence; no, sir.

The CHAIRMAN. So that you are telling the committee that, so far as the broad outlines of this picture are concerned, the lower basin must depend upon the present storage capacity in Lake Mead?

Mr. NIELSEN. For the long-time pull; yes, sir.

Senator MALONE. Mr. Nielsen, you have opened up a rather interesting angle there. There are three dams, Hoover Dam, Parker Dam, already constructed, and the Davis Dam now nearly completed, perhaps to be completed next year. Those three together would just about complete the storage possibilities in the lower basin, is that right?

Mr. NIELSEN. If you were to bring in Davis and Parker, you would also have to bring in Bridge Canyon as of about the same consequence.

Senator MALONE. What does Bridge Canyon store, under some of the estimates you have made?

Mr. NIELSEN. It would depend upon the final study—about 2½ million acre-feet.

Senator MALONE. It does not store so much, but it is a rather high dam?

Mr. NIELSEN. It is a high dam.

Senator MALONE. How high is it, the way you have estimated it?

Mr. NIELSEN. About 600 feet.

Senator MALONE. It does not vary very much from Boulder Dam in height?

Mr. NIELSEN. No.

Senator MALONE. But it is mostly to regulate the river in connection with Hoover Dam and the other dams, and to produce power; is that right?

Mr. NIELSEN. It will not accomplish much in the way of river-regulation, but it will provide a source of power.

Senator MALONE. It will prevent the silt from entering the lower dam to a large extent; is that right?

Mr. NIELSEN. When we discuss silt in relation to Bridge Canyon, we must remember that we cannot in the Bureau divorce Coconino Dam on the Little Colorado River, and bluff on the San Juan, from Bridge Canyon. We think of them as three parts of the whole.

Senator MALONE. For the purpose of my question, we take in all the dams above Hoover Dam. But when Bridge Canyon is constructed, even if no other dam were constructed, eventually, of course, the silt would settle in the Bridge Canyon Reservoir, and it would pick up the silt between Bridge Canyon and Lake Mead, then practically no silt would enter Lake Mead until such time as the Bridge Canyon Dam became filled—if it ever does; is that right?

Mr. NIELSEN. Except for the Verde and Muddy River systems.

Senator MALONE. Of course, but that is a very nominal amount in comparison, is it not?

Mr. NIELSEN. Yes.

Senator MALONE. A very nominal amount. Would you say 5 percent?

Mr. NIELSEN. I would guess about that.

Senator MALONE. Well, anyway, a very nominal amount.

Now, I am very interested in your statement of what you intend to do when you construct these projects, that is, to take a 20-year supply out of Lake Mead. Where would that leave the level of water in Lake Mead, and about how many acre-feet would be left in the reservoir?

Mr. NIELSEN. Well, of course, that is a matter of estimate.

Senator MALONE. I am talking about your own figures.

Mr. NIELSEN. On the hypothetical assumption that the lower basin were called upon to take 1,000,000 acre-feet a year out of Lake Mead for 20 years, it would then, as a rough guess as to evaporation, bring you down to about 9,000,000 acre-feet of storage.

Senator MALONE. Nine million acre-feet?

Mr. NIELSEN. Just about the bottom, so far as power operations are concerned.

Senator MALONE. In other words, there would be very little, if any, power developed after that, because you would be conserving it for irrigation?

Mr. NIELSEN. That is right.

Senator MALONE. Then there would be no repayments to the Government at all from Hoover Dam, such as is being done now through the amortization payments over the 50-year period, is that right?

Mr. NIELSEN. No; I do not think that is quite accurate. As I understand it, our contracts require payment, regardless of the stage of the reservoir, or the amount of kilowatt-hour output.

Senator MALONE. You mean they require a certain amount of payment from the potential users of the power, or I might say, the historic users of the power. If the power disappeared they must continue the payments, is that right?

Mr. NIELSEN. That is as I understand it.

Senator MALONE. Do you have any idea that you would receive such payments? Would there not be a bill in this Congress to defer payments until such time as the water came up again and the power was available?

Mr. NIELSEN. I could not guess as to what the contractors might do.

Senator MALONE. Well, I could assure you that that would be the case. In other words, there would be no payments whatever, and no money collected.

Mr. NIELSEN. I would not expect that; no, sir.

Senator MALONE. You would not expect any money to be collected, would you?

Mr. NIELSEN. Yes, I would.

Senator MALONE. Well, of course, you are very young in the business.

Mr. NIELSEN. I agree with you.

Senator MALONE. Wait until you have had some experience.

Senator DOWNEY. Senator, I would like to understand the witness. Do you mean to say if power were not available to us in southern California still you would expect us to pay for it?

Mr. NIELSEN. Sir, I am not an attorney, and I cannot say that I understand this contract.

Senator DOWNEY. I understand that. I was just asking you what opinion you expressed.

Mr. NIELSEN. It is my understanding that the contracts for the Boulder Canyon project require the payment to the United States for the cost of Hoover Dam, less flood control, and the power plant, within a stated period of years. That is my understanding.

Senator MALONE. I think you are entirely correct, that the contracts require that, but I think you would be entirely correct if you said they were to receive power, too, in return for the money they pay in.

Now, let us get by that. I merely wanted your expression on that.

Senator DOWNEY. Senator Malone, if I may intervene there. I am informed that the contracts are very precise that southern California only has to pay, as one might expect, for the power that is delivered, and that if Mead Lake is drawn down, under your assumption, to the point where there would not be any power, under the conracts we would not have to pay and morally I would not expect that anyone would expect us to pay.

Senator MALONE. Right along that line——

Senator MILLIKIN. Would you let me interject a moment, Senator. I was late getting in, and I am very much interested in the point, and I apologize for this late development of it.

What is the assumption that would dry up Lake Mead?

Senator MALONE. Yes; I wish you would explain that to the Senator. I think it is a little new to everyone.

Mr. NIELSEN. I was asked the question as to Lake Mead's ability to serve the lower basin over a period of extended drought. I made the assumption that the lower basin would call upon Lake Mead to make up a deficiency of 1,000,000 acre-feet over a period of 20 years, which with allowance for evaporation, would pull Lake Mead down to the level at which power output would be curtailed. I won't agree that power would ever diminish to zero, because irrigation water would be leaving the dam under a head, and under a minimum head under which the generators could operate, but the power would definitely be curtailed.

Senator MALONE. Give us an estimate of the power, would you.

Mr. NIELSEN. I did not bring an estimate with me.

Senator MALONE. You have three or four assistants here who are experts. Have one of them do it.

Mr. NIELSEN. They can't just do that off-the-cuff.

Senator MALONE. Give me the head, and I will do it myself.

Mr. NIELSEN. I do not believe I have available the minimum head.

Senator MALONE. All right, go ahead.

Senator MILLIKIN. That assumes a drought over the whole system?

Mr. NIELSEN. That assumes a drought over the whole system and the upper basin doing its best, of course, to use the waters of the stream.

Senator MILLIKIN. Does it assume the full development of the stream?

Mr. NIELSEN. It assumes the development of the stream.

Senator MILLIKIN. Upper and lower?

Mr. NIELSEN. Upper and lower.

Senator MILLIKIN. Thank you.

The CHAIRMAN. Is it a reasonable thing to assume a drought of that proportion, in view of the record?

Mr. NIELSEN. I think it could—I have not made this study myself—but I think it might be demonstrated that the lower basin might require of Lake Mead the long-time pull of from 500,000 to 1,000,000 acre-feet; yes, sir. And if I understand the purpose of Lake Mead, it was intended to serve that purpose.

Senator DOWNEY. Mr. Chairman, may I intervene?

Let me ask you this: As a matter of fact, do not your own figures indicate from the past records the possibility that we might have a 10-year period when, in order to meet the requirements of the lower basin, we might have to draw 1,500,000 for a period of 10 years, or 15,000,000 in 10 years? Don't your own figures indicate that?

Mr. NIELSEN. I have not made that study; no, sir.

Senator DOWNEY. Do you know whether your figures indicate that?

Mr. NIELSEN. No; I don't know about that.

Senator DOWNEY. Would you say they don't?

Mr. NIELSEN. No; I would not say they don't, because I am not familiar with that study, sir.

Senator DOWNEY. Now, let me ask you this question: Your figures indicate only that we have to set aside 1,500,000 feet of water to satisfy Mexico, do we not?

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. Isn't it true that in order to deliver a firm 1,500,000 acre-feet down to the Mexican border we certainly would have to lose an average of 1,700,000 to guarantee getting 1,500,000 down there?

Mr. NIELSEN. I don't think the Bureau would agree to that figure; no, sir.

Senator DOWNEY. How much do you think we would have to deliver?

Mr. NIELSEN. One million five hundred thousand acre-feet, with careful husbanding of the water, sir.

Senator DOWNEY. That is, you mean to say—what is that distance, 600 miles down there?

Mr. NIELSEN. From Lee Ferry?

Senator DOWNEY. Yes.

Mr. NIELSEN. That was the figure that was supplied the other day.

Senator DOWNEY. No; I mean from the Hoover Dam.

Mr. NIELSEN. So that I do not make the same mistake I am going to check it.

How far is Hoover Dam from the Mexican boundary?

Senator ANDERSON. Four hundred miles.

Senator DOWNEY. About 400 miles. Well, don't you think that since our obligation every day is to deliver 1,500,000 feet of water, and since you have varying winds that may retard or slow your stream, which cannot be foreseen—and in order to be sure that you get down there every day the water that Mexico is entitled to and is planning on and must get, otherwise we will be liable to damages—that there must be a margin of safety there?

Senator ANDERSON. Do we have a day-by-day guaranty to Mexico?

Senator DOWNEY. Yes, we do, Senator; and the engineers who have studied it carefully—and this is a point against us—say there can be no assurance when they start that water out to go 400 miles, that at any particular time we are going to day by day guarantee 1,500,000, unless we exhaust 1,700,000, because your stream may be very much delayed 5 or 10 percent in its flow. It has that much variation.

Senator ANDERSON. One million five every day would be a lot of water.

Senator DOWNEY. Oh, I beg your pardon. I mean at that rate. I mean at the annual rate of 1,500,000. I beg your pardon.

Senator MILLIKIN. Mr. Chairman, I just want to comment on what the Senator from California stated.

I think we have considerable control over when we deliver the water to Mexico.

Senator DOWNEY. Senator, so I may clearly understand, you mean to say our obligation is not to deliver at the rate of one million five the annual rate as required by Mexico?

Senator MILLIKIN. No; I say we have considerable control over when we deliver it. That makes a difference. I mean, if you had to deliver an average daily amount divided into a million and a half, that is one thing, but if you have control over when you are going to let the water down, that is something else,

Senator DOWNEY. I understand the former assumption is correct, Senator, that Mexico has the right to call for it at that annual rate, and to have the delivery made.

Senator MILLIKIN. I have no objection to the annual rate, but I say we have retained large controls over when we deliver it.

Senator DOWNEY. Mr. Chairman, I do not want to indulge in any testifying myself. We will later attempt to show that by general, universal engineering opinion, and in order to satisfy Mexico's annual rate of a million five, we will have to let down the equivalent of a million seven.

Then might I ask you this one further question:

You stated to the Chairman, or rather, the assumption was that went we went into a drought period which you say might take a million acre-feet a year out of the dam—and I think might take a million five—you went upon the assumption that the reservoir would be full, did you not?

Mr. NIELSEN. That is right.

Senator DOWNEY. Well, isn't it possible you might go into that dry era with your reservoir not full?

Mr. NIELSEN. That is possible.

Senator DOWNEY. Yes. That is all.

Senator MALONE. Mr. Chairman, I think if we could inquire and furnish for the record the irrigation seasons in the period covered by the delivery of water to Mexico, it would be very easy to see the number of per-second feet that would be required.

What do you have in mind as the general losses to the river through evaporation and seepage, from Hoover Dam, say, to the All-American Canal?

Mr. NIELSEN. The natural channel losses between Hoover Dam and the mouth of the Gila we estimate to have been 1,030,000 acre-feet.

Senator MALONE. What percentage of the total flow in the river at a given point, and in a given time?

Mr. NIELSEN. Would you prefer to have that on the basis of the flow as it has been experienced recently? It would be roughly one part of, say, 14,000,000 acre-feet over the past few years.

Senator MALONE. What is that?

Mr. NIELSEN. One part in 14, or roughly 7 percent.

Senator MALONE. A 7-percent loss?

Mr. NIELSEN. Yes.

Senator MALONE. Now, if you delivered a million and a half acre-feet, then 7 percent of the one million and a half acre-feet, that part of the loss would be just about what you would have to add to the total, would it not? That would be roughly one-fifteenth or one-fourteenth?

Mr. NIELSEN. Expressed in terms of annual amounts; yes, sir.

Senator MALONE. That amounts to how much, one-fourteenth of 1,500,000 would be——

Mr. NIELSEN. About 110,000 acre-feet.

Senator MALONE. Well, some place between 110,000 acre-feet and what the Senator described would probably be about the amount that would have to be charged to that loss? In other words, your statement obviously could not be correct that there would not be any loss.

Senator KERR. Well, you would have the loss anyway.

Senator MALONE. Well, you would have the loss anyway when you are delivering the 1,500,000 acre-feet, so you would charge it to us, to California, to Arizona, and everybody, so it works both ways. It would be quite a thing if you made just one State stand it.

Mr. NIELSEN. If you are going to introduce that loss, then you must go to the flow at the Hoover Dam in order to reconcile your estimate.

Senator MALONE. Wherever you go to it, it is all right with me, but it is about 7 percent.

Now, I want to clear up one thing we seemed to have a little misunderstanding on a little while ago. The State of Nevada does have the delivery of water for generation of electrical energy. In 1927, after they finally discovered Nevada was a part of the set-up in the Boulder Dam—now Hoover Dam, which is located half in Nevada and half in Arizona, we had a withdrawal privilege on power. We were able to secure that. Eighteen percent of all the power was to be withdrawn if and when. There were certain rules and regulations laid down for that.

Now, we have withdrawn a certain amount of power. I think this is important, Mr. Chairman.

In that contract, and right in line with my questioning of Mr. Nielsen here, and I am sure het hought he was giving me the right answer; I merely want to inject this in the record to show that the income from Hoover Dam to amortize and pay the interest on the investment, would stop if the power revenue stopped.

Paragraph (c) of that contract reads, the Nevada contract for electrical energy, that is, for the water to generate energy, reads—and this is on page A–349, paragraph (c) of the Hoover Dam documents, 1948, second edition:

> Should the delivery of water for any reason or cause other than an act or omission of the State be discontinued or reduced below the amount required for the generation of firm energy in accordance with the provisions of this contract, the total number of hours of such discontinuance or reduction in any year shall be determined by taking the sum of the number of hours during which delivery of water is totally discontinued, plus the product of the number of hours during which the delivery of water is partially reduced, and the percentage of said partial reduction below the actual quantity of water required for the generation of firm energy, total or partial reductions in the delivery of water which do not reduce the power output below the amount required at the time of the generation in the form of energy will not be considered the total hours in this contingent in any year. The minimum annual payment specified in article 14 hereof shall be reduced by the ratio that the total number of hours of such discontinuance bears to 8,760.

Now, would you still say that revenue would continue unabated?

Mr. NIELSEN. I am not an authority on those contracts, but I have the firm opinion that the obligation to pay for Hoover Dam, less flood control, must be accomplished within that stated period.

Senator MALONE. Where would it come from?

Mr. NIELSEN. Well, in the first place, the condition of long-pull on Lake Mead we do not think could conceivably occur during the repayment period.

Senator MALONE. We are simply assuming a hypothetical case, as you yourself raised, that it does occur.

Mr. NIELSEN. Then when it does occur there would still be releases for irrigation at perhaps the minimum head available for power, or suitable for power. There would still be energy generated. It will be in substantially lesser amounts.

Senator MALONE. That is right. In other words, it will not be the amount purchased, or paid for under the contract.

Mr. NIELSEN. Well, I still have the firm idea that that dam shall be paid for within a specific number of years.

Senator MALONE. I think, Mr. Chairman, we should require the witness to present the evidence that the income will continue unabated. Of course, all of us know that it would not, even if it is provided for, because there would be a bill in here in 5 minutes and we would write it off. But I want to show it is not even in the contracts now, that the Government must deliver to get the money. It is a very important item, as we will show later on.

I would like to ask the witness, departing from that for a moment, if we may have the understanding that you will present the evidence from which you draw your conclusions that the income will continue unabated, regardless of whether there is a very small amount of energy delivered, or whether it is the amount that is contracted for that is delivered.

Do I understand you, then, to say you are recommending a development on the river and that knowingly you are counting on depleting the

water in Lake Mead to a point of, say, 20,000,000 acre-feet below capacity, assuming that it is full when it starts?

Mr. NIELSEN. If I understand the question and understand the Boulder Canyon Project Act, I had assumed that was the purpose of Lake Mead, the first and primary purpose of Lake Mead.

Senator MALONE. To regulate the river?

Mr. NIELSEN. Regulation of the river and control of floods.

Senator MALONE. Control of floods, that is true. Is there anything in the Lake Mead regulatory set-up which assumed there would be no way of repaying us? There is nothing which comes from the water payments to amount to anything at all. There is no required repayment and yet you are now recommending projects which will deplete Lake Mead to a place where the revenue to the Government obviously must practically cease, unless it is paid by someone who receives no return?

Mr. NIELSEN. That condition could occur, in our opinion, only long after the repayment had been accomplished.

Senator MALONE. Well, let us refer to your figures. I understood you to say a while ago that in the 1922 to 1948 period where you have really measured the river—the rest of them are hypothetical, based on tree rings, and various other assumptions—12,628,000 acre-feet is the historical flow in the Colorado River at Lee Ferry.

The estimated virgin flow at Lee Ferry, from 1922 to 1948, inclusive, does not include any water now utilized in the upper basin, which I understood you to say was around two and a half million feet.

Mr. NIELSEN. Over that period was 2,232,000 acre-feet.

Senator MALONE. That is included in the 14,860,000?

Mr. NIELSEN. That is right.

Senator MALONE. Assuming right at the moment that the 2,232,000 acre-feet is being utilized in the upper basin, totally utilized and depleted, that is, the stream depleted by that amount, then that amount subtracted from 14,860,000 acre-feet leaves us 12,628.

Mr. NIELSEN. That is right.

Senator MALONE. Now, this 12,628, is that an average over the years, or is an allowance made for the increase from year to year, 1922 to 1948, the gradual increase in irrigation shown above? Is each year taken into consideration in the 12,628 in arriving at that average?

Mr. NIELSEN. Well, the 12,628 figure is entirely a measured figure. There is no allowance. The allowance you are speaking of comes in the 2,232,000 acre-foot figure.

Senator MALONE. I understand that. But each year you measure the actual flow.

Mr. NIELSEN. That is right.

Senator MALONE. Now, each year it increases somewhat up-stream.

Mr. NIELSEN. That is right.

Senator MALONE. Is all that taken into consideration, the margin of increase, on the average?

Mr. NIELSEN. Those averages derive from the detailed data immediately above, Senator Malone. You see, you have our estimated depletions by years immediately above. That is column 4. They begin in 1922 with 2,457,000.

Senator MALONE. Yes. Then you do arrive at a figure of 14,860,000 acre-feet as the average flow for the measured period upon which we can no doubt depend?

Mr. NIELSEN. The average virgin flow.

Senator MALONE. We can get rainfall increases or decreases from now on and it will vary to a certain degree.

Now, the upper basin is entitled, according to the contract, to deplete the stream flow further by 5,258,000 acre-feet; is that true?

Mr. NIELSEN. That is my understanding.

Senator MALONE. What does that leave us in the lower basin at Lee Ferry, if they should deplete the flow that much?

Mr. NIELSEN. That would be 14,860,000 less 75 hundred——

Senator MALONE. Yes; that is right. What is that amount?

Mr. NIELSEN. That would leave seventy-three sixty.

Senator ANDERSON. I am not clear that there is permission anywhere for the upper-basin States to deplete it 7,500 feet.

Mr. NIELSEN. I was just about to make that point, sir.

Senator ANDERSON. We are required to deliver a certain amount; we get what is left.

Mr. NIELSEN. I was just about to make that point.

Senator MALONE. I was coming to that, and I am glad the Senator interjected.

Now, in the contract itself, if they did take out their seven and a half million acre-feet, it would leave 7,360,000 acre-feet.

Mr. NIELSEN. That is right.

Senator MALONE. They are required to turn down 7,500,000 acre-feet each year; is that true?

Mr. NIELSEN. No; or over a 10-year period 75,000,000.

Senator MALONE. Or over a 10-year period 75,000,000 acre-feet?

Mr. NIELSEN. That is right.

Senator MALONE. Which would be an average of 7,500,000.

Mr. NIELSEN. That is right.

Senator MALONE. Now, they might elect to use the 7,500,000 acre-feet, let it accumulate and do the best they could to make it up later. However, it is very close.

So let us assume we have the 7,500,000 acre-feet of water at Lee Ferry, instead of the 7,360,000, and you did turn down from the upper basin, Senator Anderson, the full amount and short yourself that amount. Then that is the amount of water we can depend on, in actual measurements of the Colorado River, for the full use, plus accretions and less depletions through evaporation, losses, and other factors—that is the amount of water we start with to serve Mexico a million and a half acre-feet and the five lower-basin States?

Mr. NIELSEN. Except that the upper basin States still have the continued obligation of the treaty with Mexico.

Senator MALONE. Well, I understand that. It has been a long time since I read the contract thoroughly, but I understand this: If we are short, say, a half million acre-feet or let us say we had no water for old Mexico at all. Then out of the lower basin water and out of the upper basin water would come 50 percent from each. Is that correct?

Mr. NIELSEN. That is as I remember it.

Senator MALONE. I think that is all I have.

The CHAIRMAN. Now, Mr. Nielsen, in the life of a river such as the Colorado River, the period from 1897 to 1948, is extremely short.

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. There are other scientific methods of determining rainfall and water supply and the measurement of water?

Mr. NIELSEN. I have some information bearing on that, sir.

The CHAIRMAN. You are referring now to the tree rings?

Mr. NIELSEN. Yes, sir.

The CHAIRMAN. That was mentioned the other day. I would like to have you develop that, sir, because of the effect it may have on the conclusion we are entitled to draw as to the long-time supply of water in this basin.

Senator MALONE. Mr. Chairman, if you are going into the long-range thing now, which you said you thought we should, I would like to have the record show at this time—and if Mr. Nielsen disagrees with these figures I would be glad to have him say so—that out of this 7,500,000 acre-feet, plus the additions to the river from Lee Ferry to the Mexican border, less natural losses, we are to furnish water amounting to the sum—according to the testimony of each of the States involved in this hearing—less Utah and New Mexico, Senator—of 4,400,000 acre-feet to California; 2,800,000 acre-feet to Arizona; 1,000,000 acre-feet out of the Gila River to Arizona; one and a half million acre-feet to Mexico, and 300,000 acre-feet to Nevada. That makes a total of 10,000,000 acre-feet of water.

Mr. NIELSEN. I would have to say that I prefer those remain your figures.

Senator MALONE. They will remain mine until you can substitute some that will stand up.

Senator ANDERSON. Can you tell me what to do with this 4,400,000 California figure, along with the contracts for 5,362,000?

Mr. NIELSEN. No, sir; because it depends upon an interpretation of contracts which state that water delivered thereunder is subject to the availability under the Colorado River compact.

Senator ANDERSON. Well, we haven't firm contracts for 5,362,000.

Mr. NIELSEN. I think only an attorney could tell you that, sir. Certainly we have heard a lot of arguing about that.

Senator ANDERSON. We had some attorneys on, and I did not get too much from them. I do not know where I am going to turn to find out what I want.

The CHAIRMAN. May I suggest that first we try to develop this water supply and then go into that?

Senator MALONE. Mr. Chairman, if you will allow me to say right at this point, that is why we joined in the resolution to determine what the compact meant and where the water belonged, before we permitted them to try to deliver about twice as much water as there is in the river.

The CHAIRMAN. I understand that.

Senator KERR. May I interject here, for the information of the committee?

The CHAIRMAN. Certainly.

Senator KERR. Isn't it pretty well agreed by everybody that the contract which each State or user has carries a limiting clause that the amount of water thus contracted to be delivered is to be delivered if it is available under the compact and other laws and contracts relating thereto? Do they not all carry that? Is that not a matter of general information?

The CHAIRMAN. That was my understanding.

Senator MALONE. I think that is a matter of general information, Senator, and if I could just say this for the record: There have been serious questions raised over the years as to the meaning of contracts which attorneys differ on.

Senator KERR. That is a different question than the one I was asking.

Senator MALONE. Yes, I understand that. But those things must be determined along with the interpretation of the compact as to whether or not the Gila River is in the compact, as to whether or not the 4,400,000 acre-feet to California is a limitation, which it was certainly meant to be, and whether or not the 2,800,000 acre-feet belongs to Arizona and various other things. We know the amount of water asked for is not in the river, so the only way some of us could understand what water is available before we go into new projects—we have all taken that position on the river, except Arizona—is to have either a compact, which seems impossible, or an interpretation by a court of competent jurisdiction.

Senator MCFARLAND. Mr. Chairman, I do not want to go into this matter, because we will develop it later in the testimony and I think we may thus save time; but I would like to say to Senator Anderson that the Self-Limitation Act of California limits her to 4,400,000 acre-feet of water as the maximum of III (a) water and to one-half of the excess and surplus water. So anything above the 4,400,000 could not, under any circumstances, be a firm contract.

The CHAIRMAN. Now, Mr. Nielsen, let us go into this record you have for what it may be worth.

Mr. NIELSEN. If you will refer to this largest chart——

The CHAIRMAN. What is this large chart?

Mr. NIELSEN. That is a chart which appeared in a publication by Edmund Shulman, a dendrochronologist on the staff of the laboratory of tree-ring research of the University of Arizona. He states in his publication Tree-Ring Hydrology of the Colorado River Basin, on page 48, in which he summarizes that part of his study——

Senator MALONE. That is page 48 of what?

The CHAIRMAN. That is page 48 of this man's book.

Mr. NIELSEN. That is Tree-Ring Hydrology of the Colorado River Basin.

Senator MALONE. Where is that?

Mr. NIELSEN. I have that here. This is the publication, sir.

Senator MALONE. Do you have extra copies of it?

Mr. NIELSEN. We will try to get them for you. We were lucky to find one over the weekend.

Senator DOWNEY. Do you think you were lucky or unlucky, Mr. Nielsen, which?

Mr. NIELSEN. On the basis that I was trying to furnish the committee information, I was lucky.

Senator DOWNEY. Thank you.

The CHAIRMAN. What does this purport to show?

Mr. NIELSEN. The chart purports to show the correlation between stream flow, as it has occurred, and stream flow as it might be estimated to have occurred over the long pull from the year 1250, or thereabouts, based upon the measurement of tree-ring growth.

Senator MALONE. Who is Mr. Shulman, would you identify him?

Mr. NIELSEN. That will appear at the top of page 4 of this material which I brought.

Senator MALONE. I think you should read it into the record.

Mr. NEILSEN. I did read it once. Edmund Shulman, dendrochronologist on the staff of the laboratory of tree-ring research, University of Arizona, states in his publication, Tree-Ring Hydrology of the Colorado River Basin, on page 48:

On the basis of the 658-year index of the Colorado River run-off it appears that:

(1) On the average, 1 year in 50 shows growth less than 50 percent of the mean, indicating drought and low run-off of the severity of 1902 or 1934.

(2) Two successive years of critically small growth, a phenomenon having specially important implications in reservoir management measurement, were found to have occurred only three times in the 658-year record; there were seven 3-year intervals with two such minima.

(3) The average length of an interval of general excess or deficit appears to be about 8 years; intervals more than twice this length tend to occur once in about 200 years; maxima or minima from 2 to 5 years in length together comprise nearly half of all waves, the lengths occurring with about equal frequency.

(4) Since A. D. 1300, the interval of most severely dry conditions and low run-off seems to have occurred in 1573–93, when the average deficiency was well below that of the recent, generally dry intervals 1879–1904 and 1931–40.

(5) No cyclic recurrence considered to provide a secure basis for long-range forecasting has yet been derived from these data; a recurrence of length 23½–24 years is dominant during the last three centuries in the growth curves and appears to possess physical reality.

If you will look at panel D of this chart, you will note it represents the Colorado River above Lee Ferry. A sensitive relationship between tree growth and run-off is demonstrated in his paper.

Senator MALONE. What years are these?

Mr. NIELSEN. You have your chronological scale at the bottom of the sheet, sir, starting at the left, at 1250.

Senator MALONE. The thirteenth century?

Mr. NIELSEN. That is right, 1250 A. D.

Senator MALONE. How do you determine what the run-off was there in 1250, except from the tree rings?

Mr. NIELSEN. He has correlated only the recent run-off, sir, and finds what he terms a sensitive relationship between his knowledge of run-off as it occurred, and his knowledge of tree rings, as they have occurred during that corresponding period. He projects his estimate back.

Senator MALONE. Then this run-off is a recent run-off, projected for the same period of the year on the actual growth of tree rings, is that right?

Mr. NIELSEN. That is right.

Senator MALONE. It is a recent run-off, then. It is not the 1250 run-off; it is 1920, or some such actual measurement?

Mr. NIELSEN. That is right. He uses the tree ring as an index of the run-off.

The paper does not extend to a consideration of climatic trends, but inspection of plate III does afford a basis for judgment of this matter.

Senator MALONE. I hate to interrupt again, but it said here—maybe I am on the wrong side. Are you at the beginning of the chart?

Mr. NIELSEN. The whole chart.

Senator MALONE. That simply takes two trees, one a pine tree, and one a Douglas fir, but I see no chart here which says anything about a run-off.

Mr. NIELSEN. No, sir; he develops that in his paper at another place. But bear in mind his run-off is from records which started back in about 1897.

Senator MALONE. I understood you to say a little while ago it is simply projected backwards on the same time of year, with the period of years that were measured, and then the tree-ring growth had some similarity. This has nothing to do with any recent measurements; it is simply related to trees?

Mr. NIELSEN. Not two trees. This is simply the pine-tree index, the ponderosa and limber pines. He has used many trees through the basin.

Senator MALONE. Yes; the Douglas fir is just below it.

Mr. NIELSEN. Yes; but the curve for pinon pine represents that family of pine.

Senator MALONE. Now, these trees which date back to 1250, what condition are they in now? Were they petrified trees?

Mr. NIELSEN. No, sir; I understood they were live trees.

Senator DOWNEY. May I ask if some of those trees he is reading are now 800 years old and living?

Mr. NIELSEN. They have been cut down, sir.

Senator DOWNEY. I thought you said living trees.

Senator ANDERSON. Well, they were living. They were not lying on the ground and rotting, they were live trees.

Senator MALONE. They were living trees, because certainly in the last hundred years they would have been cut down.

Mr. NIELSEN. He describes that in his report.

That is what we have to offer as to long-time hydrology.

Senator MALONE. Does he bring in any of his petrified forests? They do have them in Arizona and Nevada and Utah.

Mr. NIELSEN. I do not think he did. I think that chemical change would prevent it.

The CHAIRMAN. Does this mean there is a record of trees growing in this basin from the year 1250 to the present?

Mr. NIELSEN. Yes, sir. I put significance in the fact that he says the interval of most severely dry conditions and low run-off seems to have occurred in 1573 to 1593. In other words, we have not seen the worst in our recent history.

The CHAIRMAN. How about the best, have we seen the best yet?

Mr. NIELSEN. He does not tell us about that.

Senator MALONE. That is an important observation, that he thinks it will get drier than it is now.

Mr. NIELSEN. No; he did not say that. Our recent experience does not extend to experiencing the kind of a period that he says occurred in 1573 to 1593.

Senator MALONE. That was a very low period?

Mr. NIELSEN. Yes, sir.

Senator MALONE. He cannot tell whether we are on the way into one of those periods or coming out, or what; is that right?

Mr. NIELSEN. I have a little more which will bear upon that, sir, if I may read it.

This is on page 3, at the bottom, the first full paragraph [reading]:

Senator Anderson has expressed interest in climatic trends as they affect runoff. We have, over the week end, found information bearing on this matter. Ivan Ray Tannehill, chief of the Weather Bureau's Division of Synoptic Reports and Forecasts, states in his publication Drought—Its Causes and Effects, on page 213——

Senator MALONE. Where is this report?

Mr. NIELSEN. Here is a copy.

Senator MALONE. What page was that?

Mr. NIELSEN. Page 213 [reading]:

Finally, returning to the drought problems and to the conditions we have known in recent years, we may expect rainfall for the United States as a whole to continue to vary between limits of moderate deficiency and rather serious excess, with occasional droughts. These will probably be more severe than those in the immediate past if deforestation and cultivation continue to expand. But there is no good reason to think that occasional droughts will become a great deal worse than in recent climatic history so long as we have extensive frozen seas in the polar regions and snow-covered land in winter on the northern part of the continent.

Senator MALONE. If you are leaving this particular thing now, I would like for you to coordinate this statement for me:

Finally, returning to the drought problem and to the conditions we have known in recent years, we may expect rainfall for the United States as a whole to continue to vary between limits of moderate deficiency and rather serious excess, with occasional droughts. These will probably be more severe—

does he mean the drought or the excess, or both?

Mr. NIELSEN. I worried over that sentence myself yesterday, and from the standpoint of grammer I can refer "these" back only to drought. It is an obscure sentence, but I can refer it back only to drought.

Senator MALONE. I think that is what he meant, that the deforestation would emphasize the drought. Is that about right?

Mr. NIELSEN. That is the meaning I get out of it.

Senator MALONE. In other words, he says, "These will probably be more severe than those in the immediate past if deforestation and cultivation continue to expand."

Mr. NIELSEN. That is the understanding that I got.

Senator MALONE. And if we need more food when we have to feed all of Europe and the other countries, chances are it is going to increase.

Now, who is Ivan Ray Tannehill?

Mr. NIELSEN. He is Chief of the Weather Bureau's Division of Synoptic Reports and Forecasts.

Senator MALONE. He is now?

Mr. NIELSEN. He appears in the June 1948 Congressional Record as occupying that position. That is as close as I could get.

Senator MALONE. Thank you.

Could I borrow this from you for a little while?

Mr. NIELSEN. Whose book is that, Mr. Witmer?

A VOICE. It belongs to Assistant Secretary Warne.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. Proceed, sir.

Mr. NIELSEN. I have covered the matter of the tree rings. If I may now go to the last partial paragraph on the bottom of page 4.

The CHAIRMAN. Let me ask you first: What is the conclusion that you and your associates draw from this tree-ring evidence?

Mr. NIELSEN. We have no reason to expect the 1931–40 drought period to occur as frequently as it has occurred within our period of measured discharges; that we can measure on the average for many more years and not again experience the sort of drought we had in 1931–40.

The CHAIRMAN. But in terms of the water supply in the Colorado River Basin, what is the future, so far as you and your engineer associates in the Bureau of Reclamation are concerned, on the basis of all of the evidence which is before you?

Mr. NIELSEN. We think we are not unduly optimistic when we base our water supply studies on the average of 1897–1948.

The CHAIRMAN. You think then this committee in forming any judgments it may be called on to form, may accept those figures from 1897 to 1948 as a reasonably accurate basis for forecasting the future?

Mr. NIELSEN. Yes, sir; I think so.

The CHAIRMAN. Thank you.

Senator ANDERSON. Except that the figures from 1897 to 1921 are hypothetical.

Senator MALONE. Tree-ring estimates.

Mr. NIELSEN. We necessarily, for lack of an adequate stream measuring program in the past, must rely upon estimates of past stream flow.

Senator ANDERSON. But when the Colorado River Compact was signed and it was necessary to measure the water flowing past Lee Ferry, that station was established. And once it was established it indicated that the water flowing past Lee Ferry indicated a stream of 14,000,000 feet, rather than 18,000,000 feet virgin flow.

Mr. NIELSEN. Because in the subsequent 27 years, or thereabouts, we experienced a 10-year period which gives undue weight to the averages, in our opinion. That drought period gives undue weight to the averages, in our opinion.

Senator ANDERSON. Yes; but it is the only measured period.

Mr. NIELSEN. That is correct, sir.

Senator MALONE. Mr. Nielsen, I notice on page 4 of this outline you have presented to us, this statement by N. G. Bennett, E. G. Nielsen, and V. E. Larson, paragraph No. (3) says:

> The average length of an interval of general excess or deficit appears to be about 8 years; intervals more than twice this length tend to occur once in about 200 years; maxima or minima from 2 to 5 years in length together comprise nearly half of all waves, the lengths occurring with about equal frequency.
>
> Since A. D. 1300, the interval of most severely dry conditions and low run-off seems to have occurred in 1573–93.

a 20-year period.

What do you deduce from your tree rings the Colorado River furnished during that period?

Mr. NIELSEN. Well, you could not determine that accurately, sir, without weighting the curve and trying to strike the mean of that extremely wavy line. I would hesitate to guess.

Senator MALONE. Would it not indicate there was a severely less run-off during that period?

Mr. NIELSEN. Yes.

Senator MALONE. Perhaps maybe a half or a third?

Mr. NIELSEN. Yes; it is more severe than we experienced in the 1930's. Shulman makes that point. The scale is quite obscure here, and it is very small.

Senator MALONE (reading):

No cyclic recurrence considered to provide a secure basis for long-range forecasting has yet been derived from these data.

That is the conclusion of the man who made the investigation?

Mr. NIELSEN. That is Mr. Shulman's conclusion; yes, sir.

Senator MALONE (reading):

A recurrence of length 23½ to 24 years is dominant during the last 3 centuries in the growth curves and appears to possess physical reality.

Without boring the committee, I will say on some of the northern streams in Nevada we have apparently cycles within cycles, one 3 or 4 or 5 years, another drought 15 years, and one about 35 years; they will all occur one within the other.

Now, on the basis of this statement, and this is the man who made the investigation, and he says:

No cyclic recurrence considered to provide a secure basis for long-range forecasting has yet been derived from these data.

it seems to me that is about the best statement that an engineer could make. In other words, there is no reason to suppose from all of his data, after all of this study, and no reason to say whether we are going into a drier cycle or a wetter cycle. It is just one of those things that may happen either way.

As Senator Anderson has so aptly pointed out, the only real data we have, aside from the tree rings—and I think you will find he used some petrified forest trees, because they are not altogether disintegrated, the rings are still there. You will find he estimated on that basis. There is a redwood forest down there some place and up in Nevada where they say we used to have 300 inches of rainfall at one time, where if we get 2 inches now they are surprised. It is just one of those things.

I want to read this again, because I think it is very important:

No cyclic recurrence considered to provide a secure basis for long-range forecasting has yet been derived from these data.

Mr. NIELSEN. May I proceed?

The CHAIRMAN. If you please.

Mr. NIELSEN. Again starting with the last partial paragraph on page 4:

Senator Anderson has asked to be informed as to the 10-year moving averages of run-off at Lee Ferry. An attached chart—

and that is the top one, as I have them stapled together here—

shows these average for: (*a*) the actual flow at Lee Ferry, or the experienced flow at Lee Ferry, (*b*) depletions by the upper basin, and (*c*) their sum, the virgin flow at Lee Ferry. We have also looked into precipitation and temperature data. From Tannehill's book Drought—Its Causes and Effects, we have compiled a chart, attached, which shows precipitation, expressed in percentage of normal, for 10 Western States, and the 10-year moving average of those percentages. On another chart, also attached, we have shown for Colorado and New Mexico precipitation and temperatures indexes, in terms of the 10-year moving averages, and for visual correlation, the 10-year moving averages of virgin flow at Lee Ferry.

Senator ANDERSON. That would show a very smooth line for temperature, would it not? Would you take a look at this chart? I am sorry I cannot put it into the record, but there is a downward trend in precipitation and a downward trend in flow. Can you correlate that with that chart?

Mr. NIELSEN. When you use the 10-year moving averages, and I thought that is what you asked for the other day——

Senator ANDERSON. That is perfectly all right.

Mr. NIELSEN. You iron out the valleys and the humps. But this sharp drop here is reflected in this line. This is Paulson's, is it?

Senator ANDERSON. Yes.

Mr. NIELSEN. Using selected stations within the Colorado River Basin. He had more time than we had. We used the State totals. But again, Colorado, influencing his curve, shows again that decline here which is this decline ironed out.

New Mexico was treated more favorably during that period and did not quite get that decline.

Senator ANDERSON. This line across here would show that for a long period of years temperature precipitation has been pretty even over 10-year periods?

Mr. NIELSEN. It runs consistently lower than 1910, but 1910 may have been short.

Senator ANDERSON. Just a trifle lower there, but this would indicate that it is substantially lower.

Mr. NIELSEN. Well, we have it in terms of percentage. I think we are working from the same data.

Several times during the course of these hearings, interest has been expressed in the water-supply data that were available at the time of the framing of the Colorado River compact and in estimates that were made at that time of the long-run average flow of the Colorado River. There has now been opportunity to check various documents contemporary with the compact, to learn what its authors thought about these matters. Many of these documents have been collected in Wilbur and Ely, the Hoover Dam Documents, House Document 717, Eightieth Congress. Page references in the paragraphs which follow are, unless otherwise specified, to that volume.

In his report to the Congress on the compact, Secretary of Commerce Hoover (as he then was), said of that document, page A25:

"Due consideration is given in it to the needs of each basin, and there is apportioned to each 7½ million acre-feet annually from the flow of the river in perpetuity, and to the lower basin an additional million feet of annual flow, giving it a total of 8½ million acre-feet annually in perpetuity. There is thus allocated about 80 percent of the total natural flow of the river, leaving some 4,000,000 acre-feet unapportioned."

It is thus clear that Mr. Hoover's estimate of the average water supply was somewhat over 20,000,000 acre-feet annually.

The then Director of the Reclamation Service, A. P. Davis, who advised the commission on engineering matters from time to time, in a letter to Senator Hayden dated January 30, 1923, estimated (p. A48) the mean actual discharge at Lee Ferry for the years 1903–20 to have been 16,400,000 acre-feet, the depletion above Lee Ferry to have been 1,700,000 acre-feet, and the average flow of the reconstructed river at Lee Ferry to have been 18,100,000 acre-feet.

W. S. Norviel, the compact commissioner for Arizona, in a paper published in the Arizona Mining Journal for January 15, 1923, summarized the data he thought significant by saying (p. A60) that there were 17,000,000 acre-feet per annum passing Boulder Canyon on the average and 16,500,000 acre-feet passing Lee Ferry. From the context, it is clear that Mr. Norviel was speaking of depleted flow and that he was estimating existing upper basin depletion at 2,500,000 acre-feet.

Senator MALONE. May I ask who W. S. Norviel was?

Mr. NIELSEN. He was a compact commissioner for Arizona.

Senator MALONE. Was he an engineer or a scientist?

Mr. NIELSEN. I did not know him at all.

Senator MALONE. It seems this data is entirely out of place here unless we have Mr. Hoover here in light of new information. Was this in 1926, 1927, or 1928?

Senator ANDERSON. This is in 1922, I am sure. I asked for this myself.

Senator MALONE. In 1920 they estimated this river without any measurements or tree rings?

Mr. NIELSEN. That is not to say they did not have measurements of the river, they had other stations.

Senator MALONE. But no coordinated data and other data such as you have from the tree rings?

Mr. NIELSEN. That is right.

Senator ANDERSON. Senator, I asked the question, because I wanted to see put in the record what was in the minds of the people there when they were dividing up the water. I think they thought they were dealing with an 18,000,000-foot stream.

Senator MALONE. That is a very important point.

Senator DOWNEY. Mr. Chairman, in connection with that I would like to ask a question.

Mr. Nielsen, I understand that at that same time in calculating what apportionment should be made of the river, it was considered that Mexico should be restricted to 750,000 acre-feet, is that correct?

Mr. NIELSEN. I would have to search the records, sir, on that. I cannot answer that.

Senator DOWNEY. Mr. Chairman, I am quite sure that is true, almost up to the time of the Mexican treaty it was conceded that Mexico was entitled to receive 750,000 acre-feet.

Mr. NIELSEN. We can search that record, so far as we have it, and try to get that answer.

Senator MALONE. Mr. Chairman——

The CHAIRMAN. Senator Malone, Mr. Downey has not quite finished yet.

Senator MALONE. Oh, pardon me.

Senator DOWNEY. Did you want to intervene on that subject?

Senator MALONE. No, you go right ahead.

Senator DOWNEY. Now, in your calculations as to providing water for Mexico now, do you use the figure of 1,500,000 acre-feet without the addition of 100,000 or 200,000 acre-feet?

Mr. NIELSEN. Yes, sir.

Senator DOWNEY. Now, in your discussions with Senator Malone and Senator Anderson about the obligations of the upper basin to let down all water, except 75,000,000 acre-feet over a 10-year period——

Senator ANDERSON. I am sorry, I don't think that is our obligation. It is to let down a specified amount, not all the water except the specified amount. It is the other way around.

Senator DOWNEY. All right, whatever the obligation is.

Senator ANDERSON. Well, it is very important.

Senator DOWNEY. We can go back to that later. In your discussion, were you using the figures for the upper basin of 7,500,000 acre-feet,

or 8,300,000 acre-feet, which is what the upper basin I understand now claims by virtue of the new definition of consumptive use?

Mr. NIELSEN. Our figures are based upon 7,500,000 acre-feet delivered at Lee Ferry, or, rather, we go to the international boundary and show the requirement as we go upstream for delivery by the upper basin of 7,500,000 acre-feet. And there is implied, if not expressly stated, that the upper basin meet its share of the obligation to Mexico.

Now, I am not sure what you mean by the upper basin's 8,300,000 acre-feet.

Senator ANDERSON. Would it not be true, if our obligation is to deliver a certain amount of water at Lee Ferry, it does not matter what definition you put on consumptive use or depletion, if we are dealing with a river that is running very light? In other words, if we have millions of acre-feet to spill besides the water contracted for, then it does matter whether we are limited to 7,500,000 or 8,300,000. But if the water situation is fairly tight and we are worrying about our obligation to deliver 75,000,000 feet every 10 years, then it does not matter what the definition of consumptive use above Lee Ferry is, because that will worry us when we try to divide up the water.

Senator DOWNEY. Which cloak have you on now, as a member of the upper or lower basin, Senator?

Senator ANDERSON. A little of each.

Senator DOWNEY. Do I understand, then, in your discussions with the Senators you have not given any effect to the—I should not say the new contention, but the—present contention of the upper basin States, which States, under the present definition of consumptive use, they claim the right to 8,300,000 under certain circumstances, instead of 7,500,000.

Mr. NIELSEN. Our studies were all reckoned upon the basis of depletion, sir.

Senator DOWNEY. All right, Mr. Nielsen, if you cannot answer my question: I am asking you, if within your testimony you have given any effect to this present claim of the upper basin States—and I am not denying that by entering into that by a certain definition of consumptive use they are now using a figure in certain cases of 8,300,000, instead of 7,500,000.

Mr. NIELSEN. I have heard that 8,300,000 figure twice. I don't know how it comes in, and I don't know how I could answer a question with regard to it.

Senator DOWNEY. Then, you are not giving any effect to it. If you have not used it, and you don't know where it comes from, that answers the question.

Mr. NIELSEN. No, sir; I have not used an upper basin figure of 8,300,000 acre-feet, if there be such a figure.

Senator DOWNEY. We in California are very much afraid there is; we hope there is not.

Senator MALONE. Mr. Chairman, of course that has been a source of considerable irritation to the lower basin States. In Senate Document 186, Seventieth Congress, second session, page 81—I might say that I did go into old Mexico and go over the lands under cultivation at that time, because there is a considerable difference of opinion as to the amount of land under cultivation, but what we actually found was that there probably never had been up to that time, from the best

testimony we could get more than 30 or 40 thousand acres in Mexico irrigated at one time; that they would change from one area to another and that they had actually about 200,000 acres in cultivation.

So, in this compilation, page 81, entitled "Total Supply After Full Development of Upper Basin," we estimate that 200,000 acres, which actually had been cultivated at one time or another, and I repeat, never at the same time, with the duty of water 4.25—four and a quarter—acre-feet annually. That would make 850,000 acre-feet, which was the largest amount of water that had ever been discussed, up to the time of the Boulder Canyon Project Act, that Mexico would ever be allotted. What the reasoning of the Senate was in okaying a treaty or approving a treaty for a million and a half acre-feet, there is no need to go into. It is a treaty now. But I know they were all crying bitter tears down there when it was up before the Senate.

So, just to clarify the record as to the amount of land that was under cultivation at that time, and how it was put under cultivation and the amount of water, the maximum amount of water that anyone ever mentioned who attended one of these conferences was that 850,000 acre-feet be delivered to Mexico.

The CHAIRMAN. Proceed, Mr. Nielsen.

Mr. NIELSEN. At the top of page 6, I will ask you to make a correction: "Mr. Norviel's legal adviser," rather than "engineering adviser"——

Senator MALONE. He was an attorney, the legal adviser?

Mr. NIELSEN. Yes, sir.

Mr. NIELSEN (reading):

Mr. Norviel's legal adviser, Richard E. Sloan, in a paper published in the same number of the Arizona Mining Journal, wrote (p. A67):

"Taking the average flow of the Colorado River at Yuma for a period of 20 years and adding thereto the amounts known to be diverted and consumed in irrigation in Colorado, Wyoming, Utah, New Mexico, Arizona, and California, the run-off from the entire watershed will be found to be approximately 21-000,000 acre-feet per annum. Excluding the Gila River and its tributaries, it is estimated that the mean annual flow at Lee's Ferry, the point of division between the two divisions is 16,400,000 acre-feet. The consumption of water above Lee's Ferry is estimated at 2,400,000 acre-feet annually. Therefore, the mean average run-off of the watershed above Lee's Ferry approximates 18,800,000 acre-feet."

Senator MALONE. That would be the virgin river condition as you estimate your uninterrupted flow of the river at Lee Ferry?

Mr. NIELSEN. I assume that is the figure he was referring to.

The commissioner from Colorado, Delph E. Carpenter, appended to his report to the Governor of Colorado a table prepared by his engineering adviser, Ralph I. Meeker, in which (p. AS2) it was estimated that the average annual water supply of the Colorado River Basin was 20,500,000 acre-feet.

S. B. Davis, Jr., the commissioner from New Mexico, pointed out in his report to the Governor of that State (p. A110) that "The San Juan River with its tributaries furnishes about one-sixth of the flow of the Colorado River, having a volume of some 3,000,000 acre-feet per annum passing the State line." It is clear from this that he thought of the basin's water supply as exceeding 18,000,000 acre-feet on the average.

R. E. Caldwell, commissioner for Utah, reported to the senate of that State (p. A118) that "The reconstructed Colorado River would have an average annual flow of from 20,000,000 to 22,000,000 acre-feet; and, if it is assumed to be 20,000,000 acre-feet, approximately 18,000,000 acre-feet would pass Lee's Ferry if there were no diversions."

And Frank C. Emerson, commissioner for Wyoming, reported to the Governor and legislature of that State (p. A127) that "Over 18,500,000 acre-feet of water is contributed annually to the river by the upper basin."

It is clear from the paragraphs above that there were rather wide discrepancies in the quantities of water the commissioners thought they were dealing with. Apparently the data available at the time left much room for the play of varying degrees of optimism.

A document frequently referred to by them as a source of information is Senate Document 142, Sixty-seventh Congress, entitled "Problems of Imperial Valley and Vicinity," a report of the Secretary of the Interior. The data contained in this volume indicated (S. Doc. 142, p. 2) that the average depleted discharge of the principal tributaries of the Colorado River totaled 17,780,000 acre-feet and (S. Doc. 142, p. 37) that the average depleted flow of the Colorado at Boulder Canyon for the years 1903–20 was 16,470,000 acre-feet. The purpose of this report did not require estimation of the virgin flow of the stream.

Nor is it clear from these minutes of the meetings of the compact commission which are available that the commissioners succeeded in making such an estimate. The closest they came to this occurred at their sixteenth meeting, where they set for themselves the task of determining what the minimum delivery of the upper-division States at Lee Ferry should be. Beginning with the available data for Laguna, they attempted to reconstruct the flow at Lee Ferry. The lengthy discussion that ensued was summarized thus—page 25 of the transcript of the sixteenth meeting:

"Mr. HOOVER. So that you would get somewhere around 17,000,000 feet as the Lee Ferry flow?

"Mr. A. P. DAVIS. Yes; 17,000,000 would be a correction in the right direction, probably not very far wrong."

Senator ANDERSON. Excuse me just a minute. When you said "a correction in the right direction," he meant a correction upward; did he not?

Mr. NIELSEN. I thought he was pulling it back down.

Senator ANDERSON. Oh, I am sorry. Go ahead, and I think you will see.

Mr. NIELSEN (continuing):

"Mr. HOOVER. I should think for matters of discussion we could take it that the reconstructed mean at Lee Ferry is a minimum of 16,400,000 and perhaps, with this elaborate calculation, half a million above, that is, 17,000,000. Therefore, we would come to a discussion of a 50–50 basis on some figure lying between 16,400,000 and 17,000,000."

Senator ANDERSON. As a matter of fact, they have been dealing with 16,400,000 for a while, and Mr. Davis had raised it to 17,000,000.

Mr. NIELSEN. I see. I think that would follow from what Mr. Hoover replied.

From the context, it appears that the period used for reckoning this rough average was 1899–1920. Based upon our present knowledge as represented by the data in House Document 419, the average virgin flow for these same years would now be estimated at 17,210,000 acre-feet. That their period of record was not long enough to include as extended a dry period as has since occurred is now clear. But whether we today in using 1897–1943 average or an 1897–1948 average may not be unduly pessimistic is open to question. At page 52 of its seventh annual report (1945) the metropolitan water district of southern California had this to say with respect to the problem:

"It appears reasonably probable that the 1905–45 mean is a better approximation than the 1897–1945 mean to the long-time (100- or 1,000-year) mean because large flood years, such as 1884 and 1885, as well as from 1862 to 1876, are known to have preceded and more or less balanced the 1904 drought period. Quantitative estimates of such floods comparable in accuracy to those for the run-off of more recent years are not possible, but this fact does not justify ignoring such known flood flows when estimating the probable long-time mean run-off. Such a use as indicated of the 1905–45 mean does not assume or imply in any sense that this is a 'complete cycle' or that additional dry years may not occur before an abnormally wet period intervenes to cancel out their effect on water supply and storage. But, without indulging in any detailed or unduly optimistic forecasts, it is highly probable that on Colorado River the next decade or two will average much less dry than the last 15 years. Therefore, estimates of the long-time mean run-off should not be unduly depressed by reason of the recent drought years even though the latter remain of primary importance in all water-supply studies."

Senator MALONE. Could I interject at that point, Mr. Chairman, to perhaps clarify the record. In other words, their conclusion was at that time, after they had estimated to the best of their ability by coordinating all of the gaging stations on the river system, summarizing it with Mr. Hoover's question to A. P. Davis, whom we all recognize as one of the greatest engineers ever connected with the Bureau, 16,400,000 acre-feet would be the reconstructed flow at Lee Ferry.

Mr. NIELSEN. That is what I take Mr. Hoover's language to be; that would be the minimum.

Senator MALONE. They do go on to say the indications are they would be much less dry in the next period, which would have been the relative period from, say, 1922 to 1940?

Mr. NIELSEN. No; that is the expression in 1945 of the expectation of a much less dry period.

Senator MALONE. Oh, I misunderstood you. I will withdraw that and make this comment on the authorities here.

Delph Carpenter is still alive, paralyzed, one of the finest attorneys in the United States, and Ralph Meeker, one of the best engineers. They were from Colorado, the upper basin, when the seven States used to meet, each trying to make a pretty good case for itself. The more water that appeared to be in the basin the less trouble there was in dividing it.

Mr. Davis was then with the Bureau of Reclamation.

Senator ANDERSON. Which Mr. Davis are you referring to?

Senator MALONE. S. B. Davis was another man. Pardon me, I did not know that.

Senator ANDERSON. He was brought into Washington by Mr. Hoover after that time.

Senator MALONE. Mr. Caldwell from Utah I remember well.

Frank Emerson became Governor of Wyoming at a later date, as the chairman will remember. He was an engineer-Governor of Wyoming. He was a very fine man, and did the best job he knew how in trying to arrive at some agreement on the seven-State basis.

Now, the Weymouth report. Have you heard of the Weymouth report?

Mr. NIELSEN. Yes, sir.

Senator MALONE. I think you may have overlooked the Weymouth report. It had about 10 sections, each one about 2 inches thick, typewritten. I imagine you would still find it on file over there at the Bureau of Reclamation.

Was that not the latest report they had at that time to study?

Mr. NIELSEN. I may have to be corrected on this, but as I understand it the Weymouth report was in the process at the time the hearings were going on.

Senator MALONE. What date were the hearings going on?

Mr. NIELSEN. 1921.

Senator MALONE. Yes; you are correct. The Weymouth report was available in 1927. I am sorry, I am mistaken about that. But the Weymouth report took the place of all our studies up to that time.

Mr. NIELSEN. I think it attempted to summarize them.

Senator ANDERSON. Didn't the hearings start in 1921?

Mr. NIELSEN. That is my understanding.

Senator ANDERSON. You said 1922.

Mr. NIELSEN. I thought he said 1922, and I said 1921.

Senator MALONE. Whatever it is.

Senator ANDERSON. I am sorry.

Senator MALONE. 1927 is the time I had in mind when the Weymouth report became available. It displaced all other reports and took into consideration all the available data.

Now, Mr. Nielsen, taking the 16,400,000 acre-feet as representing, according to Mr. Hoover, his best judgment of the reconstructed mean delivery of the river at Lee Ferry, that would correspond to the figure that you arrived at for the measured flow of 1922–48, including the entire utilization of the river, according to the compact above Lee Ferry, and leaves 7,760,000 acre-feet delivered there. Now, just one more thing. The figure would correspond to your 14,860,000 acre-feet on the measured flow?

Mr. NIELSEN. No, sir; because you are not using the same periods.

Senator MALONE. Certainly not, but I mean it would correspond to the conclusion of the flow. He estimated it at 16,400,000; was it?

Senator ANDERSON. 16,400,000.

Senator MALONE. But the actual flow for the 21- or 22-year period, or more than that, about 30-year period——

Senator KERR. 1922 to 1948—27 years.

Senator MALONE. Twenty-seven year period. It actually shows it to be 14,860,000.

Mr. NIELSEN. That is a comparable figure for a different period; yes.

Senator MALONE. For a different period; but this actually is measured flow, and all the rest was estimates from the gaging stations throughout the system; is that true?

Mr. NIELSEN. That is true.

Senator ANDERSON. The actual flow for 27 years has been 1,500,000 acre-feet less than the figure the commissioners were using at the time they were discussing how to divide the water in the river; is that a fair statement?

Mr. NIELSEN. Would you mind stating that again? I want to be sure of that.

Senator ANDERSON. I say, the commissioners, in discussing the flow of the river, were using a figure of 16,400,000 at Lee Ferry. The actual measured flow for a 27-year period has averaged 14,860,000, so that that figure is actually 1,540,000 acre-feet less, for 27 years, than the figure which the compact commissioners were using in their discussions in 1921.

Mr. NIELSEN. I think that is correct.

Senator MALONE. And the latter figure you have now arrived at after 27 years of actual measurement of the river, assuming that the upper basin uses all the water they are entitled to under the compact, would lead us back to the figure of 7,360,000 acre-feet for the lower basin, plus these accretions minus evaporation and natural losses?

Mr. NIELSEN. I still take the obligation of the upper basin to be the average of the 75,000,000.

Senator MALONE. You are entirely correct, but let us just assume they can live up to the contract without any variations at all, and for that purpose the statement still stands.

Mr. NIELSEN. You can arrive at that mathematical answer—7,360,000.

Senator MALONE. Now, if they did get more water one year than the next, then it would be 500,000 less than this figure 7,360,000, which

would be approximately 6,800,000 acre-feet available to the lower basin.

Mr. NIELSEN. You certainly lost me there.

Senator MALONE. I want to go back and pick you up. Your figure is 14,860,000 acre-feet delivered, actual measurement over a period of 27 years.

Mr. NIELSEN. No; that is the virgin flow, sir.

Senator MALONE. That is the virgin flow, yes; that is true. We depleted it by 2,232,000 acre-feet, estimated amount in use by the upper basin at that time, and that left a matter of 5,258,000 that they could still use.

Now, if you do assume that they use their entire amount of water, which, of course, they will sometime, what would that leave for the lower basin?

Mr. NIELSEN. If they use their entire amount of water, as I understand it, they would deliver to the lower basin 75,000,000 acre-feet over a period of 10 years, plus whatever amount of water might be necessary to satisfy the Mexican obligation.

Senator MALONE. Yes; but that would not leave any more for the lower basin States, it would simply be making up a part of the seven and a half million which it is perfectly obvious they will have to do, unless there is a substantial increase in the flow at Lee's Ferry; is that not true?

Mr. NIELSEN. I am talking about something separate and apart from the seven and a half million. Over and above that obligation is the obligation to serve the Mexican treaty.

Senator MALONE. That is entirely true. But leaving that out for the moment, let us suppose there is enough in the lower basin that we have to furnish it all. Then if they use all of their water there and we cannot predict as to when they will withhold water and when they will try to make it up, so assume for the purpose of the record that 7,500,000 acre-feet is delivered each year. What does that leave for the entire lower basin, including Mexico or our part of it? How much does it leave there?

Mr. NIELSEN. If I get your question correctly, that would leave the figure of 7,360,000 acre-feet delivered at Lee Ferry.

Senator MALONE. That is correct.

Senator ANDERSON. Mr. Chairman, I just want to say that I appreciate the fact that this witness brought in some material in answer to some questions of mine which were probably quite random. I was curious about temperature; I was curious about precipitation. I realize these things are hard to prove and I apppreciate the fact the witness has spent some time over the week end in bringing that material in.

Senator MALONE. It has been very helpful.

The CHAIRMAN. I think he and his associates have done a very excellent job in preparing the material.

Now, is there anything more?

Mr. NIELSEN. No, sir; that is the end of my presentation.

The CHAIRMAN. I think it would be to the advantage of the record if the entire statement of Mr. Nielsen may also appear, as well as the interruptions, so that those who care to read it may be able to read it without the interruptions. And without objection that will be done.

(The statement of Mr. Nielsen is in full as follows:)

FURTHER STATEMENT OF N. B. BENNETT, JR., E. G. NIELSEN, AND V. E. LARSON OF THE COLORADO RIVER BASIN WATER SUPPLY

In the course of the March 26 hearings before the Committee on Interior and Insular Affairs of the Senate on S. 75 and Senate Joint Resolution 4, the chairman of the committee requested the individuals named above, all engineers in the employ of the Bureau of Reclamation to prepare a statement of the basic facts as to the water supply of the Colorado River.

Basic to an evaluation of the water supply of the Colorado River is the consideration of the flows of the Colorado River at Lee Ferry, as experienced and measured, as they may be estimated from records of stream discharge measurements above and below Lee Ferry, and as they would have been experienced had man not intervened. The first two we refer to as the "historical" flow. The last we refer to as the "natural" or "virgin" flow of the stream.

The Bureau's derivation of the historical flow of the river at Lee Ferry appears as table CXXXVII, appendix 1, of House Document No. 419, Eightieth Congress, first session, which is the Secretary of the Interior's report on the Colorado River. A copy of that table, extended through 1948, is attached. The average has been recomputed. It will be noted that the data for historical flow at Lee Ferry for the years prior to 1922 are estimates derived from measurements of stream flow at other main stream stations, from measurements of stream flow of principal tributaries, and from combinations of those measurements. Those data for the years 1922 and subsequently are actual measurements as published by the Geological Survey.

The virgin or natural flow of the Colorado River at Lee Ferry may be derived by adding to the flow which actually occurred at that point the amount which man's activities are estimated to have withheld upstream. That derivation is shown in table CXL, appendix 1, of House Document No. 419. That table, extended through 1948, is attached. For the convenience of the committee, averages have been struck for the period 1897–1948; for the period 1897–1943, for which full data, estimated or measured, are readily available; for the period 1897–1921, for which period actual run-off at Lee Ferry was estimated; for the period 1922–48, during which period the run-off at Lee Ferry was actually measured; for the period 1931–40, which is the 10-year period of minimum run-off; and for the 1931–46 period, which is the 16-year period of minimum run-off.

Proceeding downstream from Lee Ferry, the stream is next measured at Bright Angel, within the Grand Canyon. For the period 1923 to 1943, there was a measured average net accretion to the river in this stretch of 406,000 acre-feet. From this experience we estimate the net gain between Lee Ferry and Hoover Dam to have been 810,000 acre-feet. With due allowance for the depletions by man during the 1923–43 period, we estimate that the gain under virgin conditions would have been 900,000 acre-feet per annum, on an average. Weighing the fact that the 1923–43 period was one in which stream flow was about 85 percent of average, we estimate the accretion to the stream between Lee Ferry and Hoover Dam, under virgin conditions, to average 1,060,000 acre-feet.

The estimate of virgin flow at Hoover Dam for the period 1897–1943 may be developed as follows:

	Acre-feet
Average virgin flow at Lee Ferry	16,270,000
Average virgin gain to Hoover Dam	1,060,000
Average virgin flow at Hoover Dam	17,330,000

The next stretch of the river considered lies between Hoover Dam and Laguna Dam; the latter dam is just above the confluence of the Colorado and Gila Rivers. Only one perennial stream, the Bill Williams River, enters the Colorado River in this stretch. That stream has been measured at intervals; from that record, from a consideration of the area the run-off from which is not measured, and from a consideration of precipitation in the area, we estimate the long-time average annual accretion to the stream from this area to be 150,000 acre-feet.

The Colorado River is a losing stream in the Hoover Dam-Laguna Dam reach. From measurements of stream flow at Topack and at Yuma, from consideration of depletions resulting from irrigation, and from considerations of river channel losses, we estimate the total natural losses between Hoover Dam and Laguna Dam, under virgin conditions, to have been 1,030,000 acre-feet annually.

The average annual virgin flow of the Colorado River at Laguna Dam may be derived, then, as follows:

	Acre-feet
Virgin flow, Colorado River at Hoover Dam	17,330,000
Plus tributary inflow Hoover Dam to Laguna Dam	150,000
Less natural channel losses	1,030,000
Virgin flow, Colorado River at Laguna Dam (above Gila River)	16,450,000

The Gila River represents the sole accretion of any consequence between Laguna Dam and the Mexican boundary. Table CXLVI, appendix 1, House Document No. 419, derives the estimate of virgin inflow to the Phoenix area from the Gila River and its perennial and intermittent tributaries, and derives also the estimate of the virgin flow of the Gila River at its mouth. That table has been reproduced and is attached. Unfortunately, the task of extending that table from 1943 through 1948 is a most substantial one, and we have not undertaken it in the interest of getting before the committee the data which we understood to have been requested. We have, for the convenience of the committee, however, derived averages for the periods of years as to which the committee has expressed interest. These periods are 1897–1943, 1897–1921, 1921–43, 1931–40, and 1931–43.

The long-time average virgin flow of the Gila River at its mouth is derived in table CXLVI at 1,272,000 acre-feet, which we round to 1,270,000 acre-feet. The virgin flow of the Colorado River at the international boundary, then, is made up of two components: the virgin flow of the main stream at Laguna Dam and the virgin flow of the Gila River at its mouth. These are respectively, the contributions of the main stream system and of the Gila River system to the virgin flow of the river at the international boundary; together they represent the part of the water developed within the Colorado River system which would have reached the international boundary had not man come upon the river. Stated in a table, the average annual virgin flow of the Colorado River at the international boundary is estimated to be:

Average annual virgin flow:

	Acre-feet
Colorado River at Laguna Dam	16,450,000
Gila River at mouth	1,270,000
Colorado River at international boundary	17,720,000

In answer to a question asked the witness on March 24, column 8 of table CXLVI gives, by years, our estimate of the flow of the Gila River which would have reached the mouth of the stream had not man come upon the stream.

The March 26 witness did not discuss the record of measured discharge of the Gila River at its mouth, nor was that record requested. We have thought the committee might be interested, and have attached a table showing the experienced discharge of the Gila River at its mouth, as published by the Geological Survey.

Senator Anderson has expressed interest in climatic trends as they affect run-off. We have, over the week-end, found information bearing on this matter. Ivan Ray Tannehill, Chief of the Weather Bureau's Division of Synoptic Reports and Forecasts, states in his publication Drought, Its Causes and Effects, on page 213:

"Finally, returning to the drought problem and to the conditions we have known in recent years, we may expect rainfall for the United States as a whole to continue to vary between limits of moderate deficiency and rather serious excess, with occasional droughts. These will probably be more severe than those in the immediate past if deforestation and cultivation continue to expand. But there is no good reason to think that occasional droughts will become a great deal worse than in recent climatic history so long as we have extensive frozen seas in the polar regions and snow-covered land in winter on the northern part of the continent."

Edmund Shulman, dendrochronologist on the staff of the laboratory of tree-ring research, University of Arizona, states in his publication, Tree-Ring Hydrology of the Colorado River Basin, on page 48:

On the basis of the 658-year index of the Colorado River run-off, it appears that:

(1) On the average, 1 year in 50 shows growth less than 50 percent of the mean, indicating drought and low run-off of the severity of 1902 or 1934.

(2) Two successive years of critically small growth, a phenomenom having specially important implications in reservoir management, were found to have occurred only three times in the 658-year record; there were seven 3-year intervals with two such minima.

(3) The average length of an interval of general excess of deficit appears to be about 8 years; intervals more than twice this length tend to occur once in about 200 years; maxima or minima from 2 to 5 years in length together comprise nearly half of all waves, the lengths occurring with about equal frequency.

(4) Since A. D. 1300, the interval of most severely dry conditions and low run-off seems to have occurred in 1573–93, when the average deficiency was well below that of the recent, generally dry intervals 1879–1904 and 1931–40.

(5) No cyclic recurrence considered to provide a secure basis for long-range forcasting has yet been derived from these data; a recurrence of length 23½ to 24 years is dominant during the last three centuries in the growth curves and appears to possess physical reality.

Shulman provides in plate III, Tree-Ring Indices in the Colorado River Basin, an index as to the run-off of the Colorado River over a long period; a copy of that plate is attached. Note that panel D of this plate represents the Colorado River above Lee Ferry. A sensitive relationship between tree growth and run-off is demonstrated in his paper. The paper does not extend to a consideration of climatic trends, but inspection of plate III does afford a basis for judgment of this matter.

Senator Anderson has asked to be informed as to the 10-year moving averages of run-off at Lee Ferry. An attached chart shows these averages for: (*a*) experienced flow at Lee Ferry, (*b*) depletions by the upper basin, and (*c*) their sum, the virgin flow at Lee Ferry. We have also looked into precipitation and temperature data. From Tannehill's book, Drought, Its Causes and Effects, we have compiled a chart, attached, which shows precipitation, expressed in percentage of normal, for 10 Western States, and the 10-year moving average of those percentages. On another chart, also attached, we have shown for Colorado and New Mexico precipitation and temperature indexes, in terms of the 10-year moving averages, and for visual correlation, the 10-year moving averages of virgin flow at Lee Ferry.

Several times during the course of these hearings, interest has been expressed in the water-supply data that were available at the time of the framing of the Colorado River compact and in estimates that were made at that time of the long-run average flow of the Colorado River. There has now been opportunity to check various documents contemporary with the compact, to learn what its authors thought about these matters. Many of these documents have been collected in Wilbur and Ely, the Hoover Dam Documents (H. Doc. 717, 80th Cong.). Page references in the paragraphs which follow are, unless otherwise specified, to that volume.

In his report to the Congress on the compact, Secretary of Commerce Hoover (as he then was) said of that document (p. A25):

"Due consideration is given (in it) to the needs of each basin, and there is apportioned to each 7½ million acre-feet annually from the flow of the river in perpetuity, and to the lower basin an additional million feet of annual flow, giving it a total of 8½ million acre-feet annually in perpetuity. There is thus allocated about 80 percent of the total natural flow of the river, leaving some 4,000,000 acre-feet unapportioned."

It is thus clear that Mr. Hoover's estimate of the average water supply was somewhat over 20,000,000 acre-feet annually.

The then Director of the Reclamation Service, A. P. Davis, who advised the commission on engineering matters from time to time, in a letter to Senator Hayden dated January 30, 1923, estimated (p. A48) the mean actual discharge at Lee Ferry for the years 1903–20 to have been 16,400,000 acre-feet, the depletion above Lee Ferry to have been 1,700,000 acre-feet, and the average flow of the "reconstructed river at Lee Ferry" to have been 18,100,000 acre-feet.

W. S. Norviel, the compact commissioner for Arizona, in a paper published in the Arizona Mining Journal for January 15, 1923, summarized the data he thought significant by saying (p. A60) that there were 17,000,000 acre-feet per annum passing Boulder Canyon on the average and 16,500,000 acre-feet passing Lee Ferry. From the context, it is clear that Mr. Norviel was speaking of depleted flow and that he was estimating existing upper-basin depletion at 2,500,000 acre-feet.

Mr. Norviel's engineering adviser, Richard E. Sloan, in a paper published in the same number of the Arizona Mining Journal, wrote (p. A67):

"Taking the average flow of the Colorado River at Yuma for a period of 20 years and adding thereto the amounts known to be diverted and consumed in

irrigation in Colorado, Wyoming, Utah, New Mexico, Arizona, and California, the run-off from the entire watershed will be found to be approximately 21,000,000 acre-feet per annum. * * * Excluding the Gila River and its tributaries, it is estimated that the mean annual flow of Lee Ferry, the point of division between the two divisions, is 16,400,000 acre-feet. The consumption of water above Lee Ferry is estimated at 2,400,000 acre-feet annually. Therefore, the mean average run-off of the watershed above Lee Ferry approximates 18,800,000 acre-feet."

The commissioner from Colorado, Delph E. Carpenter, appended to his report to the Governor of Colorado a table prepared by his engineering adviser, Ralph I. Meeker, in which (p. A82) it was estimated that the average annual water supply of the Colorado River Basin was 20,500,000 acre-feet.

S. B. Davis, Jr., the commissioner from New Mexico, pointed out in his report to the Governor of that State (p. A110) that "The San Juan River with its tributaries furnishes about one-sixth of the flow of the Colorado River, having a volume of some 3,000,000 acre-feet per annum passing the State line." It is clear from this that he thought of the basin's water supply as exceeding 18,000,000 acre-feet on the average.

R. E. Caldwell, commissioner for Utah, reported to the senate of that State (p. A118) that "The reconstructed Colorado River would have an average annual flow of from 20,000,000 to 22,000,000 acre-feet, and if it is assumed to be 20,000,000 acre-feet, approximately 18,000,000 acre-feet would pass Lee's Ferry if there were no diversions."

And Frank C. Emerson, commissioner for Wyoming, reported to the Governor and legislature of that State (p. A127) that "Over 18,500,000 acre-feet of water is contributed annually to the river by the upper basin. * * *

It is clear from the paragraphs above that there were rather wide discrepancies in the quantities of water the commissioners thought they were dealing with. Apparently the data available at the time left much room for the play of varying degrees of optimism.

A document frequently referred to by them as a source of information is Senate Document 142, Sixty-seventh Congress, entitled "Problems of Imperial Valley and Vicinity," a report of the Secretary of the Interior. The data contained in this volume indicate (S. Doc. 142, p. 2) that the average depleted discharge of the principal tributaries of the Colorado River totaled 17,780,000 acre-feet and (S. Doc. 142, p. 37) that the average depleted flow of the Colorado at Boulder Canyon for the years 1903–20 was 16,470,000 acre-feet. The purpose of this report did not require estimation of the virgin flow of the stream.

Nor is it clear from these minutes of the meetings of the compact commission which are available that the commissioners succeeded in making such an estimate. The closest they came to this occurred at their sixteenth meeting, where they set for themselves the task of determining what the minimum delivery of the upper division States at Lee Ferry should be. Beginning with the available data for Laguna, they attempted to reconstruct the flow at Lee Ferry. The lengthy discussion that ensued was summarized thus (p. 25 of the transcript of the 16th meeting):

"Mr. HOOVER. So that you would get somewhere around 17,000,000 feet as the Lee's Ferry flow?

"Mr. A. P. DAVIS. Yes; 17,000,000 would be a correction in the right direction; probably not very far wrong.

"Mr. HOOVER. I should think for matters of discussion we could take it that the reconstructed mean at Lee's Ferry is a minimum of 16,400,000 and perhaps, with this elaborate calculation, half a million above, that is 17,000,000. Therefore we would come to a discussion of a 50–50 basis on some figure lying between 16,400 000 and 17,000,000."

From the context, it appears that the period used for reckoning this rough average was 1899–1920. Based upon our present knowledge as represented by the data in House Document 419, the average virgin flow for these same years would now be estimated at 17,210,000 acre-feet. That their period of record was not long enough to include as extended a dry period as has since occurred is now clear. But whether we today in using an 1897–1943 average or an 1897–1948 average may not be unduly pessimistic is open to question. At page 52 of its seventh annual report (1945), the Metropolitan Water District of Southern California had this to say with respect to the problem:

"It appears reasonably probable that the 1905–45 mean is a better approximation than the 1897–1945 mean to the longtime 100- or 1,000-year mean because large flood years, such as 1884 and 1885, as well as from 1862 to 1876, are known to have preceded and more or less balanced the 1904 drought period. Quantitative estimates of such floods comparable in accuracy to those for the

run-off of more recent years are not possible but this fact does not justify ignoring such known flood flows when estimating the probable long-time mean run-off. Such a use as indicated of the 1905–45 mean does not assume or imply in any sense that this is a 'complete cycle' or that additional dry years may not occur before an abnormally wet period intervenes to cancel out their effect on water supply and storage. But without indulging in any detailed or unduly optimistic forecasts, it is highly probable that on the Colorado River, the next decade or two will average much less dry than the last 15 years. Therefore, estimates of the long-time mean run-off should not be unduly depressed by reason of the recent drought years even though the latter remain of primary importance in all water-supply studies."

(The tables are as follows:)

WATER SUPPLY TABLE CXXXVII.—*Recorded and estimated historical discharges—Colorado River at Lee Ferry*

Calendar year—	Main stem station		Sum of Colorado River at Cisco, Green at Little Valley, and San Juan at Farmington [1]	Historical flow Colorado River at Lee Ferry [1 2]
	Name of station	Recorded flow [1]		
	(1)	(2)	(3)	(4)
1897 [3]			18,721	19,797
1898 [3]			12,206	12,948
1899 [3]			16,925	17,899
1900 [3]			11,996	12,686
1901 [3]			12,925	13,668
1902 [3]	Yuma, Ariz.	7,959	8,245	8,454
1903 [3]	do	11,328	12,550	12,346
1904 [3]	do	10,118	12,505	11,675
1905 [3]	do	19,712	13,800	15,290
1906 [3]	Hardyville, Ariz.	19,162	18,131	18,656
1907 [3]	do	21,547	20,755	21,179
1908 [3]	Yuma, Ariz.	13,688	10,852	12,055
1909 [3]	do	25,975	20,543	23,295
1910 [3]	do	14,335	12,392	13,588
1911 [3]	do	17,840	14,688	16,473
1912 [3]	do	18,406	17,686	18,393
1913 [3]	do	11,748	12,394	12,581
1914 [3]	do	20,684	18,206	19,868
1915 [3]	do	14,641	10,964	12,398
1916 [3]	do	23,140	16,865	18,380
1917 [3]	do	20,598	19,918	20,436
1918 [3]	do	13,158	13,373	13,775
1919 [3]	do	10,747	9,980	10,611
1920 [3]	do	21,444	18,764	20,387
1921 [3]	do	19,428	18,728	19,572
1922				16,198
1923				16,868
1924				11,707
1925				12,412
1926				13,080
1927				17,549
1928				14,714
1929				19,632
1930				12,414
1931				6,229
1932				15,180
1933				9,750
1934				3,966
1935				10,283
1936				12,145
1937				12,006
1938				15,661
1939				8,872
1940				7,617
1941				17,888
1942				14,809
1943				11,435
1944				13,034
1945				11,782
1946				8,791
1947				14,047
1948				12,883
Average				14,180

[1] Thousand acre-feet.

[2] Determined in following manner: 1897–1901 estimated from flow of principal tributaries; 1902–21 estimated from flow of principal tributaries, and flow at main stem station; 1922 and 1923 flow at Lees Ferry increased by estimated discharge Paria at mouth; and 1924–43 Colorado at Lees Ferry plus Paria at mouth.

[3] Flow at 1 or more base stations on principal tributaries estimated in whole or part by comparison with records elsewhere on stream.

WATER SUPPLY TABLE CXL.—*Estimated virgin flow Colorado River at Lee Ferry*

[Thousand acre-feet]

Calendar year—	Historical flow Colorado River at Lee Ferry	Estimated normal depletions		Estimated actual upstream depletion	Estimated virgin flow at Lee Ferry
		Irrigation within basin	Export from basin		
	(1)	(2)	(3)	(4)	(5)
1897	19,797	650	5	741	20,538
1898	12,948	711	5	658	13,606
1899	17,899	772	5	836	18,735
1900	12,686	834	5	764	13,450
1901	13,668	896	5	853	14,521
1902	8,454	957	6	751	9,205
1903	12,346	1,036	6	948	13,294
1904	11,675	1,118	11	1,005	12,680
1905	15,290	1,197	21	1,230	16,520
1906	18,656	1,276	21	1,450	20,106
1907	21,179	1,358	21	1,655	22,834
1908	12,065	1,437	21	1,327	13,392
1909	23,295	1,516	21	1,960	25,255
1910	13,583	1,568	21	1,535	15,118
1911	16,473	1,620	22	1,740	18,213
1912	18,393	1,671	22	1,902	20,295
1913	12,581	1,724	30	1,646	14,227
1914	19,868	1,774	35	2,127	21,995
1915	12,396	1,826	55	1,760	14,156
1916	18,380	1,878	85	2,225	20,605
1917	20,436	1,929	105	2,449	22,885
1918	13,775	1,982	105	2,058	15,843
1919	10,611	2,032	115	1,890	12,501
1920	20,387	2,080	115	2,651	23,038
1921	19,572	2,127	115	2,652	22,224
1922	16,198	2,175	115	2,457	18,655
1923	16,868	2,175	115	2,508	19,376
1924	11,708	2,175	115	2,120	13,828
1925	12,411	2,175	115	2,171	14,582
1926	13,080	2,175	115	2,221	15,301
1927	17,551	2,175	117	2,560	20,111
1928	14,714	2,175	120	2,350	17,064
1929	19,632	2,175	120	2,723	22,355
1930	12,414	2,175	120	2,175	14,589
1931	6,220	2,175	120	1,707	7,936
1932	15,180	2,175	120	2,386	17,566
1933	9,750	2,175	120	1,973	11,723
1934	3,966	2,175	120	1,535	5,501
1935	10,283	2,190	135	2,043	12,326
1936	12,145	2,190	160	2,212	14,357
1937	12,006	2,190	170	2,212	14,218
1938	15,661	2,190	180	2,508	18,169
1939	8,872	2,190	180	1,973	10,845
1940	7,617	2,190	180	1,878	9,495
1941	17,888	2,190	185	2,688	20,576
1942	14,809	2,190	185	2,447	17,256
1943	11,435	2,190	185	2,180	13,615
1944	13,034	2,190	185	2,320	15,354
1945	11,782	2,190	185	2,240	14,022
1946	8,791	2,190	185	2,000	10,791
1947	14,047	2,190	185	2,392	16,439
1948	12,883	2,190	185	2,306	15,189
Averages:					
1897-1948	14,180	1,825	96	1,906	16,086
1897-1943	14,400	1,786	87	1,870	16,270
1897-1921	15,856	1,439	39	1,553	17,409
1922-48	12,628	2,183	149	2,232	14,860
1931-40	10,171	2,184	148	2,043	12,214
1931-46	11,216	2,186	162	2,144	13,360

WATER SUPPLY TABLE CXLVI.—*Estimated virgin flow of Gila River at mouth*

[Thousand acre-feet]

Year—	Flow of Salt River at Granite Reef (1)	Flow of Gila River at Kelvin (2)	Unmeasured natural inflow to Phoenix area (3)	Total natural inflow to Phoenix area (4)	Natural loss in Phoenix area (5)	Natural flow Gila River at Gillespie Dam (6)	Natural loss Gillespie Dam to Gila River at mouth (7)	Natural flow Gila River at mouth (8)
1897	[1] 1,289	605	231	2,125	550	1,575	501	1,074
1898	[1] 537	401	97	1,035	372	663	302	361
1899	[1] 514	302	98	914	345	569	272	297
1900	[1] 269	[1] 274	52	595	262	333	193	140
1901	[1] 765	[1] 352	136	1,253	415	838	348	490
1902	[1] 442	[1] 223	99	764	302	462	240	222
1903	[1] 436	[1] 266	98	800	314	486	248	238
1904	527	[1] 336	121	984	355	629	290	339
1905	5,542	[1] 1,582	821	7,945	904	7,041	900	6,141
1906	2,396	[1] 688	360	3,444	690	2,754	659	2,095
1907	2,021	[1] 1,013	337	3,371	685	2,686	650	2,036
1908	1,828	[1] 483	270	2,581	610	1,971	564	1,407
1909	1,736	[1] 395	262	2,393	588	1,805	540	1,265
1910	930	[1] 206	216	1,352	416	936	376	560
1911	[1] 2,143	521	326	2,990	650	2,340	612	1,728
1912	[1] 1,041	535	187	1,763	502	1,261	443	818
1913	888	310	160	1,358	430	928	374	554
1914	1,350	1,342	167	2,859	651	2,208	598	1,610
1915	2,490	1,487	306	4,283	760	3,523	728	2,795
1916	5,301	1,716	435	7,452	901	6,551	885	5,666
1917	2,819	420	384	3,623	702	2,921	673	2,248
1918	1,018	250	258	1,526	444	1,082	408	674
1919	2,201	949	375	3,525	697	2,828	666	2,162
1920	2,478	627	440	3,545	691	2,854	670	2,184
1921	1,826	536	170	2,532	616	1,916	558	1,358
1922	1,569	189	339	2,097	534	1,563	501	1,062
1923	1,754	575	325	2,654	610	2,044	573	1,471
1924	967	299	140	1,406	443	963	380	583
1925	693	303	143	1,139	388	751	330	421
1926	1,334	493	241	2,068	546	1,522	492	1,030
1927	1,927	366	417	2,710	607	2,103	582	1,521
1928	643	214	153	1,010	353	657	300	357
1929	1,025	338	188	1,551	462	1,089	409	680
1930	857	420	158	1,435	446	989	384	605
1931	1,360	577	224	2,161	560	1,601	507	1,094
1932	2,045	534	390	2,969	635	2,334	610	1,724
1933	701	304	107	1,112	390	722	315	407
1934	372	256	84	712	285	427	220	207
1935	1,516	481	255	2,252	560	1,692	520	1,172
1936	1,109	328	146	1,583	472	1,111	410	701
1937	2,101	511	408	3,020	640	2,380	615	1,765
1938	971	232	222	1,425	414	1,011	385	626
1939	749	263	136	1,148	410	738	320	418
1940	1,070	462	126	1,658	490	1,168	515	653
1941	3,491	1,250	557	5,298	808	4,490	790	3,700
1942	884	288	147	1,319	427	892	355	537
1943	874	288	143	1,405	440	965	380	585
Averages:								
1897–1943	1,508	527	244	2,279	527	1,752	480	1,272
1897–1921	1,711	633	256	2,600	554	2,046	508	1,538
1922–43	1,278	408	230	1,916	497	1,419	450	969
1931–40	1,199	395	210	1,804	486	1,318	441	877
1931–43	1,334	444	227	2,005	503	1,502	457	1,045

[1] Basic run-off record estimated in whole or part.

Measured flow of the Gila River at Dome, Ariz. (available records from Oct. 1903 to Dec. 1906 and from May 1929 to date)

Calendar year:	Run-off in acre-feet	Calendar year:	Run-off in acre-feet
1904	226,400	1937	153,700
1905	3,665,000	1938	45,900
1906	1,790,000	1939	22,460
1930	13,700	1940	0
1931	111,000	1941	14,200
1932	259,000	1942	15,668
1933	0	1943	14,120
1934	169	1944	13,040
1935	5,900	1945	12,480
1936	0		

The CHAIRMAN. Mr. Nielsen, we are certainly very grateful.

Mr. NIELSEN. Thank you, sir.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee is now in recess until 10 o'clock tomorrow morning.

(Whereupon, at 12:15 p. m., a recess was taken until 10 a. m. of the following day, Tuesday, March 29, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

TUESDAY, MARCH 29, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in Room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney, McFarland, Downey, Anderson, Malone, and Ecton.

The CHAIRMAN. The committee will come to order, please.

Senator McFarland, who is the first witness?

Senator MCFARLAND. Mr. Debler, I believe, is going to testify.

STATEMENT OF E. B. DEBLER, CONSULTING ENGINEER

The CHAIRMAN. Mr. Debler, you are well known to all the members of the committee, but for the record, will you please give your name and your background?

Mr. DEBLER. I am E. B. Debler, a consulting engineer, residing in Denver, Colo.; in this situation acting as consulting engineer for the State of Arizona.

My background briefly is that of a consulting engineer for the past 2 years. Before that time, for 28 years, with the Bureau of Reclamation. For the greater part of that time I was in charge of investigation of proposed projects.

The CHAIRMAN. You may proceed, sir.

Mr. DEBLER. The discussion this morning on the part of Arizona will be devoted to the submission made for Arizona to the chairman with regard to stream flows.

Arizona submitted a compilation of four pages. For those committee members who do not have their copies of this compilation we can secure them.

The CHAIRMAN. They have been distributed, Mr. Debler.

Mr. DEBLER. The first page of this compilation is a short digest of the material that was presented in more detail yesterday by Mr. Nielsen. Unless a further discussion of that material is desired, I shall not discuss it, excepting only with respect to the derivation of stream flows prior to the start of the gaging station at Lee Ferry.

The CHAIRMAN. This is in no way different from the table already before us, is it?

Mr. DEBLER. It is exactly the same thing.

I think the thing which was not made entirely too clear is that the Lee Ferry records back of 1922 were based mainly on correlations, using the existing records of stream flow above Lee Ferry. I think if you will refer to Mr. Nielsen's tabulation you will find that the stations at which the flow was actually recorded in most of those years would show it was fully 80 percent of the flow at Lee Ferry. And consequently such errors as crept into the Lee Ferry records, by reason of faulty estimating, had to do only with at most, 20 percent of the Lee Ferry flow.

Furthermore, we took into consideration at the same time the flow at Yuma station. In the parlance of the engineer we were swinging Lee Ferry estimates between the records above Lee Ferry and the record at Yuma, as a result of which the Lee Ferry record should be considered rather good.

There was a further study made under my direction in connection with this situation, of the inflows to Great Salt Lake; that for the reason that we had records of the levels of Great Salt Lake extending back to 1854. In other words, even back in 1922 we had some 70 years of record. Great Salt Lake has no outlet. If you convert the evaporating area into water evaporated by multiplying that area by the evaporating rate, and then correct also for the change in content of the lake, you do obtain the actual inflow.

If, then, you correct this inflow for the gradually increasing depletion which was going on there, like everywhere else in the West, through irrigation, we do get the natural inflow.

Senator MALONE. Mr. Chairman, I think this is very important, Mr. Debler's testimony, because he is a really experienced man in this business.

Were the records of inflow into Great Salt Lake available back in 1854?

Mr. DEBLER. There was no record whatsoever of inflow back of about 1905, no direct record. The lake levels, however, had been recorded continuously and possibly you were not here when I explained that a few minutes ago——

Senator MALONE. Yes, I was here.

Mr. DEBLER. We derived the inflow by developing the evaporation from the lake area and correcting for the change in storage.

Senator MALONE. How did you know about the evaporation; were those records kept?

Mr. DEBLER. There have been records of evaporation kept at a number of places around Salt Lake for at least 40 to 50 years.

Senator MALONE. There were records kept entirely from the lake surface, or from pans?

Mr. DEBLER. Some of the records were from the lake surface, floating pans, some of them alongside.

The reason I took that lake and made a study of it was because the headwaters of Great Salt Lake where the water is produced that flows into that lake, are the same mountain ranges that feed the western side of the Colorado River Basin, almost up to Yellowstone Park on the north, and well into the central area of Utah in the south. In other words, for a distance of some 250 miles those two drainage areas interlock. They should show something of the same variation in runoff.

I merely bring that out to point out that we did not rely on some very short records.

As a result of that, I might also point out, when we made the study which is usually called the Weymouth Report, which on February 1924, was made available to the congressional committees——

Senator MALONE. What year?

Mr. DEBLER. In February 1924. It was submitted to the congressional committees. It was the basis of the Boulder Canyon Project Act. That study included the records up to 1922. That report, however, was never printed. Senator Malone, at that time State engineer, arranged for the compilation of the Senate Document No. 186 of the Seventieth Congress, in which Mr. Malone did a very swell job——

Senator MALONE. With your help, I might add.

Mr. DEBLER. Of compiling the information for that bulky report. At that time, it was 1922 mind you, I find that I developed a figure for the inflow to the lower basin at Lee Ferry, with the upper basin completely developed.

Senator MALONE. What page is that?

Mr. DEBLER. Page 46. A flow at Lee Ferry of 8,880,000 acre-feet. That flow, gentlemen, compares with our present estimate of 8,770,000 acre-feet, for an average, a difference of but 110,000 acre-feet.

Senator ANDERSON. I do not follow you.

Mr. DEBLER. With the upper basin fully developed, a flow at Lee Ferry of 8,880,000 acre-feet'

That is all I have to offer, Mr. Chairman, on the stream flows with which we are dealing and on which our conclusions of available water are based.

The CHAIRMAN. What are the facts about the level of Salt Lake now, 25 years ago, and 50 years ago?

Mr. DEBLER. Great Salt Lake has varied in level almost 20 feet over the years. It was low in 1854. It reached a high, as I recall it, in about 1869, then declined quite a bit, then up a little bit, and then came way down in 1905. Then Great Salt Lake rose and kept rising until 1923, at which time it even endangered the railroads around the lake. In fact, the Western Pacific was out of operation for some time.

Then the lake gradually fell, and if I remember rightly, in about 1940 it reachel a low again, and has since been somewhat higher.

Of course, you have this situation on Great Salt Lake: People are constantly bringing in more irrigation, some with the help of the Bureau of Reclamation. I used to have a pet phrase, that I hoped to see the day when I could dry up Salt Lake for good and put all that water to a better use than to just evaporate into thin air. I did not stay long enough to do that. But Great Salt Lake naturally shows a general trend toward lower water levels, because of the increasing depletion by irrigation in the lake basin. But those swings up and down, as they are on the Colorado River, are also found on Great Salt Lake.

The CHAIRMAN. Well, is it on the whole shrinking or not?

Mr. DEBLER. Yes.

The CHAIRMAN. It is shrinking?

Mr. DEBLER. Yes, sir, and it will continue to do so, Senator, because of the constantly increasing irrigation in the basin.

The CHAIRMAN. Since you regarded the amount of water in Great Salt Lake as at least an indication of the supply in the Colorado River, are we to draw the conclusion that the supply in the Colorado River, in your judgment, is also shrinking?

Mr. DEBLER. Yes, in fact, as these studies of ours show, when the upper basin uses its full depletion it will be just a little more than half of what it was originally.

The CHAIRMAN. What is the full depletion of which you speak for the upper basin?

Mr. DEBLER. The full depletion of which I speak is the compact allowance of 7,500,000 acre-feet.

The CHAIRMAN. Where do you find an allowance to the upper basin in the compact?

Mr. DEBLER. I would not want to say it is an allowance. It is an——

Senator MCFARLAND. Apportionment.

Mr. DEBLER. Apportionment under the compact.

The CHAIRMAN. Well, is it not rather that the upper basin is required to deliver 7½ million feet at a particular point, namely, Lee Ferry, annually, or 75 million over any 10-year period?

Mr. DEBLER. The upper basin, along with its privilege of using the 7,500,000 acre-feet, does have a concurrent obligation of delivering 75,000,000 acre-feet at Lee Ferry. The two are not inconsistent, however. At least the delivery can be made, without any doubt. There are some differences of opinion as to whether the upper basin will ever fully reach a use of 7,500,000 acre-feet.

The CHAIRMAN. Well, let us take a hypothetical case. Let us assume that there should be a series of very wet years in the upper basin, thereby greatly increasing the normal water supply above the average. You do not wish anybody to understand from what you say that the upper basin States could not use that excess supply, provided, however, they complied with the compact obligation of delivery?

Mr. DEBLER. As the compact now stands, the upper basin can only use 7,500,000 acre-feet, and that is, as I understand it, an average. The upper basin cannot in some years use that much water.

The CHAIRMAN. Then, are you telling us, in your opinion, there is a limitation upon the upper basin States of use?

Mr. DEBLER. There is to this extent——

The CHAIRMAN. Is that a matter of interpretation?

Mr. DEBLER. All that has been apportioned is 7,500,000 acre-feet.

Senator ANDERSON. May I read you something from the compact, please:

> The States of the upper division shall not withhold water and the States of the lower division shall not require the delivery of water which cannot reasonably be applied to domestic and agricultural uses.

Now, if we had 20,000,000 acre-feet in the river and the lower States were not prepared to make that available to domestic and agricultural uses, there would be no obligation to deliver it past Lee Ferry, would there?

Mr. DEBLER. If it is needed for agricultural or domestic uses in the lower basin it cannot be withheld.

Senator ANDERSON. I said if there was not a use for 15,000,000 acre-feet, which there might be coming across there in a rather large year,

there would be no obligation to deliver it past Lee Ferry, but it might be used in the upper basin States, might it not?

Mr. DEBLER. So long as it is waste water, yes.

Senator ANDERSON. Well, if it was not waste water and the lower basin States had not developed more than 8,500,000, and such other quantities as might be needed for Mexico, do you think there would be an obligation on the upper basin States to deliver water which cannot reasonably be applied to the domestic and agricultural users in the lower basin?

Mr. DEBLER. I think they could use it, yes, but mind you, you do not want to narrow the definition too much on that 8,500,000 acre-feet.

There are such things as filling reservoirs, Senator.

Senator ANDERSON. In both basins.

Mr. DEBLER. That is right.

Senator ANDERSON. Thus far the stress is on filling them in one basin.

Mr. DEBLER. Well, I don't know.

Senator ANDERSON. Your figures way back in 1924, whenever this was, "corrected for future depletion" show 5,815,000 acre-feet, as the maximum. Are there any other figures totaling up to 7½ million?

Mr. DEBLER. That is only the future depletion. That is depletion in addition to the depletion that was already occurring at that time. That column is headed, Senator, "Correction for future depletion."

Senator ANDERSON. Yes.

Mr. DEBLER. Now, in column 2 you have the past depletion.

Senator ANDERSON. Well, that is zero in 1922.

Mr. DEBLER. That is right.

Senator ANDERSON. I am trying to find out what that figure was in 1922.

Mr. DEBLER. The actual depletion in 1922 was somewhere in the neighborhood of 2,000,000, very close to 2,000,000, so that it actually adds up to just about 7,500,000 acre-feet.

Senator MALONE. 7,800,000.

Mr. DEBLER. Well, I think, George, on the average it would be about seven five.

Senator ANDERSON. I thought so. I just wanted to find out whether there was a depletion figure.

Mr. DEBLER. Oh, yes.

Senator ANDERSON. You are adding to it the use that was then being made in 1922 of the water of the upper basin?

Mr. DEBLER. That is right.

The CHAIRMAN. In the light of the information which we now have, the measurements which have been taken, and the averages which have now been compiled for that period from 1897 through 1948, what is your opinion as to whether or not those who participated in making the estimates at the time the compact was drawn were correct in their estimates?

Mr. DEBLER. I will put it this way, Senator: That most of those at those compact meetings, which I did not attend personally, but the views of whom were from time to time carried to me—most of the people there thought of a larger available stream flow than was actually available.

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The CHAIRMAN. They thought of a larger available stream flow?

Mr. DEBLER. That is right. I know that I talked a number of times with Mr. A. P. Davis about that and even he did not want to accept the lower estimates which Mr. Conkling and I were inclined to use. Conkling was at that time with the Bureau.

The CHAIRMAN. As was stated to us yesterday by Mr. Nielsen, quoting from colloquy between Secretary Hoover, then Secretary of Commerce, and Mr. A. P. Davis, Mr. Hoover said:

I should think for matters of discussion we could take it that the reconstructed mean at Lee Ferry is a minimum of 16,400,000 and perhaps with this elaborate calculation half a million above, that is, 17,000,000. Therefore, we would come to a discussion of a 50–50 basis on some figure lying between 16,400,000 and 17,000,000.

The estimated mean submitted in your table is 16,270,000?

Mr. DEBLER. That is right.

The CHAIRMAN. And for the period to 1948, shown by the table presented yesterday by Mr. Nielsen, it is estimated at 16,086,000. Do you agree substantially with those figures? Of course, you agree with your own. You see, Mr. Nielsen added five more years, the five recent years, 1944, 1945, 1946, 1947, and 1948, thereby bringing about a reduction.

Mr. DEBLER. I am inclined to think, Mr. Chairman, that the addition of these later years tends to lower the average too much.

The CHAIRMAN. Of course, these are accurately measured years.

Mr. DEBLER. That is right. Of course, the reason for that is that we are now including in those figures a low run-off period which started in 1930. It begins to appear that that low run-off period is over.

However, at the start of the 1897–1904 period we were including 8 years—9 years, in fact—of a previous very low period. In short, we have taken in roughly one high run-off period and more than one low run-off period. The tendency then is to produce an average which is somewhat low.

The CHAIRMAN. If you observe the table on the historical flow at Lee Ferry, beginning with the year 1921, which showed a measurement of 19,572,000, you find that we do not have a comparable figure for 8 years. In 1929 it was 19,632,000. Since that time there has been no year which is anywhere comparable to either 1921 or 1929. Indeed, the highest figure since that time is the figure for 1941, 17,888,000.

So what I am trying to determine from my own mind is whether you and these other expert engineers who have been familiar with the water supply of the Colorado River Basin are willing to tell us whether or not, in your judgment, we are dealing with a diminishing supply or with a supply which may again increase.

I have in mind the fact that I was told that not so long ago an engineer from Egypt was visiting in the city of Washington conferring with some water engineers, and he expressed the opinion, I am told, that in Egypt they would never think of building a large dam unless they had a historical record of at least 500 years of water flow.

Senator DOWNEY. That would not be tree rings, would it, Mr. Chairman?

Mr. DEBLER. Well, Mr. Chairman, I think I would like a record of 500 years, too, but I think nearly all of us have some ambition of accomplishing something while we are still alive, and I know that we all want to develop our country and we do not want to wait 500 years.

But coming back to this record since 1921 and the matter of whether we are in a period of diminishing flow, my studies have indicated that there is no perceptible change in the average flow of the Colorado River over many hundreds of years.

The CHAIRMAN. Then your opinion is that we are not dealing with a diminishing supply?

Mr. DEBLER. No. And that the situation is just this: That 1921 was just about the middle of the period when we had high flows; that naturally the flows of this stream are on the upturn for a number of years and then are on the downtrend for a number of years.

We had an especially long cycle here. From 1905 on there was a distinct upward trend in run-off. In fact, the highest years we have had in run-off on the Colorado River, the highest year, was 1909. The highest year that has been recorded was 1909. Then we have had some very high years from 1909 to 1921. Naturally, nature balances off those high years of run-off with some low years at some succeeding time.

The CHAIRMAN. You speak of 1909 as being a recorded flow. It was an estimated flow, was it not?

Mr. DEBLER. At Yuma it was recorded and it was recorded at a number of stations above Lee Ferry as a result of which this estimated Lee Ferry flow must be very nearly correct.

The CHAIRMAN. Now, will you tell us the factors which have been taken into consideration by yourself and other engineers in making the estimates prior to 1921 when actual measurements began at Lee Ferry?

Mr. DEBLER. We took into consideration the fact that in 1921, by our parallel of Great Salt Lake, we knew we were in a period of high run-off; for most of that period from 1905 on; that we had only 8 years in that period of low run-off, from 1897 to 1904, inclusive; and that we knew also from the precipitation records and from the Great Salt Lake behavior that that period of low run-off started much earlier than 1897. Consequently we made allowances there. We made various estimates of our own which I of course cannot reproduce here now, but the result was to arrive at that estimate of 16,000,000 and about 400,000 acre-feet, as I remember it now, for the dependable long-time flow.

That was taking into account these ups and downs in the run-off behavior. And, of course, as the record shows—not from the long Lee Ferry record as it has been extended, and other Colorado River basin records, but other streams throughout this general area show that same trend. They all show these declining flows in these later years.

As you recall, Mr. Chairman, we have a great number of projects that were started in the period of good run-off, 1907 to 1910, 1905 to 1910, with a good many of them now back to the brush.

The CHAIRMAN. The tremendous storms that we had throughout the West during the past winter may be an indication that we are returning to an era of high precipitation and that the run-off may reach proportions far exceeding those since 1921.

Mr. DEBLER. That is right.

The CHAIRMAN. But at any rate we must draw the conclusion that the run-off this spring, 1949, in this general area, will be far above what it has been for the last 10 or 20 years, would you agree?

Mr. DEBLER. The present indications are that, yes.

Senator ANDERSON. Well, you have to have a little rainfall along with the snow melting?

Mr. DEBLER. Yes.

Senator ANDERSON. And has that rainfall been deficient thus far?

Mr. DEBLER. I was going to explain that, Senator.

Senator ANDERSON. It takes a combination of them.

Mr. DEBLER. In the early part of this winter we did have indications of a very, very high run-off on the Colorado River, very high. That indication, because of the lack of continuation of that high snowfall is not quite so strong, but the indications, as I was told not so long ago, are still for an above-average run-off. Now, what happens in the next 3 or 4 months we do not know.

The snow that still comes in the Colorado River Basin in April and the rains that come into that basin in May, June, and even in July have a lot to do with the total for the year.

The CHAIRMAN. Assume that we do have a higher-than-average run-off, then assume that there were storage facilities in the upper basin sufficient to hold this supply back, do you think that in the upper basin States the people there under the compact could utilize that more-than-average flow, regardless of what you call the apportionment, provided the delivery were made as required by the compact at Lee Ferry? Or would they be compelled to see this water, this precipitation which, falling in their backyards and ranches and farms in the form of snow destroyed many of their sheep and cattle, would they be required to see that flow on by Lee Ferry for use in the lower basin?

Mr. DEBLER. They could not do it, of course, this year, because we have no such development.

The CHAIRMAN. Oh, no.

Mr. DEBLER. And as time goes on and the upper basin develops, it is quite unlikely to develop beyond the water supply which is assured.

The only water supply which is assured to the upper basin is this apportionment of 7,500,000 acres.

The CHAIRMAN. That, of course, does not answer the question. You are merely saying that back when the compact was drawn there was an estimate made of the total amount that would be available and you think that is a good estimate; that it will not be exceeded, and therefore we do not need to worry about it in the upper basin. That is all you said.

Mr. DEBLER. I would like to point out, Mr. Chairman, that that estimate of 16,400,000 acre-feet also had to take care of anything that might be given to Mexico by treaty. That is in addition to these basin apportionments.

The CHAIRMAN. Well, I can see that an engineer, as well as a lawyer, can evade answering a question.

Mr. DEBLER. I did not intentionally evade your question, Mr. Chairman.

Senator DOWNEY. Mr. Chairman, I have three or four short questions.

The CHAIRMAN. Just a moment, Senator Downey.

Will the reporter read my last question?

(Question read by reporter as above recorded.)

The CHAIRMAN. That is the question, Mr. Debler.

Mr. DEBLER. It is a rather long question. I would say that if the lower basin cannot use the water under its apportionment then there would be no reason to retain it in the upper basin.

The CHAIRMAN. Thank you, very much.

Mr. DEBLER. That is the opinion of an engineer.

Senator MCFARLAND. On a legal point.

Mr. DEBLER. On a legal point. [Laughter.]

Senator MCFARLAND. I have often said that all irrigation engineers think they are lawyers and all lawyers think they are engineers.

The CHAIRMAN. All right, Senator Downey.

Senator DOWNEY. Mr. Debler, directing your attention to the table you have in the middle of page 3 where you have the item "Gain Lee Ferry to International Boundary, net, long-time average, 1,450,000; low run-off period," the same figure 1,450,000, that attracts my attention. Why do you have identically the same amount allocated to the two different periods?

Mr. DEBLER. It so happens, Senator, that the low run-off periods above Lee Ferry and below do not coincide. And in this late low run-off period we have been through with respect to the Lee Ferry station, the run-off in the lower basin is not substantially less than the long time average.

Senator DOWNEY. Let me ask the question this way: You are satisfied with that statement the way you have it?

Mr. DEBLER. I think so.

Senator DOWNEY. Now, as a matter of fact, is it not true that in the low run-off period the Gila River discharge was down around three, four, and five hundred thousand acre-feet.

Mr. DEBLER. In an individual year, yes.

Senator DOWNEY. But not on an average?

Mr. DEBLER. Not on an average.

Senator DOWNEY. It was up at 1,450,000?

Mr. DEBLER. I would say it is very close to that. That is not just the Gila; that includes all of the streams in that area.

Senator DOWNEY. I understand that, but about 1,200,000 of that represents the discharge of the Gila, on an average, does it not, a long-time average?

Mr. DEBLER. About 1,270,000.

Senator DOWNEY. Well, I stand corrected. Again, Mr. Debler, I would suggest that you check that figure for me. It probably is right, but it attracts my attention.

Now, Mr. Debler, as an engineer do you not think in making the allowance for Mexico which you place at 1,500,000 acre-feet, the amount which must be delivered under the treaty and for which we would be liable in damages if we did not make delivery, that you should make some allowance there for evaporation in the river over that 400 miles, and some allowance to allow for uncertainty in the flow of the river during that 400 miles?

Mr. DEBLER. With respect to the losses that you speak of, Senator, I do not find that figure in this tabulation. But the loss allowance which appears in the statement which I submitted to the last Congress and which appears in the printed record beginning at page 292, has an item—which I could find—of river losses below Hoover Dam and

down to the international boundary. It is an item of 1,127,000 acre-feet. That is the amount that is lost from all the water that was turned out of Hoover Dam, whether for Mexico, for Arizona, California, or Nevada.

Senator DOWNEY. But, Mr. Debler, that does not include any allowance for regulating the flow so as to certainly deliver the amount to Mexico that she desires, does it?

Mr. DEBLER. No. We have this situation, Senator: Some distance below Hoover Dam is Davis Dam which performs a regulating duty, in fact is mentioned in connection with the Mexican treaty. Then going down somewhat farther we have the Parker Dam where considerable regulation takes place. I realize that that reservoir is primarily used for providing the diversion head for the metropolitan district and for power production, but it has consistently been and will continue to be operated as a regulator to some extent.

Then we go farther downstream, and we have the Imperial Dam, which has a considerable capacity, certainly far more than needed to provide the remaining necessary regulation. The result is that from the Imperial Dam, and even at Laguna Dam below there, where we still have a little capacity, there is less than 35 miles of river channel down to the point where Mexico diverts its water from the Morelos Dam that is now under contract for construction by Mexico.

I see no reason to anticipate any difficulty by so regulating any water that is turned out of Boulder Dam for Mexico and others so as to keep entirely within the limits of variations that are permitted by the treaty with Mexico, as a result of which there should be no regulating loss whatever on the water delivered to Mexico.

Senator DOWNEY. Mr. Debler, I do not want to prolong this particular discussion, but is it not true that Laguna and Imperial will silt up so that they will have no regulating capacity?

Mr. DEBLER. No; that is not true. They will never completely silt up.

Senator DOWNEY. Well, I mean to an extent that their capacity for regulating that flow will be negligible?

Mr. DEBLER. Their capacity will be adequate for that purpose.

Senator DOWNEY. Very well. Now, returning to your question of the allowance of 1,400,000 acre-feet in the low run-off period, again from Lee Ferry to the international boundary, is it not true that the Salt River reservoirs dried up in 1931–40 period of low run-off?

Mr. DEBLER. They were practically dry in 1940, and they were substantially full in 1941.

Senator DOWNEY. I am asking you about the period from 1931 to 1940, Mr. Debler, the low run-off period.

Mr. DEBLER. From 1931 to 1940 the reservoirs were pretty well depleted. I might add that the Bartlett Reservoir, which is very important to the water supply of the Salt River project, was not completed, as I remember it, until 1939. In other words, it was not available to help with the water supply.

Senator DOWNEY. Well, again I suggest, if you will, for me, check that figure to see whether you have not made too large an allowance.

Mr. DEBLER. I will be glad to, Senator.

Senator DOWNEY. Now, Mr. Debler, at the bottom of this page, after your calculations are over, you show a shortage for the lower basin of 75,000 acre-feet.

Mr. DEBLER. That is right.

Senator DOWNEY. Then on the last page you show a balance for further use of 1,341,000 acre-feet, which does not include the charge for the central Arizona project, does it?

Mr. DEBLER. No; because that is only for the present and authorized projects.

Senator DOWNEY. I understand that, but it does not include it, Mr. Debler.

Mr. DEBLER. That is right.

Senator DOWNEY. Now, do you not think that even assuming your figures are valid on the record, don't you think your calculation does draw the river down to a precariously low balance on the basis of these figures? Would it be your engineering judgment that we should operate the river in the lower basin and its projects upon such a narrow margin?

Mr. DEBLER. If you will notice, Senator, a part of this narrow margin you speak of is due to the overuse by California.

Senator DOWNEY. Well, now, Mr. Debler——

Mr. DEBLER. To the extent of 260,000 acre-feet.

Senator DOWNEY. That is your interpretation of the law, Mr. Debler.

Mr. DEBLER. Not entirely so.

Senator DOWNEY. Well, all right. You say that in your judgment there should be how much, 230,000 acre-feet?

Mr. DEBLER. Two hundred and sixty thousand acre-feet.

Senator DOWNEY. But still are you not on a precariously narrow margin in the matter of water which is life and death in the Colorado River Basin?

Mr. DEBLER. I do not think we are. That would make an unused balance of 1,600,000 and the proposal by Arizona is to take 1,200,000 and return a full 100,000—in other words, a net take of 1,100,000—that would still leave 500,000.

Senator DOWNEY. Well, that is upon your interpretation of California's rights.

Senator ANDERSON. But California is not limited to 4,400,000 overall, is she, it is just a certain type of water, just III (a) water?

Mr. DEBLER. We are coming now to legal interpretations there. Senator, in my studies I have been guided by the legal interpretations that appear in the previous hearings given by Mr. Carson on pages 221 to 291 and 481 to 495; and by Mr. Clifford H. Stone, whose discussion also appears in that record.

Senator ANDERSON. Then will you help me out on the difference between the California and the Arizona figures and let me have your interpretation of them? California has a table in which it lists the All-American Canal project as requiring 3,800,000 acre-feet. You have it in here 2,946,000. That is a pretty substantial difference.

Mr. DEBLER. The 2,946,000 figure that you see there, Senator, is the result of some studies I have made on the amount of water that California can physically use in that area.

Senator ANDERSON. What is its contract with the Department of the Interior?

Mr. DEBLER. The contract with the Department of the Interior is for a maximum quantity of 3,850,000 acre-feet less the uses by certain areas along the Colorado River.

Senator ANDERSON. It is a little bit confusing to those of us who have to look at it.

Mr. DEBLER. That is right.

Senator ANDERSON. California uses one figure and you use another one.

Senator MALONE. I do not want to interrupt you.

Mr. Chairman, it is absolutely imperative that I leave. Of course, I want to hear Mr. Debler's testimony and I have some questions to ask him myself. I consider him one of the outstanding engineers of the United States.

The final conclusions after cross-examination will also bear great weight in this discussion. But the Senate of the Congress is on the floor, and I think I am going on the floor myself. I would respectfully suggest that we do not run any further.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess.

(Whereupon, at 11:15 o'clock a. m., a recess was taken until 10 a. m., Wednesday, March 30, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

WEDNESDAY, MARCH 30, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, Anderson, Kerr, Miller, Malone, Ecton, and Watkins.

The CHAIRMAN. The hearing will be in order.

Mr. Debler.

STATEMENT OF E. B. DEBLER—Resumed

Senator ANDERSON. Mr. Chairman.

The CHAIRMAN. Senator Anderson.

Senator ANDERSON. Mr. Chairman, before any further cross-examination proceeds, I wonder if we might ask the Salt Lake office of the Bureau of Reclamation to furnish to the committee full information as to what it now has in the selection of storage sites in the upper basin, preparation and plans for the construction of the structures, tentative costs which they assume these structures may represent, and generally what the Bureau of Reclamation is doing toward providing the storage that seems to be so essential if the upper basin is to deliver 75,000,000 feet every 10 years to the lower basin States. We have heard a good deal about what the plans are for the lower basin States, but what is being done for the upper basin States to discharge their responsibilities?

The CHAIRMAN. It is the understanding of the Chair that the reports on the basis of studies which have been made in several years past in the upper basin States are now in process of final preparation.

Mr. BENNETT. That is right.

The CHAIRMAN. What is the status of the report?

Mr. BENNETT. The report on the upper basin should be reaching Washington in May. That is what it looks like at present.

Senator ANDERSON. What does that include?

Mr. BENNETT. That will include, our present thinking is, the presentation of your storage possibilities in the upper basin, together with recommendations for authorization of certain ones at this time, together with the group of selected irrigation projects which should proceed now, and upon which we have detailed information.

Senator ANDERSON. I was anxious to know, Mr. Chairman, because in any calculation of what there now is in the river in the way of water, it is necessary to say, "We recognize you have these low years, but that water will be supplemented from storage." Now, what storage? There is none at the present time; therefore I think it is pertinent for us to know what is expected.

The CHAIRMAN. It is very important to know what is going into the upper basin.

Mr. Debler, you had not quite finished your statement yesterday. While Mr. Debler is looking for his papers I might say to the members of the committee that the 1st of April has been set down for consideration of the nomination of Governor Gruening, of Alaska, so that we have only today and tomorrow before that date, when there will necessarily be an interruption of these hearings because of previous commitments that have been made by this committee.

Do the members of the committee consider that there is any possibility of our shortening these hearings? I would like to have suggestions from the members with respect to that.

Senator MALONE. How would you shorten them?

The CHAIRMAN. By placing a limitation upon the witnesses.

Senator MALONE. I would say in that connection, Mr. Chairman, I think the chairman lives in an arid State which has streams of much less importance that have taken many years to develop. Now, it took 10 years to get together to build the first project. What we are trying to do now is to establish a water supply. I think Mr. Debler's testimony has been very important and is very pertinent.

The CHAIRMAN. I think we all agree on that.

Senator MALONE. I would like to examine him at some length.

Again, we go on the floor at 11. I missed yesterday, but they say I am taking the floor today. I know that the testimony of the Arizona engineers is going to be interesting and important, as well as California's. That is shown from the preliminary evidence that we received from Mr. Nelson, in regard to trying to coordinate the two, which seemed impossible.

I think this is one of the most important things before the Congress, so why should we shorten it?

The CHAIRMAN. I quite agree with you, Senator.

Senator ANDERSON. May we go off the record?

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. All right, Mr. Debler, without objection you may finish your statement without interruption, and then you may be examined later, if any of the Senators desire to ask you questions.

Senator DOWNEY. Mr. Chairman, before Mr. Debler starts, I wonder if I could make arrangement with some representative of the Bureau of Reclamation to come to my office after we are through, someone who can interpret and explain to me certain charts and figures on this project.

Mr. NIELSEN. Charts which I had in my testimony?

Senator DOWNEY. No; I mean the long charts you have showing the amount of water developed in the Gila Valley and the uses of that.

Mr. NIELSEN. We can arrange that, sir.

Senator DOWNEY. I think maybe I can save a lot of time instead of cross-examining before the committee, if I can have the explanation.

The CHAIRMAN. Very well. Proceed, Mr. Debler.

Mr. DEBLER. Mr. Chairman, I believe we had finished with the first page of tables of the submission made a few days ago by Arizona in response to the request of the chairman for the data on stream flow, intended to bring out the extent of agreement and the extent of disagreement.

On the second page of this compilation, I start out with a short statement which I may well read:

From Lee Ferry to the international boundary, about 6 miles from Yuma, Colorado River receives a number of tributaries of which the principal streams are the Little Colorado, Virgin, Williams, and Gila Rivers. The Colorado is a gaining stream to Hoover Dam and has always lost water through evaporation from plants, land, and water below that point. Irrigation started about 1860, with man-made depletions by irrigation and reservoir evaporation increasing rapidly after 1900. The net gain from Lee Ferry to the boundary under virgin conditions is estimated at 1,450,000 acre-feet.

That is taken from page 285 of the March 1946 Report of the Bureau of Reclamation.

The Colorado River compact apportions to the upper basin 7,500,000 acre-feet but also requires the upper basin to maintain a minimum 10-year flow at Lee Ferry of 75,000,000 acre-feet, or an average of 7,500,000 acre-feet.

At that point, as a matter of explanation, I may add that the compact does not mention that average of 7,500,000 acre-feet. That is merely a division of the 75,000,000 acre-feet.

Lake Mead would be filled during a high run-off period and would yield 900,000 acre-feet during a low run-off period of 20 years.

What I wish to bring out at that point is that, when we have a period of high run-off as we had from 1905 to 1930, the virgin flow of the river exceeds the compact apportionments together with the Mexican water, and at that time any prudent operator would be filling those reservoirs. The States as a group were supposed to be prudent in their stream operations, and they similarly would be filling all of the reservoirs and holding their development to such a state that such a filling is assured.

In turn, this filling is for the purpose of supplementing the natural flow in the following low run-off period, such as the one that happened from 1930 to 1945, or 1946.

Going back to this Lake Mead draw-down. The 900,000 acre-feet of draw-down represents a withdrawal of 16,000,000 acre-feet from Lake Mead, active storage capacity, which would result from lowering the lake from a full content of about 25,000,000 acre-feet at the beginning of the low run-off period to 9,000,000 acre-feet at the end of the low run-off period. The 9,000,000 acre-feet is not necessarily the minimum to which the lake may be lowered. It still has considerable usable capacity below that level, but in this compilation we assumed only 16,000,000 acre-feet withdrawn.

An additional 2,000,000 acre-feet is yielded by the ground on which the reservoir is built. In filling this reservoir, some 3,000,000 acre-feet went into the ground. We know that from the records. Of that 3,000,000 acre-feet, we estimate that roughly 2,000,000 acre-feet will again come out as the reservoir is gradually lowered over this low run-off period.

That then gives us 18,000,000 acre-feet of water which can be used to supplement the natural flow. And when taking a 20-year low run-off

period, which I assumed, that provides an annual average storage outflow of 900,000 acre-feet per year.

These figures which I have just quoted appear in the paper which was presented by me at the last Congress.

From this basic data the next table is developed:

Waters available to the lower basin and Mexico with the upper basin fully using its apportionment then become as follows:

I have there two headings: "Long-time average," which is the 1897–1943 period; and the "Low run-off period," which, in my paper of the last hearings, is the period of 1930 to 1945, inclusive, except as I stated before, that I assumed a 20-year possible low run-off period in my reservoir storage release of 900,000 acre-feet per year.

The virgin flow at Lee Ferry becomes 16,270,000 acre-feet for the long-time average. The upper basin apportionment is 7,500,000 acre-feet. And, in the event the upper basin fully uses that much water, the remaining average flow at Lee Ferry is 8,770,000 acre-feet.

The corresponding flow in a low run-off period is the water which the upper basin is obligated to deliver, a minimum flow of 75,000,000 acre-feet in 10 years, which amounts to an average of 7,500,000 acre-feet per year.

There is a natural gain from Lee Ferry to the international boundary in the net amount of 1,450,000 acre-feet over a long period. That was brought out in the March 1946 report of the Bureau of Reclamation.

For the low run-off period, I have used the same figure. Senator Downey questioned that figure yesterday, and I wish to place in the record here, Mr. Chairman, a short item in support of the figure that I used, if this is the right time.

The CHAIRMAN. It may be received.

(The chart is as follows:)

Net gain, Lee Ferry to Yuma

Long-time net gain from March 1946 report by Bureau		**1,450,000**
Low run-off period, 1930–45:[1]		
Derived gain for 1939–45, from p. 305 of hearings in 80th Cong., table 3 ---------- acre-feet	810,000	
Depletion on streams entering in this area from p. 186 of March 1946 report ---------- acre-feet	166,000	
		976,000
Bill Williams's River in 1930–43 averaged 119,000 acre-feet and other streams in Hoover Dam-Yuma area would increase this quantity to		180,000
Gila River natural outflow for 1930–43 average (1944 and 1945 not completed for lack of adequate data immediately available)		1,014,000
		2,170,000
Estimated Hoover Dam-Yuma losses average 1,030,000 under natural conditions (March 1946 report, p. 283) and with reduced run-off of 1930-45 period would also be lower. They are herein estimated at		800,000
Net gain 1930–45		**1,370,000**

[1] Table 1, p. 304, of the 80th Cong. hearings shows 1930–45 to have been almost the same average run-off for the principal streams as in 1939–45.

Mr. DEBLER. My statement yesterday was that in those particular years the gain was substantially equal to that of the long-time period.

We have then, in addition, the draw-down at Lake Mead in the low run-off period of 900,000 acre-feet, the resulting average available for the lower basin and the delivery of water to Mexico, without calling on the upper basin for any water for the Mexican allotment, of an average of 10,220,000 acre-feet in the long-time period, and 9,850,000 acre-feet in the low run-off period. There has been apportioned to the lower basin and Mexico, the latter by treaty, 10,000,000 acre-feet, which results, with the long-time everage, in a surplus of 220,000 acre-feet, and in the low run-off period a deficiency of 150,000 acre-feet.

Mexico was accorded 1,500,000 acre-feet by treaty. Since such a delivery results in a supply to the lower basin in the low-flow period of less than the 8,500,000 acre-feet apportioned by the compact, each basin is obligated by the compact to bear one-half of the deficiency in the supply to Mexico. Except as Mexico can under the treaty provisions be shortened in proportion to the shortages in the United States, the distribution of available water in the low run-off period would then be as follows:

Upper basin delivery for the lower basin, 7,500,000 acre-feet, and, for Mexico, 75,000 acre-feet.

The 75,000 acre-feet would be one-half of the initial deficiency of 150,000 acre-feet shown in the preceding tabulation. With a gain in the lower basin of 1,450,000 acre-feet, and a Lake Mead draw-down of 900,000 acre-feet, the result is a total for the lower basin and Mexico of 9,925,000 acre-feet. The delivery to Mexico being 1,500,000 acre-feet, there remains for the lower basin 8,425,000 acre-feet, which is 75,000 acre-feet less than the compact apportionment to the lower basin.

I will next take up the division in the lower basin which is presented on the fourth page of the memorandum.

The lower basin has been apportioned 8,500,000 acre-feet. Of this, California, by self-limitation, is entitled to the maximum of 4,400,000 acre-feet. The remainder, being the minimum available for Arizona, Nevada, New Mexico, and Utah, is 4,100,000 acre-feet. The maximum use contemplated for Utah, Nevada, and New Mexico is 430,000 acre-feet. This item of 430,000 acre-feet is made up of 300,000 acre-feet, being the amount for which Nevada has contracted, a use by Utah of 101,000 acre-feet, by New Mexico on the Little Colorado River of 13,000 acre-feet, and by New Mexico on the Gila River of 16,000 acre-feet, these being the maximum diversions contemplated in those States out of lower-basin waters as presented on page 184 of the Colorado River Basin Report of March 1946.

The result then leaves a minimum available for Arizona of 3,670,000 acre-feet.

At this point I wish to acknowledge that we made an error in the very next figure, in the hurry of getting up this compilation. The wrong figure was used and, if the committee members would care to do so, I suggest the insertion, instead of the figure 1,206,000, the figure 1,120,000. That leaves a minimum available from the main stream of 2,550,000.

Senator WATKINS. You said "Nevada." You mean Arizona?

Mr. DEBLER. Yes; I meant Arizona.

Senator WATKINS. You said "Nevada." I thought you misspoke yourself.

Mr. DEBLER. I am sorry, Senator Watkins. I do not want to mislead the committee.

Senator WATKINS. I thought if you gave Nevada a million you might find another million for Utah.

Mr. DEBLER. I wish we could.

Senator WATKINS. I wish you could, too.

Senator MALONE. What is the amount in the main stream?

Mr. DEBLER. The amount in the main stream would be 2,550,000, eleven-twenty deducted from thirty-six seventy.

If I may, I should like to bring out the derivation of the 1,120,000 at this point. The virgin outflow of the Gila River under natural conditions——

Senator ANDERSON. I would like to see that sheet that he presented for the record. It does not help for it to go into the record unless I have a peek at it.

Mr. DEBLER. Here you are, sir; excuse me.

Senator MALONE. Is this a supplement to your statement?

Mr. DEBLER. That was in answer to Senator Downey's question of yesterday.

The virgin outflow of the Gila River Basin under natural conditions as has been reported by the Bureau on the Colorado River Basin, page 285, is 1,272,000, which figure has usually been taken in the statements as 1,270,000. In the same report the Bureau estimated the depletion of the stream with the development on the Gila River as of 1943 at 1,135,000 acre-feet, leaving an outflow of 135,000 acre-feet. The Bureau, in its report on the central Arizona project, anticipated a further depletion of 36,000 acre-feet exclusive of the central Arizona project. I have discussed those derivations with the Bureau and agree with that figure.

Further adjustments for the effects of the central Arizona project, comprising a reduction in spills of 35,000 acre-feet and an outflow of 70,000 acre-feet for the maintenance of adequate salt balance outflows, results eventually in a total depletion of 1,136,000 acre-feet and an Arizona depletion of 1,120,000 acre-feet of Gila River water, independent of an outflow of 88,000 acre-feet of Colorado River water released for salt balance.

Senator WATKINS. Where is that listed on this extra sheet you passed out, Mr. Debler?

Mr. DEBLER. It is on this paper.

Senator WATKINS. It is on your main statement?

Mr. DEBLER. Yes.

Senator WATKINS. I thought maybe you were talking about this supplement.

Mr. DEBLER. No; I merely presented that as my answer to the Senator's question yesterday.

Senator WATKINS. Thank you.

Mr. DEBLER. The Arizona uses for present and authorized projects, including reservoir evaporation in the low run-off period above Lake Mead, 64,000 acre-feet, which is taken from the Colorado River Basin report on page 184; the Williams River, 3,000 acre-feet from the same page, a use by Parker Valley of 215,000 acre-feet, which was developed by me in connection with the previous statements submitted, the Gila project with a use of 600,000 acre-feet, which use

was authorized by Congress, or, rather, which limitation on use was placed on that project by Congress, the Yuma project with its depletion of 130,000 acre-feet, and a reservoir evaporation of 175,000 acre-feet, being Arizona's share of the total main-stream reservoir evaporation in the lower basin during the low run-off period, with the evaporation prorated in accordance with the amounts of water that Arizona and California would withdraw from the river.

The result is an Arizona use of 1,187,000 acre-feet for present and authorized projects, leaving 1,363,000 acre-feet of water available at present.

Senator MALONE. Mr. Chairman, I will not interpose an objection to the continued hearing by the committee, but I must go to another committee. I just want that to appear for the record.

Mr. DEBLER. The last sheet of this statement is a balance sheet for the lower basin as a whole, assuming the upper basin is fully developed and a low run-off period, with the lower basin uses limited to the present and authorized projects.

At that time, Nevada, Utah, and New Mexico would be using 118,000 acre-feet. That is taken from the Colorado River Basin report. Again it really represents the 1943 uses by those States, because none of them have at this time any authorized projects for construction for the use of the lower basin waters of the Colorado River.

Arizona would be using, as shown on the previous page, 64,000 above Hoover Dam, again, because Arizona has no additional authorized projects; Williams River, 3,000; Parker Valley Indian Reservation, because it is an authorized project, 215,000 acre-feet; the Gila project, 600,000 acre-feet; Yuma project, 130,000 acre-feet. The Gila depletion, with such additional depletion as comes after 1943 because of the lack of completion of some of the private works, would be 1,119,000, which also, you will notice, is substantially the depletion of 1,120,000, which we would have with full development on the Gila River after the building of the central Arizona project; then the main stream reservoir evaporation of 175,000, as before, making an Arizona use of 2,306,000.

California, with the Metropolitan district, including the annexed San Diego area, using its full contract quantity of 1,212,000; the Palo Verde district, a private project, and assumed to be fully developed, 176,000; the Yuma project in California, 31,000, and the All-American Canal diverting 2,946,000 into Imperial Valley.

Incidentally, that quantity (2,946,000 acre-feet) is substantially the 1947 and 1948 diversion into the Imperial Valley through the All-American Canal. It represents a study on my part of the maximum amount of water that could be utilized in the area served by the All-American Canal.

The mainstream reservoir evaporation for California, computed as I have outlined for Arizona, would be 295,000, with a total use for California of 4,660,000, which, incidentally, is 260,000 acre-feet in excess of the 4,400,000 of apportioned water to which California limited herself by her Self-Limitation Act.

The resulting uses would be 7,084,000 out of an available water supply of 8,425,000 acre-feet, leaving a balance for further use of 1,341,000 acre-feet which would be increased to 1,600,000 acre-feet, if the California use were reduced to 4,400,000 acre-feet.

This tabulation was prepared specifically in answer to the questions submitted by Senator Anderson with regard to what water is still physically available for additional use.

Senator WATKINS. Mr. Chairman, I would like to leave in a moment. May I ask the witness one question?

The CHAIRMAN. I think the witness has finished his statement.

Mr. DEBLER. I am through.

Senator WATKINS. I would like to know, Mr. Debler, if you have prepared a balance sheet for the upper basin under the low-water flow and storage, as you have just given here for the lower basin.

Mr. DEBLER. No; I have not.

Senator WATKINS. You do not know, under this situation, what would be available to the upper basin States?

Mr. DEBLER. The amount that would be available to the upper basin States depends quite a bit, Senator, on this storage development that we are discussing.

Senator WATKINS. I mean, without that storage. What would be the natural flow available to the upper basin States under the balance sheet you have just shown for the lower basin States, during the low-water cycle? I know it is not completely and entirely germane to this question, but it does throw some additional light on studies that have been made.

Mr. DEBLER. I do not have available to me at the moment, Senator Watkins, that information.

Senator WATKINS. If you do not have it now, I have to leave, but I would appreciate it if you could give us information showing just what would happen to the water supply in the upper basin States during the same period you have given for the States of the lower basin.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. Senator Anderson, do you want to ask some questions?

Senator ANDERSON. Yes; I have a few here.

This figure, on the very last sheet, where we asked for a balance sheet, would you explain again this 118,000 acre-feet that you allot to Nevada, Utah, and New Mexico, as lower basin States?

Mr. DEBLER. That figure is taken from page 184 of this report by the Bureau on the Colorado River Basin. It represents the present depletions, that is, the 1943 depletions as they are given in the first column of that table, by adding the figure for Nevada, which is 43,800 acre-feet, the 29,000 acre-feet for New Mexico, and the figure of 45,000 acre-feet for Utah. That should give the 118,000, if I have added correctly.

Senator ANDERSON. Therefore, you believe that regardless of the 300,000 set aside to Nevada, that your figures should hold them to 118,000 total? Was there not 300,000 set aside for Nevada by contract?

Mr. DEBLER. Well, this tabulation, Senator, presents, as you will notice, for the lower basin—the heading of that tabulation—"Lower basin uses, present and authorized projects."

Senator ANDERSON. I realize that.

Mr. DEBLER. I took that for every lower basin State, Arizona, California, and all the States. The entire tabulation is limited to present and authorized uses.

Senator ANDERSON. Then the total available balance is 1,341,000?

Mr. DEBLER. That is the physical balance if all these authorized projects and existing projects complete their full development.

Senator ANDERSON. From that there should be some additional water for Nevada, surely, should there not?

Mr. DEBLER. Oh, yes.

Senator ANDERSON. And some additional water for Utah?

Mr. DEBLER. That is right.

Senator ANDERSON. Then how much is available for future use, if you take those projects into consideration? Just using this sheet here.

Mr. DEBLER. That is shown on the previous page.

Senator ANDERSON. The previous page operates a little differently. The previous page lists California at 4,400,000.

Mr. DEBLER. But it also shows a use of 430,000 for Arizona, Nevada, New Mexico, and Utah.

Senator ANDERSON. What I am getting at is in order to show there is 1,360,000 feet available in the table where you show the division of water, you put California down at 4,400,000. You do put Utah, New Mexico, and Arizona up. But when you start dealing with actual figures, you put California at 4,660,000 and therefore shrink New Mexico and Arizona. Would it not be better to have one table where you put them all in and then see what you have left?

Mr. DEBLER. Senator, that last page was in response to your request for information on the physical water available without regard to any compacts, or anything else.

Senator ANDERSON. I realize that. Now, having that, and adjusting your other figures for the figures brought out by that, do you not come out with a million available for any project in Arizona do you?

Mr. DEBLER. The preceding page shows 1,363,000 available for additional use by Arizona.

Senator ANDERSON. Exactly, by using California 4,400,000 instead of an actual figure of 5,362,000, or even your lowered figure of 4,660,000.

Mr. DEBLER. That is right.

Senator ANDERSON. Now, if you would take this table you have here that is dealing with actual facts and transfer those actual facts into your previous table, it does not come out with quite that figure.

Mr. DEBLER. No; the previous statement is based on rights. The last page is not based on rights.

Senator ANDERSON. Then the question is, What happens to California? If you are able to shrink California a million acre-feet, there is a million acre-feet available for the project in Arizona. Is that a fair statement of it?

Mr. DEBLER. Well, no; I would not agree to that.

Senator ANDERSON. How would you state it?

Senator KERR. Well, is this not the thing, Senator, and maybe this will clarify it? As I understand your figures, you say California is presently physically using 4,660,000?

Mr. DEBLER. She would be if she had these authorized projects all now fully developed. What I mean by that, Senator, is this: The Metropolitan aqueduct last year diverted less than 200,000 acre-feet, but the contract for the Metropolitan district and the San Diego area, which was annexed, contemplated an ultimate use of 1,212,000 acre-feet, if it is available.

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Now, I have merely assumed, in response to what I understood the Senator's question to be, I have put down the use of 1,212,000, but without any responsibility or any opinion on my part that that amount of water would ever be available for that district.

Senator KERR. But even giving effect to that, you find 1,341,000 not allocated?

Mr. DEBLER. Still running in the river unused with all those uses.

Senator KERR. Then deducting 260,000 from the total set up there for California which you said would bring her within her own Limitation Act, would give you 1,600,000?

Mr. DEBLER. 1,601,000. That is the amount of water that would then be available on that basis for use in all the lower basin States, excepting, of course, California, if you held her to the 4,400,000.

Senator ANDERSON. You have used a figure of 29,000 for the projects in New Mexico.

Mr. DEBLER. That is the depletion contemplated ultimately in New Mexico in this Bureau report.

Senator ANDERSON. Do you think that Bureau report is in any way binding on New Mexico?

Mr. DEBLER. No.

Senator ANDERSON. In other words, would the Bureau have the authority to do what Congress itself could not do, apportion the waters?

Mr. DEBLER. They did not apportion the water, they merely made an estimate of what New Mexico would ultimately use.

Senator ANDERSON. They have never made a survey to see if New Mexico could use more. Certainly, if they took it out of the Hooker Dam and dropped it down into the area of Mimbres, that is a much shorter lift than to go from the Bridge Canyon site down to the central Arizona project, is it not? I mean, if New Mexico is entitled to a fair and accurate share of the water it does not have to be used right under Hooker Dam, does it?

Mr. DEBLER. I am not in a position to comment on that kind of a project, Senator, I just do not know enough about it.

Senator ANDERSON. But you are pretty well satisfied to limit New Mexico to 29,000?

Mr. DEBLER. The investigation made under my direction while I was with the Bureau would tend to confirm the results that the Bureau here presents.

Senator ANDERSON. By the same theory, that is, if the Arizona water was handled in the same way, namely, that you had to use it right under the dam, there would not be much point in considering the central Arizona project today, would there?

Mr. DEBLER. Excepting only to keep those lands that are now under irrigation, to keep them in irrigation.

Senator ANDERSON. All right, that is fine, because in the Mimbres Valley of New Mexico there are now lands under irrigation by pumps, just as there are in the Arizona area. Would you feel the same responsibility toward that, as you testified with respect to the central Arizona project?

Mr. DEBLER. I do not have that responsibility any more, Senator, but I have an idea that the Bureau would say they would have the same responsibility. That is for them to say.

Senator ANDERSON. I was looking at your balance sheet here as to the division of water. Each time we start with the fact that there

must be 10 million acre-feet of water apportioned to the lower basin and Mexico.

Mr. DEBLER. That is right.

Senator ANDERSON. That steadily puts the upper basin States in a deficiency position. You recognize where we might be interested now in California's definition of uses of water which we were never interested in before?

Mr. DEBLER. What kind of position?

Senator ANDERSON. A deficiency. There never will be a year when we will have enough water to get 7,500,000 acre-feet out of that river in the upper basin States, because we will still be paying off back debts to the lower basin States, if there is any credence to these rainfall figures for the last 35 years. There never has been a year in which you could take out 10 million and have 7½ million left. In other words, if the stream actually is a 14, 15, or 16 million acre-foot stream instead of the 20 million acre-foot stream they were talking about, the upper basin States are always going to have a deficit if they try to get the utilization of 7,500,000 acre-feet.

Mr. DEBLER. I am sure, Senator, you have possibly overlooked one point, that is, the average net gain in the lower basin is 1,450,000 acre-feet. Consequently, in order to make 10 million acre-feet available for the lower basin and Mexico, you need to have passing at Lee Ferry only an average of 8,550,000 acre- feet.

Senator ANDERSON. But there is some dispute over that 1,450,000, is there not? Do all engineers agree that that is a fairly reasonable figure?

Mr. DEBLER. Well, I do not think engineers agree any better than lawyers do.

Senator ANDERSON. In other words, the table you have submitted shows the derived gain from 1939 to 1945. Why did you happen to use that particular 6-year period? Why not take a 20-year period, or, as you have been saying here, a figure since 1897?

Mr. DEBLER. We have no measurements at Boulder before 1934.

Senator ANDERSON. Well, you had none at Lee Ferry before 1921, but you have them all in your table here.

Mr. DEBLER. Yes; but this gain is a gain from Lee Ferry to Boulder. There was no station there before 1935.

Then from 1935 to 1939, Lake Mead was filling. While it was filling there was a large mass of water imbedded in the surrounding area of the reservoir. The result is that you cannot derive the gain in the Ferry-Hoover Dam section because we could not measure all the streams coming into the reservoir. Various streams come in all around the reservoir; some on the surface and some underground.

Consequently, I used the years 1939 to 1945, because by the beginning of 1939 the reservoir was at the same level that it was at the end of 1945. There was therefore no gain or loss from bank storage during that period, no net gain or loss. Then by making allowance for evaporation, I developed this gain below Lee Ferry.

I made a further study of the streams in that particular area, in a tabulation which appears in my statement to the last Congress, which showed that for the streams in that area the flow for 1939 to 1945 was substantially the same as for the period 1930 to 1945, which is the 16-year low period.

As a result, I think I was warranted in assuming that the results from 1939 to 1945 correctly reflect the low period of 1930 to 1945.

Senator ANDERSON. Your table starts out 1,450,000, and ends up 1,370,000.

Mr. DEBLER. That is right. I made the statement yesterday that the gain is substantially the same.

Senator ANDERSON. I realize it could not be completely accurate.

Mr. DEBLER. There is another item which comes into the feature of that gain which I have not discussed because it is rather complicated. I left it as simple as possible. It brings it even closer together than that, but it is rather complicated, and I hesitate to start it.

The CHAIRMAN. Any further questions, Senator Anderson?

Senator ANDERSON. No, I guess not. I am just trying to figure where this grain which comes in below Lee Ferry is of any interest to the upper States.

Mr. DEBLER. In this way, Senator: When you speak of the upper basin having no water at all because of this demand for 10,000,000 in the lower basin, that is not 10,000,000 past Lee Ferry, it is only 8,850,000 on the average.

Senator KERR. 8,550,000.

Mr. DEBLER. 8,550,000 on the average.

The CHAIRMAN. Your first table says 8,770,000.

Senator ANDERSON. That is the long-time average.

Mr. DEBLER. That is the supply.

The CHAIRMAN. Well, I just read, "Long-time average" on page 2.

Mr. DEBLER. That is the actual flow. With the virgin flow of 16,270,000 acre-feet, less that upper basin average take of 7,500,000 acre-feet, leaves an average flow of 8,770,000 acre-feet. Then if you deduct from that the average demand for the lower basin and Mexico of 8,550,000 acre-feet, which is the net after deducting losses below Hoover Dam, you get that surplus of 220,000 acre-feet which shows in that table.

Senator ANDERSON. Let me ask you just this one question: Based on your long experience in the area, do you believe that if the Central Arizona project is authorized and constructed, it will not present any drain upon the waters available to the upper basin States?

Mr. DEBLER. I certainly do believe that.

Senator ANDERSON. And will not present any hazard to the States of New Mexico, Utah, and Nevada, which have additional rights as lower basin States?

Mr. DEBLER. None whatever.

The CHAIRMAN. What hazard does it present to any other upper basin State?

Mr. DEBLER. None.

Senator DOWNEY. Is that all, Senator?

Senator ANDERSON. That is all.

Senator DOWNEY. Mr. Chairman, I will ask the witness a few, I hope, rather brief questions. While I personally believe there are ambiguities and optimism shown in Mr. Debler's statement, I would prefer to leave it to one of our engineers who can very briefly review the statement and point out what they believe to be true.

But there are a few patent errors in here, in my opinion, and I would like to ask about them. The most vital is this: On the last page, page 4, the balance sheet for the lower basin, you say that purports to be

a statement of the present and authorized projects in the lower basin. Is that right?

Mr. DEBLER. That is my understanding that that is the entire group.

Senator DOWNEY. And on the basis of that kind of a particular compilation, you carry the item for the three minor lower-basin States at 118,000 acre feet, instead of 430,000 acre feet?

Mr. DEBLER. That is right.

Senator DOWNEY. Of course, manifestly, in a realistic interpretation we would have to deduct another 300,000 acre-feet surplus from this 1,341,000 acre-feet, to proceed to an interpretation of the rest of the contract, which would bring the figures down to something less than a million acre-feet. I mean, taking the actual amount we all admit is due Nevada, Arizona, and Utah, is that not true?

Mr. DEBLER. No.

Senator DOWNEY. Now, you have here, under the California All-American Canal, as the project allotment, 2,946,000 feet, have you not?

Mr. DEBLER. An allotment.?

Senator DOWNEY. Well, a contract.

Mr. DEBLER. No. I made the statement that that is the maximum amount of water that area can use.

Senator DOWNEY. Oh, I thought this was supposed to be your present and authorized projects.

Mr. DEBLER. That is right; the use of water by present and authorized projects.

Senator DOWNEY. Well, as a matter of fact, the Secretary of the Interior granted a right to California on the All-American of 3,800,000 acre-feet, did he not?

Mr. DEBLER. The Secretary of the Interior made no grant that I find. He made a contract——

Senator DOWNEY. He made a contract, very well.

Mr. DEBLER. There is a contract by the United States with California for the use of a maximum amount of 3,850,000 acre-feet on this particular area, plus the California area on the Yuma project, plus the Palo Verde irrigation district also.

Senator DOWNEY. And under that contract from the Government, the All-American Canal was built as a Bureau of Reclamation project, was it not?

Mr. DEBLER. That is right.

Senator DOWNEY. And was not the Bureau of Reclamation project built—I mean, the canal—to carry the 3,800,000 acre-feet?

Mr. DEBLER. No.

Senator DOWNEY. Are you sure of that, Mr. Debler?

Mr. DEBLER. I am quite sure of that.

Senator DOWNEY. Well, what will it carry? What will it deliver?

Mr. DEBLER. It will deliver only the amount of water that these lands can use, of course. If you are speaking of the per-second-foot capacity of the canal, its capacity into the Imperial Valley is 10,000 second-feet, possibly 10,155.

Senator DOWNEY. For second-feet, you mean?

Dr. DEBLER. That is right.

Senator DOWNEY. Mr. Debler, that canal was built so that it has a practical capacity that would deliver the 3,800,000 acre-feet a year, was it not? Was it not planned for that?

Mr. DEBLER. No.

Senator DOWNEY. Now, on what do you base that statement, Mr. Debler?

Mr. DEBLER. It was not based on that, because you had to deduct from that 3,850,000 acre-feet the waters you were using in the Palo Verde and Yuma projects.

Senator DOWNEY. All right, deduct, them, then, if that is correct. I did not know that. But they are minor.

Mr. DEBLER. And the planning, of course, has been changed in the meantime. Just the other day the Secretary made a finding that the East Mesa was infeasible. And naturally what you have on the point you are getting at, Senator, I think, is that you now have an over-capacity in the canal.

Senator DOWNEY. Now, Mr. Debler, I do not want to argue, but I do think we ought to have a fair statement of this. Now, there was this contract granted for the All-American Canal area and these other two small projects you mentioned, to use up to 3,800,000 acre-feet; is that right?

Mr. DEBLER. That is right.

Senator DOWNEY. And the canal was constructed to be able to distribute that much water, was it not?

Mr. DEBLER. Well, that much less the amount; that is right. It can.

Senator DOWNEY. Less what amount?

Mr. DEBLER. Not required for these other two areas.

Senator DOWNEY. Yes, and they amount to about 200,000 acre-feet. Apparently I was wrong. I thought the 3,800,000 was for the All-American Canal alone, but Mr. Debler is right in that, I believe. I understand now the canal was constructed for 4,150,000, including the other projects. What is the contract, 4,150,000?

Senator ANDERSON. Wait a minute; let's get the witness out here. I want to hear this, too. I am not trying to stop you from checking that.

Senator DOWNEY. Off the record.

(Discussion off the record.)

Senator DOWNEY. Now, Mr. Debler, you have headed your statement, "Lower basin uses, present and authorized projects." Now, you certainly are not restricting the statement here to water that is actually used, are you?

Mr. DEBLER. No. This statement, with respect to the All-American Canal project is my determination of the maximum amount of water which, in my opinion, can be used in the area served by that canal.

Senator DOWNEY. All right. Now, I understand you to interpret your statement this way: That while the contract from the Government to the All-American Canal and these other small items is 3,850,000 acre-feet and the facilities are already constructed by the Bureau of Reclamation to handle that water, you say that you cut it down to 2,946,000, because you say there is not enough land in this area to consume more than the 2,946,000 acre-feet; is that it?

Mr. DEBLER. That was not my statement. I said that was my determination of the maximum amount of water that could be used in that area.

Senator DOWNEY. Have you personally investigated the lands of that area?

Mr. DEBLER. I have.

Senator DOWNEY. How long ago?

Mr. DEBLER. The latest time I made a visit through that area was in January of 1948.

Senator DOWNEY. You are here now testifying on behalf of Arizona that the reason you cut this contract down 1,000,000 acre-feet was because it is your belief that there are not lands susceptible of proper irrigation to the full amount?

Mr. DEBLER. That does not reflect my statement.

Senator DOWNEY. Very well, I will withdraw the question. We will cover that in our own testimony, Mr. Chairman. We will endeavor to make it plain to the committee that there are first-class lands available for the full amount of water.

Now, Mr. Debler, without involving us in an argument—and I would appreciate as simple an answer as you can give—do you not think under the conditions you have assumed, and supposing a shortage of 1,500,000 to Mexico, under which the upper basin would have to contribute 750,000 acre-feet a year, that practically it would be very difficult, it not impossible, for the lower basin ever to get that 750,000 acre-feet from the upper basin?

Mr. DEBLER. No, I have implicit faith in the upper basin making that delivery.

Senator DOWNEY. And you do not think we might be involved in tedious discussions of the interpretation of the Mexican treaty and tedious discussions of the run-offs for the different years before we would ever get it?

Mr. DEBLER. Oh, you are apt to have discussions, Senator.

Senator DOWNEY. Now, in your final figures here, did you make up for the error of about 75,000 acre-feet that you found in the low run-off period of the Gila?

Mr. DEBLER. No. That brings me, Senator, to this additional item that I mentioned. It is rather complicated.

Senator DOWNEY. I would rather just rest on the question.

Mr. DEBLER. It does not require this explanation you speak of.

Senator DOWNEY. You say it does not?

Mr. DEBLER. No. As a matter of fact, it brings it right back to the situation I have presented here. It would not take long, and it is just this: In practical operation the Gila River system and the Colorado River source as to Arizona would be operated pretty much independently. It would require, for proper operating technique, that there be assigned this definite amount of water to be secured from the Gila River system over a long period of time, and a definite amount from the Colorado River system.

The result of that is that your yield of the Gila River through the low run-off period would be considered the same as it is over the long-time mean, although in practice, in some of these low periods, the Gila River does not yield as much as it does in others. But with its enormous ground-storage capacity in that central area, it is leveled off over the year.

Now, the result of that is that instead of having only—as this little tabulation shows—an actual natural out-flow of the Gila River of 1,014,000 acre-feet in the low run-off period of 1930–43 the charge against the Gila River would nevertheless be 1,120,000 acre-feet. Regardless of the storage that had been accumulated in earlier years, par-

ticularly in ground-water reservoirs. That is the only way in which the Arizona development can be properly operated.

Senator DOWNEY. Mr. Debler, I do not quite follow that explanation as to why there is a reduction of your figures for the average of the low run-off period in the Gila, but I do not want to proceed with that.

Mr. DEBLER. The practical effect of it is that there is no diminution.

Senator DOWNEY. Now, Mr. Debler, on your last sheet you come out with a balance of 1,341,000 acre-feet. If we are using this table for a practical calculation what would happen to California and Arizona if the central Arizona project is authorized? I would take it we first would have to deduct another approximately 341,000 acre-feet to take care of Nevada, New Mexico, and Utah, leaving approximately 1,000,000 acre-feet of water, which is substantially less than Arizona is now asking.

Now, on the basis of this statement here, and still assuming that the All-American Canal rights are only 2,946,000 acre-feet which we do not admit, where would the balance of the water come from for Arizona, which of these figures here? You are not counting on taking it away from New Mexico?

Mr. DEBLER. Would you mind putting that multiple question into two or three questions?

Senator DOWNEY. Let me first ask you this: There is no disposition here on your part representing Arizona to argue that the other three lower basin States should not get their 340,000 acre-feet of water?

Mr. DEBLER. None whatever.

Senator DOWNEY. Making allowance for that, your balance for further use is reduced to slightly below a million acre-feet?

Mr. DEBLER. You are correct in saying that if we do not consider the overuse by California.

Senator DOWNEY. Mr. Debler, if you will just answer my questions and not engage in argument. Under the assumption it would reduce it to something less than a million acre-feet. I ask you where, from the sums here on your last sheet, would you anticipate you might find additional water for Arizona?

Mr. DEBLER. Well, my last sheet actually points out that with that 260,000 there is 1,601,000 acre-feet available.

Senator DOWNEY. Mr. Debler, I would like to start with your balance for further use, 1,341,000 acre-feet.

Mr. DEBLER. All right, we will start with that.

Senator DOWNEY. Now, let us reduce that by reason of the fact that Nevada, Utah, and New Mexico are going to take 341,000 acre-feet off that, bringing it down to about a million acre-feet.

Mr. DEBLER. Yes.

Senator DOWNEY. Now, I ask you, how do you build that 1,000,000 acre-feet up to 1,200,000 acre-feet, is that what the central Arizona project will have?

Mr. DEBLER. That is right, it is 1,200,000 acre-feet, less about 90,000, which would make it about 1,110,000. That would be built up by requiring California to cease her overdiversions.

Senator DOWNEY. To cease her what?

Mr. DEBLER. Overuses, excess uses.

Senator DOWNEY. Would that be on the metropolitan district?

Mr. DEBLER. I don't know. That would be up to California to decide.

Senator DOWNEY. All you have given us in this for California is 4,660,000, is that not right?

Mr. DEBLER. That is right.

Senator DOWNEY. And that includes mainstream reservoir evaporation of 295,000?

Mr. DEBLER. That is right.

Senator DOWNEY. You understand California claims that as an improper charge against her, do you not?

Mr. DEBLER. I understand that.

Senator DOWNEY. Then where is our overuse here?

Mr. DEBLER. I would not want to say which one of these projects the State wants to cut down to bring it within its limitation.

Senator DOWNEY. You mean, to bring it down to the 4,400,000?

Mr. DEBLER. That is right.

Senator DOWNEY. You do not allow us anything because of one-half the surplus?

Mr. DEBLER. I do not know what that surplus would be. If there ever is a surplus and California can, under the further compact, secure some of it, I do not know where you would use it. That would be up to California.

Senator DOWNEY. The way you bring us above the 4,400,000 is by charging us with 295,000 of mainstream reservoir evaporation, is it not?

Mr. DEBLER. That is part of it.

Senator DOWNEY. And you give us no right or credit for anything in the III (b) water, in this table you have here?

Mr. DEBLER. So far as I understand it, and, of course——

Senator DOWNEY. No, Mr. Debler; first, you do not give us any allowance or credit here for any water coming from the III (b) provision?

Mr. DEBLER. I do not know that California has any III (b) credit particularly.

Senator DOWNEY. Mr. Debler, I am just trying to interpret your statement. You do not give us any credit under the III (b) provision, do you?

Mr. DEBLER. No additional credit, no.

Senator DOWNEY. I think that is all, Mr. Chairman.

We will have our witnesses categorically discuss Mr. Debler's statement.

The CHAIRMAN. Senator Kerr, have you any questions?

Senator KERR. No questions.

The CHAIRMAN. Mr. Debler, may I ask one or two questions before we adjourn this session?

Mr. DEBLER. You may, Mr. Chairman.

The CHAIRMAN. Looking at your last page, the balance sheet for the lower basin, we start with the premise that the upper basin is assumed to be fully developed.

Mr. DEBLER. That is right.

The CHAIRMAN. Now, if the upper basin is fully developed, according to your assumption, how much water must it deliver to the lower basin?

Mr. DEBLER. For use by the lower basin in this low run-off period, which was also assumed, Mr. Chairman, for this last tabulation—this last tabulation is based on a low run-off period.

The CHAIRMAN. Yes.

Mr. DEBLER. At that time there must be delivered at Lee Ferry for the lower basin an average of 7,500,000.

The CHAIRMAN. So that your table now purports to be a showing of the available water for lower basin use in a period of low run-off?

Mr. DEBLER. That is right. It starts from the figure of 8,425,000 at the bottom of the second page of the tabulation.

The CHAIRMAN. Do you assume, in submitting this table to us, that this is a basic, undiminishing supply?

Mr. DEBLER. That is right. This is the bedrock supply.

The CHAIRMAN. In other words, you are telling the committee that the low run-off has to be such, as may be anticipated from the records of the river before us, that Arizona and California may confidently count upon the supplies here mentioned?

Mr. DEBLER. That is right.

The CHAIRMAN. Is it to be assumed, therefore, that in the period of average run-off, long-time average, that the amount of water in each of these areas available for use will be more?

Mr. DEBLER. That is right. The tabulation on the second page shows there is a surplus of 220,000 in the long-time period, over a very long-time period, above all of the present apportionments and the treaty water. Now, that surplus is the average over the high and low periods. Consequently, in the high run-off periods it is very much larger.

The CHAIRMAN. Then may I ask you this question: Is it your belief that in the upper basin, and also in the lower basin, when the supply of water is at least equal to the long-time average you are making no computation as to the uses which may be made in either basin of the increased supply?

Mr. DEBLER. I am not, for the reason that that water has to be covered by additional compacts before you know who can get it. The compact only apportioned 16,000,000 acre-feet, plus what went to Mexico.

The CHAIRMAN. Do we not have the question here with respect to the distribution of surplus water?

Mr. DEBLER. There is nothing in the compact that distributes it.

The CHAIRMAN. Well, do we not have such a question?

Mr. DEBLER. There is that question; yes, sir, Mr. Chairman.

The CHAIRMAN. I asked you yesterday with respect to the upper basin, if, in your opinion, as a former reclamation engineer, there was any objection to the construction in the upper basin of reservoir capacity to store excessive precipitation, or any objection to the utilization of that excessive precipitation and storage, provided the deliveries at Lee Ferry were made in accordance with the compact. And I understood your answer to be no.

Mr. DEBLER. That is right, that was my answer, Mr. Chairman.

The CHAIRMAN. Well, is not the same thing true of the lower basin, whether it is California or Arizona, if there should be excessive precipitation?

Mr. DEBLER. That presents a rather deep legal problem, I believe, Mr. Chairman, but to the best of my knowledge I will try to answer it.

There is as yet no compact in the lower basin.

The CHAIRMAN. Unfortunately you are right.

Mr. DEBLER. They have only one item which in any way specifies any use and that is the self-limitation act of California. Now, as to what the ultimate distribution of that water will be, I do not know, and just how far any one State can go in using water which it may ultimately not receive by compact and hope to keep, that is a very deep legal question.

The CHAIRMAN. I did not say anything about hoping to keep it, because as I conceive this whole compact situation, it is that in making the basic compact the States were considering what seemed to be in the minds of the engineers the average flow of the river, and that was apportioned.

Mr. DEBLER. No, I do not think you meant it in just that way. It did not apportion all of the average flow.

The CHAIRMAN. That is right, but so far as the delivery of 7,500,000 acre-feet to the lower basin was concerned, it apparently was the judgment of the compact commissioners that the upper basin States could provide the development desired and still deliver 7,500,000 acre-feet for the lower basin States, allowing them to make certain desirable developments. But it was also conceived that neither the upper basin nor the lower basin could ever acquire a firm and continuing right to the use of all the water they could use, if more water were flowing.

Mr. DEBLER. That certainly is correct. They could only develop permanent rights by compact.

The CHAIRMAN. All right. Is there any difference in your opinion between the treatment to be accorded to the upper basin States and the lower basin States?

Mr. DEBLER. I cannot see any reason for that.

The CHAIRMAN. Referring now to your table entitled, "Division of Water, Lower Basin," I find you using the words "maximum" and "minimum" several times in the upper portion. I confess I am not altogether clear as to just what you had in mind and what the significance of the two words is. For example, you say, "California, by self-limitation a maximum of 4,400,000." Then you say in the next line, "Minimum available for Arizona, Nevada, New Mexico, and Utah." Then in the next line you have, "Maximum use contemplated for Utah, Nevada, and New Mexico." Then in the next line, "Minimum available for Arizona." Just what was the significance in your mind of the two words as you used them in this part of the table?

Mr. DEBLER. That all stems, Mr. Chairman, from the Self-Limitation Act by California, which in accordance with the Boulder Canyon Project Act specified a maximum use of 4,400,000 acre-feet. Of course, if that use should ever be brought to something less than 4,400,000 acre-feet then this quantity for the other States is increased.

The CHAIRMAN. Let me call your attention to these two lines. In this paragraph you refer to the "Maximum use contemplated for Utah, Nevada, and New Mexico." You set that down as 430,000 acre-feet. In the next table you have at the very top under the title, "Lower Basin Uses, Present and Authorized Projects: Nevada, Utah, and New Mexico, 118,000 Acre-feet." Do I understand this means that in your opinion the compact allows these three States a maximum of

430,000 acre-feet, but that in the period of low run-off they can expect a certain delivery of only 118,000, but might have more?

Mr. DEBLER. That is not quite the situation. The 430,000 acre-feet mentioned on this tabulation represents a contract quantity of 300,000 acre-feet for Nevada. That amount is placed in there by reason of the thought that there is a possibility, just a bare possibility, that Nevada might eventually use that amount. As a matter of fact, the report by the Bureau of Reclamation shows the possibility for using almost that much. It shows the possibility for eventual use of 257,000 acre-feet, on page 184 of this Bureau report, which approaches the 300,000 acre-feet of water contracted for. It was thought best to use the 300,000 as the ultimate limit.

In the case of New Mexico and Utah there are no contracts for water. There I used the ultimate uses which the Bureau deemed likely in those States.

The CHAIRMAN. Well, how do you divide the 118,000 among these three States?

Mr. DEBLER. The 118,000, on the other hand, represents the present-day uses.

The CHAIRMAN. How do you divide that among the three States, how much for New Mexico, how much for Utah, and how much for Nevada? I am talking about the 118,000 shown in your balance sheet?

Mr. DEBLER. That is right. For Arizona——

The CHAIRMAN. I am not talking about Arizona, I am talking about these States.

Mr. DEBLER. For Nevada 44,000; for New Mexico 13,000; for Utah 45,000.

Senator KERR. That is not right, is it, Mr. Debler?

Mr. DEBLER. What is missing?

Senator KERR. The three of them do not add up to 118.

Senator ANDERSON. You have left out a little bit more in New Mexico. You left out one of the items.

Mr. DEBLER. That is right. For New Mexico there should be also the Gila water, 16,000, and that makes 118,000.

The CHAIRMAN. But of these three only Nevada has a contract for 300,000?

Mr. DEBLER. That is right.

Senator ANDERSON. It is not exactly present use, either, is it? Is 29,000 acre-feet the present use in New Mexico?

Mr. DEBLER. Yes. That is the way the Bureau reports it, 29,000 consumed for New Mexico.

Senator ANDERSON. Show me where the Bureau reports that, will you?

Mr. DEBLER. Page 184.

Senator ANDERSON. Present and potential.

Mr. DEBLER. Yes; here is the present and here is the potential and here is the ultimate. The present is in this column [indicating].

Senator ANDERSON. The Bureau of Reclamation then believes that 8,000 acre-feet is all the water that New Mexico could profitably use out of Hoover Dam?

Mr. DEBLER. That is the additional use.

Senator ANDERSON. That is a fair and equitable division of the waters of the Colorado?

Mr. DEBLER. That was their idea of feasible projects in that area.

Senator ANDERSON. But when we keep dealing with their figures we, in effect, accept their distribution of the waters of the Colorado River?

Mr. DEBLER. Well, I would not say that, Senator.

Senator ANDERSON. But if they do not get up any projects to use any more or do not consider it feasible to use any more, when you have an area that could use a whole lot more, you are just as effectively blocked as if you had participated in the division.

Why was the contract signed with Nevada when they had no projects?

Mr. DEBLER. They wanted a contract for water. It was mainly brought to a head by reason of the development of the magnesium plant where water was wanted.

Senator ANDERSON. That is not agricultural.

Mr. DEBLER. That is not, no. Then Nevada also had in mind and was very firmly convinced that there was a feasible project around Las Vegas.

Senator ANDERSON. Well, if you think there is a feasible project do you go to the Bureau and say, "We want to contract for so much water?" Did they present a project when they got the contract for 300,000 acre-feet?

Mr. DEBLER. That is what these other States have been doing. Every contract says it is subject to availability. That does not mean that that much water would be used.

Senator KERR. Was not the 300,000 acre-feet for Nevada used in the Boulder Canyon Project Act?

Mr. DEBLER. The Boulder Canyon Project Act authorized a compact which let Nevada have 300,000 acre-feet.

Senator KERR. Was that not part of the basis for that figure?

Mr. DEBLER. I have an idea it probably was part of it. That figure goes way, way back. I remember Senator George Malone talking about that back in the early twenties.

Senator ANDERSON. You are familiar with California's exceptions to the Colorado River report, are you not?

Mr. DEBLER. I have read that statement, but not too carefully. I do not recall very much of it now.

Senator ANDERSON. California here sets up a basis for—I wish I were a lawyer and then I could say what it is—at least it is a resistance to the limitations in the Boulder Canyon Project Act, by pointing out that the contracts for the areas involved are of long standing; that the filings go back many, many years and get down to the theory of prior beneficial use, so no matter whether they use 5, 6, or 10 million acre-feet the limitation act would not apply because they have been using it a long time.

I was wondering if the Nevada contract was put in so that it also might have a prior claim.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. Are there any other questions to be asked of this witness?

Senator DOWNEY. I have just one question.

The CHAIRMAN. Proceed, sir.

Senator DOWNEY. Mr. Debler, have you not helped to create an additional 75,000 acre-feet of water here between page 2 and page

3, when you give at the bottom of page 2 "Available for lower basin, 8,425,000," then you start on page 3, "Apportioned to lower basin, 8,500,000." In other words, is not the apportionment figure you used 75,000 acre-feet more than your own figures would indicate would be available?

Mr. DEBLER. That page headed "Division of water" was based on the average water. In other words, there would be a full 8,500,000 available under the apportionment.

Senator DOWNEY. Did not your own calculations indicate—as to which I might say we think you are entirely too optimistic—that there would be available 8,425,000?

Mr. DEBLER. That is right.

Senator DOWNEY. Then we have another deficiency of 75,000 acre-feet, have we not?

Mr. DEBLER. If you wanted to put this page on a low run-off basis; yes.

Senator DOWNEY. That is all.

Senator ANDERSON. I was concerned about his California figures because in the California comments the question arises as to the All-American Canal and then the rights of the cities. I am quoting now from California's comments:

> The report implying that these diversions of the Colorado River in California constitute potential expansion is in error, in that it fails to point out that these rights are not only already established by appropriation and contract with the United States but also that the works have already been constructed to utilize this water; that the All-American Canal has been completed and is already in operation, except for one branch—

and so forth.

All the way through California's contentions is the fact that there is no limitation on California's use of water. I wonder if the resolution to get this matter into court is to try to get the Limitation Act declared unconstitutional?

Senator DOWNEY. Senator, I do not think you are correctly stating our position.

Senator ANDERSON. I am not trying to; I am stating worries. I am admitting that frankly.

Senator DOWNEY. We make no such claim that our limitation is not effective. We claim 4,400,000 plus other waters.

Senator ANDERSON. But you do claim it is not effective in your comments on the report of the Colorado River.

Mr. DOWD. Oh, no.

Senator ANDERSON. No?

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon a recess was taken at 12:10 p. m., until 10 a. m. the next day, Thursday, March 31, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

THURSDAY, MARCH 31, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Anderson, Kerr, Ecton, Watkins.

The CHAIRMAN. The committee will come to order.

Senator Downey, the first witness this morning.

Senator DOWNEY. Yes, sir. Mr. Chairman, before he appears, is it proper to inquire whether the chairman has yet made up his mind as to what time we will recess or adjourn at the conclusion of today's hearing?

The CHAIRMAN. The committee has not yet made up the chairman's mind.

Senator DOWNEY. What is the chairman going to advise the committee members to do?

The CHAIRMAN. Off the record.

(Discussion off the record.)

Senator DOWNEY. Mr. Matthew.

Mr. Chairman, we will now present Mr. Raymond Matthew, engineer for California. I understand his testimony this morning is primarily to be directed to the water supply issue of the Colorado River system.

The CHAIRMAN. May I say for the record that I have word from Senator Malone that he will be unable to be present at the hearing this morning. He does, however, desire to cross-examine any of the witnesses who may appear, and that will be arranged.

Very well, Mr. Matthew, we will be very glad to get your view of this very simple question.

STATEMENT OF RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA

Mr. MATTHEW. Mr. Chairman and gentlemen of the committee:

My name is Raymond Matthew. I am chief engineer of the Colorado River Board of California.

In response to the request made we have prepared estimates of the available water supply of the Colorado River system, which were submitted to the committee last Saturday, I believe. I am now prepared to explain the estimates presented.

Fundamentally it is considered that the water supply of the Colorado River system constitutes, and should be estimated on the basis of, the flow available in the main stream and tributaries for consumptive use at actual existing or potential places of use. The data now readily available do not include sufficient information to permit reliable estimation of the available water supplies at the different places of use within the Colorado River Basin. The estimates submitted herewith are based on the somewhat meager data in the report by the Bureau of Reclamation entitled "The Colorado River," dated March 1946 (H. Doc. 419, 80th Cong., 2d sess.) and data from other sources including past studies of the Bureau of Reclamation.

Obviously, the estimated flow of the Colorado River at the international boundary does not and cannot represent the amount of water available for use by projects throughout the basin. It could only be considered to represent the amount of water available for use below that point, or in other words, in Mexico. Likewise, the flow of the Gila River at its mouth cannot represent the amount of water which is available for use from the Gila River in central Arizona.

For example, if you were looking into the availability of a water supply, from an engineering standpoint, in the Green River Basin, you would make an investigation of the water supply available in the Green River or tributaries thereof in the vicinity of the project, or in other words, investigate the nearest source of water by which the project might be served. The flow of the Colorado River at some point way downstream obviously would not give you the information as to the water supply available for such a project.

As I said before, the data readily available in the Bureau reports do not give the information necessary to properly determine the amount of water available at actual places of use. The best approximation that can be made at this time, however, is to utilize the figures contained in the Bureau report, selecting therefrom those figures which would most closely represent the amount of water available for consumptive use at actual or potential places of use.

The tabulations which have been prepared and submitted to the committee comprise two on available water supply, table 1, covering the estimated water supply available for consumptive use from Colorado River system, that is, the entire basin, under full development;

Table 2, covering the available water supply in the lower basin; and

Table 3, which presents estimates of the water requirements of existing and authorized projects in the lower basin.

TABLE 1.—*Estimated water supply available for consumptive use from Colorado River system under full development*

Source of supply	Estimated average supply (thousand acre-feet per annum)		
	Long-term period, 1897–1943	Critical periods	
		1931–40	1930–46
1. Colorado River and tributaries above Lee Ferry	16,300	12,200	13,500
2. Tributaries, Lee Ferry to mouth of the Gila River	600	300	300
3. Gila River system	2,300	2,300	2,300
4. Entire Colorado River system	19,200	14,800	16,100

Source: Submitted by Raymond Matthew, chief engineer, Colorado River Board of California.

TABLE 2.—*Estimated water supply available in lower basin*

Source	Estimated annual average supply (thousand acre-feet per annum)	
	Long-term 1897–1943	Critical period 1930–46
1. Colorado River at Lee Ferry	8,800	7,500
2. Tributaries, Lee Ferry to mouth of Gila River	600	300
3. Gila River system	2,300	2,300
4. Total supply	11,700	10,100

Source: Submitted by Raymond Matthew, chief engineer, Colorado River Board of California.

TABLE 3.—*Estimated water requirements of existing and authorized projects in lower basin*

		Annual consumptive use in acre-feet
1. **Main stream reservoir projects (net evaporation losses)**		780,000
NEVADA, UTAH AND NEW MEXICO		
2. **Projects in lower basin**		440,000
ARIZONA		
3. **Projects using water of Gila River and tributaries**	2,270,000	
4. **Projects on other tributaries**	130,000	
5. Colorado River Indian Reservation (Parker project)	300,000	
6. **Yuma project in Arizona**	250,000	
7. **Gila project (under construction)**	600,000	
8. **Total, Arizona projects**		3,550,000
CALIFORNIA (AS LIMITED BY EXISTING CONTRACTS)		
9. **Palo Verde irrigation district**	300,000	
10. **Yuma project in California**	50,000	
11. All-American Canal project	3,800,000	
12. **Metropolitan Water District of Southern California**	1,212,000	
13. **Total California projects**		5,362,000
14. **Total requirements of existing and authorized projects in lower basin**		10,132,000
15. **Requirement for delivery to meet Mexican Water Treaty guaranty**		1,700,000
16. **Total requirements to be met from estimated available water supply in lower basin**		11,832,000

Source: Submitted by Raymond Matthew, chief engineer, Colorado River Board of California.

The figures I have presented are engineering estimates considered to be independent of any legal interpretations.

First, taking up table 1, the available water supply is set up in three columns, one, the "Long-term period, 1897–1943," and then two separate columns for two separate critical periods, 1931–40 and 1930–46.

First, taking up the long-term period, Item 1, Colorado River and Tributaries above Lee Ferry, 16,300,000 acre-feet—and these figures are given in thousands of acre-feet—is the Bureau's estimate of the natural flow, the so-called virgin flow at Lee Ferry. I might say that all of these figures, or most of them, have already been referred

to, Mr. Chairman, by Mr. Nielsen. They are taken directly from the tabulations, estimates of the Bureau in House Document 419. So I do not think that need be explained any further.

In the critical periods, the corresponding figures at Lee Ferry, taken from the same tabulation, 1931–40, 12,200,000 acre-feet, and 1930–46, 13,500,000 acre-feet.

Item 2, entitled "Tributaries, Lee Ferry to mouth of the Gila River" is an estimate of the net gain in that stretch of the Colorado River which takes into account inflow, and also estimated channel losses.

In the absence of more adequate data, the assumption is made that the increase in supply between Lee Ferry and the mouth of the Gila River would be the net increase in the flow of the main river between Lee Ferry and Hoover Dam, plus the tributary inflow between Hoover Dam and the Gila River, minus the channel loss in the Colorado River below Hoover Dam. The equation for the long-term average is 1,100,000—these are Bureau figures taken out of the Bureau report—1,100,000, plus 100,000, minus 600,000, which equals 600,000 for the long-term mean.

Senator MCFARLAND. Pardon me, I do not want to interrupt you, but the first two figures are the amount that is the inflow?

Mr. MATTHEW. Those are the two inflow figures.

Senator MCFARLAND. Then you subtract 600,000?

Mr. MATTHEW. 600,000 for channel losses; yes, sir.

Senator MCFARLAND. Thank you very kindly.

Mr. MATTHEW. The equation for both deficient periods is 800,000, plus 100,000, minus 600,000, which equals 300,000. The only difference in that estimate between the long-term mean and the critical period is the Bureau's estimate of the net gain between Lee Ferry and Hoover Dam which, for the long-term period, is estimated by the Bureau at 1,100,000 acre-feet, and in the critical dry-year period, such as 1930–40, at 800,000 acre-feet.

The estimate of 800,000 acre-feet net gain is taken from House Document No. 39, which contains estimates prepared by Mr. Bashore, then Commissioner of Reclamation, so that there is just 300,000 acre-feet difference in that water supply, reflecting the combination of inflow and channel losses from Lee Ferry to the mouth of the Gila River.

Item No. 3 is set up at 2,300,000 acre-feet. That is based largely on the figure contained in the report, House Document 419, an estimate by the Bureau of Reclamation, in table 146, which shows—as has been testified to by previous witnesses—an inflow into the Phoenix area of 2,279,000 acre-feet annually on the average.

That same amount is shown for the long-term period and for the critical periods, for the reason that it is possible to regulate the mean run-off into that area with the surface storage reservoirs, and the very large underground storage capacity available in that area.

The final figures, then, on the water supply for the entire basin are indicated to be 19,200,000 acre-feet annually for the long-term period—1897–1943; 14,800,000 acre-feet for the period 1931–40, and 16,100,000 acre-feet annually for the period 1930 to 1946.

I want to emphasize again that these figures do not necessarily show the water supply that would be available at actual places of use, either existing or potential, but for the data readily available they are believed to indicate the best approximation at this time of the water supply that would be available on that basis, for consumptive use at actual and potential places of use.

Table 2 is derived from table 1, and follows from table 1. It shows the estimated water supply available in the lower basin. It is given for the long-term period, 1897 to 1943, and for the critical period 1930 to 1946, which is the critical period of run-off in the lower basin, according to the estimates of flow by the Bureau of Reclamation. The critical period in the upper basin appears to be 1931 to 1940, the 10-year period, whereas the longer period is critical in the lower basin.

Item 1, the "Colorado River at Lee Ferry," on the long-term basis, 8,800,000 acre-feet. These figures are all rounded. That is the difference between the total supply at Lee Ferry estimated at 16,300,000 acre-feet by the Bureau of Reclamation, and a consumptive use in the upper basin of 7,500,000 acre-feet.

Senator WATKINS. You mean at the present time there is that amount of consumptive use?

Mr. MATTHEW. No; this is all future.

Senator WATKINS. You mean this is projected?

Mr. MATTHEW. This is projected. That leaves an average annual flow, with the upper basin assumed to be using 7,500,000 acre-feet—a flow into the lower basin at Lee Ferry of 8,800,000 acre-feet.

Item 2, the net gain from the tributaries from Lee Ferry to the mouth of the Gila River, 600,000 acre-feet, the same figure as appears in table 1.

And item 3, "Gila River system," 2,300,000 acre-feet, the same figure appearing in table 1, giving a total long-term supply available for the lower basin of 11,700,000 acre-feet annually on the average.

The corresponding figures for the critical period are explained as follows:

Item 1, 7,500,000 acre-feet is the average of the flow that is expected to pass Lee Ferry as a minimum under the provisions of the Colorado River compact, which as has previously been brought out provides that the flow at Lee Ferry shall never be reduced below 75,000,000 acre-feet in any consecutive 10-year period.

Item 2, 300,000 acre-feet net gain from the tributaries from Lee Ferry to the mouth of the Gila River, has previously been explained.

Item 3, 2,300,000 acre-feet for the Gila River system available for use in central Arizona, making a total for the critical period of 10,100,000 acre-feet for the lower basin. You will note that is 1,600,000 acre-feet less than the indicated long-term mean.

Table 3 sets forth our estimates of the water requirements of existing and authorized projects in the lower basin, that is, the ultimate water requirements when they are fully served. This table has been prepared for the purpose of comparing these estimated requirements of the projects that are already existing or have been authorized, and commitments which are recognized, with the estimates of available

water supply. The final purpose is to demonstrate that the water requirements of existing and authorized projects, together with recognized commitments in the lower basin, and including the water required to service the Mexican water treaty, exceed the water supply that would be available even on a long-term basis, and that no water will be available for any new project in the lower basin, such as the proposed central Arizona project, if the requirements of existing and authorized projects and other commitments are fully met, including the Mexican-treaty guaranty.

Item No. 1, "Main-stream reservoir projects—net evaporation losses," 780,000 acre-feet, is an estimate by the Bureau of Reclamation of the net reservoir losses on existing reservoirs. That figure does not include the evaporation losses of Bridge Canyon or Marble Canyon Reservoirs which are proposed projects above Hoover Dam. If and when those reservoirs are built, the Bureau estimates the net evaporation loss therefrom as 90,000, so that the total evaporation losses from the lower-basin reservoirs, as estimated by the Bureau, would be 870,000 acre-feet.

However, in this tabulation we have used only the existing reservoirs, including Davis, of course, which is building.

Item No. 2, "Projects in lower basin," Nevada, Utah, and New Mexico, 440,000 acre-feet. Mr. Chairman, there has already been considerable discussion about that item. All of the estimates presented are about the same for this item. It of course comprises 300,000 acre-feet for the State of Nevada which is in accordance with the contracts of the State of Nevada with the Secretary of the Interior for storage in and delivery from Lake Mead.

The 140,000 acre-feet in addition is a Bureau estimate of ultimate requirements or use of water in the lower basin in Utah and New Mexico.

Senator WATKINS. Would you break that down further?

Mr. MATTHEW. Yes, sir; I think I can.

New Mexico, Little Colorado River, 13,000 acre-feet; Gila River, 24,000 acre-feet.

Senator WATKINS. Twenty-four; is that the same figure we have had previously?

Mr. MATTHEW. I do not recollect what figure was testified to.

Senator ANDERSON. It was 16 plus 8.

Mr. MATTHEW. I think it was a smaller figure. But that would make a total for New Mexico of 37,000 acre-feet.

For the State of Utah, Virgin River, 101,300 acre-feet, making a total of 138,300 acre-feet, which I have rounded out to 140,000 acre-feet, because I do not believe these figures can be estimated that closely.

Item 3 to 7 are estimates of the water requirements of projects existing and authorized in the State of Arizona, aggregating 3,550,000 acre-feet.

Item No. 3, "Projects using water of Gila River and tributaries," 2,270,000 acre-feet.

Senator WATKINS. Are those projects that are now in operation?

Mr. MATTHEW. Some of these projects are in operation. They are either all in operation or authorized, Senator.

Senator WATKINS. Could you give us a break-down on how much is actually being used now out of the Gila?

Mr. MATTHEW. Actually, most of that water is now being used. In the first place, let me say that the Bureau of Reclamation in their report on the central Arizona project proposes some additional conservation of water in central Arizona on the Gila River. It is our belief that additional waters in the central Arizona area can be conserved and made available for use. So that the total consumptive use, when there is full maximum conservation and the most efficient utilization of the existing surface and underground storage, is estimated at 2,270,000 acre-feet. We believe that figure can be approximated.

Item No. 4. "Projects on other tributaries," 130,000 acre-feet. Those are tributaries other than the Gila River. Those are based on estimates by the Bureau of Reclamation.

Item No. 5, "Colorado River Indian Reservation—Parker project," 300,000 acre-feet. That figure is based upon the ultimate irrigation of about 100,000 acres on the Parker Indian project, at an estimated consumptive use of 3 acre-feet per acre.

Item No. 6, "Yuma project in Arizona," 250,000 acre-feet. That approximates the present use of water on that project. There are 52,300 acres irrigated in 1943 on the Yuma project in Arizona, as given in the Bureau's Colorado River report. The indication as to the amount of water used is rather large and considerable of it escapes into Mexico at the present time.

Item 7, "Gila project—under construction," 600,000 acre-feet. That is taken as the amount set forth in the authorization act on the Gila reclamation project passed by the last Congress.

Item No. 8, the total for Arizona projects, is 3,550,000 acre-feet.

Now, coming to items 9 to 12, they set forth the estimated consumptive-use requirements of projects in California. The first item, No. 9, "Palo Verde irrigation district," 300,000 acre-feet, is based upon a consumptive use of 3 acre-feet per acre on 100,000 acres, which is expected to be irrigated in that project.

Item No. 10, "Yuma project in California"—doubtless you all know that a part of the Yuma project, which was one of the first built on the main Colorado River, has some lands in California and some in Arizona, the larger part in Arizona. The Yuma project in California, 50,000 acre-feet.

Item No. 11, "All-American Canal project," 3,800,000 acre-feet. That is the amount of water which is estimated to be the contractual right under the contract of the Imperial irrigation district with the Secretary of the Interior. It also constitutes the minimum water requirements of the area to be irrigated in that project.

I might point out that when the water contracts were executed by the Secretary of the Interior with California agencies in 1931 to 1934, the amounts set forth in those contracts were based upon the then estimated requirements of those projects, which is somewhat different than the Arizona contract, for instance, which merely sets up a face amount of 2,800,000 acre-feet, but not based upon any definite projects.

The All-American Canal will provide for the irrigation of roughly 900,000 to 1,000,000 acres of land.

Senator WATKINS. What is your duty of water down there? What is the amount per acre?

Mr. MATTHEW. It is expected ultimately that the duty of water on the All-American Canal, at least for the Imperial Valley area which is the main area to be served, that the gross diversion duty will be about 4.75 acre-feet per acre.

Senator WATKINS. That is the all-round use?

Mr. MATTHEWS. Yes. And the delivery on farms to the crops, the consumptive use will be somewhere from 3 to 3⅓ acre-feet per acre.

Item No. 12, "Metropolitan Water District of Southern California." 1,212,00 acre-feet, combines together the contracts originally executed, one with the metropolitan water district of southern California, for 1,100,000 acre-feet, and the contract executed with the city and county of San Diego for 112,000 acre-feet. The San Diego agencies are now a part of the metropolitan water district of southern California. That requirement of 1,212,000 acre-feet is the combined contractual amounts.

Now, there again, that figure represents the minimum requirements of the area to be served by Colorado River water.

The total for all California projects then becomes 5,362,000 acre-feet, shown in item 13.

Item 14, "Total requirements of existing and authorized projects in lower basin," 10,132,000 acre-feet.

Item 15, "Requirement for delivery to meet Mexican Water Treaty guaranty," we estimate at 1,700,000 acre-feet. The treaty provides that Mexico shall be guaranteed a delivery of 1,500,000 acre-feet. In the opinion of our engineers in order to be sure of delivering the guaranteed amount, in accordance with the specified demands of the Mexican irrigators, it would be necessary to have additional water for regulation. That we estimate at 200,000 acre-feet. That is based upon experience in operating any large canal system; in order to meet your delivery demands at your headgates, and so on, it is absolutely unavoidable that you must have some additional water which will waste beyond the net deliveries that you are credited with. So we believe it would be with the operation of deliveries to Mexico at specified rates of delivery. You have a long river, and there are very large quantities of water that you are dealing with. You are dealing not only with deliveries of water to Mexico, but with deliveries to Palo Verde, Parker, All-American Canal, the Yuma project, and the Gila project, all of them having separate demands that must be met by the water supervisor.

We believe it would be unavoidable that some 200,000 acre-feet will be required for regulation, in order to meet all of these varied demands, so that figure is set up at 1,700,000 acre-feet.

This makes the total requirements for consumptive use in the lower basin, together with the Mexican-treaty demand, 11,830,000 acre-feet annually.

Now, if we compare that water requirement of 11,830,000 acre-feet with the water supply that would be available to the lower basin in a critical period, actual flow, without any withdrawals from storage on the main stream, you will note that the deficiency would be 1,730,000 acre-feet annually. Of course, it is anticipated, and one of the chief

purposes of Hoover Dam and Lake Mead, is to regulate the long-term mean supply in the lower basin. But in order to equate the long-term mean over a critical period such as 1930–46, an annual withdrawal from storage in the amount of 1,600,000 acre-feet would be required, or a total of about 25,000,000 acre-feet.

It is by no means clear at this time that long-term mean water supply can be equated in the lower basin. The possibility of obtaining the storage required for that purpose, and of even more importance, having that amount of water in storage at the beginning of a critical period, is certainly something that cannot be anticipated with certainty at this time.

However, if it were assumed that by some means or other this long-term mean supply for the lower basin of 11,700,000 acre-feet could be realized, the deficit between the water requirements of existing and authorized projects, and the long-term average supply would still be indicated at 130,000 acre-feet.

Now, in regard to the possible withdrawal from storage at Lake Mead, I might call to your attention that Mr. Debler has previously testified that over such a period, he mentioned 20 years, not more than 900,000 acre-feet could be depended upon.

I wish to stress the showing of these tables, and that is this: That even on a long-term basis, assuming that you could fully equate the indicated long-term supply that would be available to the lower basin, there would still be a deficit in meeting the full requirements of the existing and authorized projects, many of which have already been built and are in operation, most of them, in fact, some of them building, such as the Gila project, and still in the development stage. So that if the requirements of existing and authorized projects were fully met, together with the Mexican treaty guarantee, there will be no water available under full development for any new project in any of the States of the lower basin, such as that proposed for central Arizona.

Now, Mr. Chairman, that is our main presentation as to the available water supply in the lower basin.

I have prepared another table, Mr. Chairman, which is set up on a slightly different basis.

Senator McFARLAND. Mr. Chairman, I have some questions I would like to ask the witness at the proper time.

The CHAIRMAN. What does this new table purport to be?

Mr. MATTHEW. This is a water budget in the lower basin, Mr. Chairman, that is set up on the basis of comparing the available supply on the main stream only, with the several claims on that supply.

Senator McFARLAND. It was my thought if we were moving to another topic, maybe it would be better to question on this matter which Mr. Matthew has just been discussing.

Senator DOWNEY. Mr. Chairman, I think maybe this is an amplification of the figures. I think it would be easier for everybody if this were presented first, Senator McFarland.

The CHAIRMAN. I really think this is part of the same story.

Senator McFARLAND. That is quite all right with me.

The CHAIRMAN. Proceed, Mr. Matthew.

Water budget, lower Colorado River Basin, main stream only

[Quantities in million acre-feet to nearest hundred thousand]

Total available water supply from main stream		9.4
Less reservoir losses		.9
Net supply		8.5
Demand, on supply:		
Nevada, Utah, New Mexico	0.4	
Arizona (claimed by State)	2.8	
California (by contracts)	5.4	
Mexico (by treaty)	1.7	
		10.3
Deficit		1.8
Total available supply		8.5
Deducting Nevada, Utah, New Mexico, and Mexico demands		2.1
Remainder for Arizona and California		6.4
If California contracts satisfied, Arizona would have		1.0
If Arizona gets 2.8, California would have		3.6

Or—

Less than historic use before Hoover Dam was built.
Less than III (a) limitation.

Source: Submitted by Raymond Matthew, chief engineer, Colorado River Board of California, March 25, 1949.

Mr. MATTHEW. This is for the main stream only. The total available water supply for the main stream is 9,400,000 acre-feet, excluding the Gila River; less reservoir evaporation losses, which are set up here at 900,000 acre-feet, making a net supply of 8,500,000 acre-feet.

The CHAIRMAN. How is that figure 9,400,000 reached?

Mr. MATTHEW. The 9,400,000 is the long-term mean supply for the lower basin, 11,700,000, less the Gila River supply, 2,300,000.

The reservoir losses are estimated here in a rounded figure of 900,000 acre-feet, which assumes full development, including the Bridge Canyon and the Marble Canyon reservoirs. So that the net supply would be 8,500,000 acre-feet.

Now, the demands on that supply are as follows: For Nevada, Utah, and New Mexico—these are all rounded figures—four-tenths of a million or 400,000 acre-feet; for Arizona, claimed by State, 2,800,000 acre-feet; for California, by contract, 5,400,000 acre-feet; Mexico, by treaty, 1,700,000 acre-feet, which is the same figure used in previous table as the demand on the river to satisfy that treaty guarantee; total demands on the supply, 10,300,000 acre-feet. So that the indicated deficit is 1,800,000 acre-feet, as between supply and the several claims on that supply.

Then starting again with the total available net supply of 8,500,000 acre-feet and deducting the demands for Nevada, Utah, New Mexico, and Mexico, which is 2,100,000 acre-feet, it leaves a remainder for Arizona and California of 6,400,000 acre-feet.

Now, if the full water requirements of the California projects are satisfied, Arizona would have 1,000,000 acre-feet from the main stream. That is in addition to all of the Gila River supply of 2,300,000 acre-feet, of course.

If Arizona were to get 2,800,000 acre-feet from the main stream, California would have only 3,600,000 acre-feet, or less than the historic use of Colorado River water by California agencies before Hoover Dam was built, and less than the article III (a) limitation.

Senator McFARLAND. How much was it that California would get? Would you give me that figure again? Pardon me for interrupting you.

Mr. MATTHEW. That is quite all right, Senator.

Senator ANDERSON. 3,600,000 was his figure.

Mr. MATTHEW. 3,600,000 acre-feet.

Senator McFARLAND. Thank you very much.

Mr. MATTHEW. The chief purpose, Mr. Chairman and gentlemen of the committee, in presenting this tabulation is to simply focus attention on the wide discrepancy between the conflicting claims as related to the available water supply.

The CHAIRMAN. Probably it would not interrupt you if I were to ask you at this point to tell us what the historic use of California was before the building of the Hoover Dam, what particular projects, and the amount for each project.

Mr. MATTHEW. At that time the Palo Verde Valley was under irrigation, a part of the Yuma project in California, and the Imperial Valley development, which at that time diverted water into the Imperial Valley with a canal which went around through Lower California. It was subsequently replaced, of course, by the All-American Canal.

The CHAIRMAN. Let me ask it in this way: What was the historic use on Palo Verde before Hoover Dam?

Mr. MATTHEW. I cannot give you that figure exactly right here. I will be glad to supply that for you, Mr. Chairman.

The CHAIRMAN. All right, correct the figure for the record, but can you give me an approximation now?

Mr. MATTHEW. No, sir; I would not like to do that. That would be anytime up to the building of Hoover Dam, and I do not have that figure in mind at the present time.

The CHAIRMAN. How about the Yuma project?

Mr. MATTHEW. Not for the Yuma project, either.

The CHAIRMAN. How about for the All-American?

Mr. MATTHEW. I can tell you that the diversion, as I recall, reached over 3½ million in the canal, the Imperial diversion near Yuma.

The CHAIRMAN. At what time?

Mr. MATTHEW. In the 1920's.

The CHAIRMAN. Three and a half million?

Mr. MATTHEW. Yes.

Senator KERR. Mr. Chairman, may I inquire as to how long the committee will be in session?

The CHAIRMAN. Off the record.

(Discussion off the record.)

Mr. MATTHEW. I will be glad to supply those figures for the record, Mr. Chairman.

The CHAIRMAN. If you please.

(The answers to Senator O'Mahoney's questions are given as follows:)

	Acre-feet annually
Diversion by Imperial irrigation district (1929)	3,424,000
Diversion by Palo Verde irrigation district (1929)	203,000
Estimated diversion by Yuma project in California (1929)	50,000
Total	3,677,000

Mr. MATTHEW. I would like to add one more thing in connection with this table. Of course these figures are approximate figures. I mean to say they are all rounded off. They are simply meant to reveal clearly this large discrepancy as between the claims and the available supply on the main stream only.

I would like to state that during the hearings on the Gila reclamation project bill, Arizona's own witness, I think Mr. Gail Baker, testified that, if all of Arizona's contentions were to prevail, California's use of Colorado River water would be reduced substantially to 3,900,000 acre-feet annually. That same figure appears in Mr. Nielsen's statement, or, rather, the statement filed by the Bureau witnesses in setting forth what the Bureau understands to be Arizona's interpretation. I do not know, Mr. Chairman, whether that tabulation is in the record. Is that full statement in the record?

Senator MCFARLAND. I do not believe I understand, Mr. Matthew, what you are talking about. Do you mean Mr. Baker's testimony?

Mr. MATTHEW. No, sir. Mr. Baker's testimony that I refer to appears in the hearings on H. R. 5434.

Senator MCFARLAND. I think Mr. Baker's testimony was to the effect—if I may interrupt you to state it—that even under California's theory the figure would be much less than you contended. That was the effect of his testimony, not that if Arizona's contentions prevailed. Of course, it will speak for itself.

Mr. MATTHEW. Pardon me, Senator, but he did present figures which showed that if Arizona got all the water that she thought she was entitled to, that the remaining water for California would be 3,900,000 acre-feet, substantially.

Now, in this tabulation which was prepared by N. B. Bennett, E. G. Nielsen, and V. E. Larson, which was presented to the committee on March 25, I believe, under their interpretation of the Arizona interpretation——

Senator KERR. Repeat that statement. Under their interpretation of the Arizona interpretation?

Mr. MATTHEW. Yes. Under item 23 appears for California 3,938,999 acre-feet. I believe that is the same figure that Mr. Gail Baker arrived at in the hearings on H. R. 5434.

Senator MCFARLAND. I understand what you are talking about now. That is charging you with the evaporation losses.

Mr. MATTHEW. Yes. In other words, California, under the Arizona contentions, would not even get 4,400,000 feet, they would get only 3,900,000 acre-feet substantially.

I was merely asking the question, Mr. Chairman, whether this full statement of the Bureau of Reclamation is in the record.

The CHAIRMAN. Yes; the full statement is in the record.

Mr. MATTHEW. Including the tabulation?

The CHAIRMAN. That is right.

Senator ANDERSON. Mr. Chairman, he would help me a whole lot if he would explain one thing right at the beginning. Is there a flow of the Gila at its mouth approximating a million acre-feet?

Mr. MATTHEW. Yes, sir.

Senator ANDERSON. Dumping into the Colorado?

Mr. MATTHEW. Yes, sir.

Senator ANDERSON. Is there any actual flow at the mouth of the Gila?

Mr. MATTHEW. There has not been very much flow of the Gila River at its mouth for the several past years. Mr. Nielsen furnished the committee with those actual figures, I believe. But the fact is that for several years past there has been little, if any flow, at the mouth, actually.

Senator ANDERSON. The total Gila River system flow in your tabulation here is taken as 2,300,000.

Mr. MATTHEW. That is right.

Senator ANDERSON. Now, in table No. 3 you list Arizona projects using water of the Gila River 2,270,000.

Mr. MATTHEW. Yes, sir.

Senator ANDERSON. Then the Gila project at 600,000.

Mr. MATTHEW. That is right.

Senator ANDERSON. Is that a diversion from the Gila also?

Mr. MATTHEW. No, sir. The Gila project given here in item No. 7, Senator, is a project diverting water from the main stream at Imperial Dam, on the Arizona side of the Imperial Dam. On the California side, the All-American Canal takes out. The Gila project contemplates the irrigation of lands on lower Gila River on the Yuma mesa, and upstream in the Welton-Mohawk area.

Senator ANDERSON. By taking it out of the Colorado?

Mr. MATTHEW. Yes; taking it out of the main stream of the Colorado River. The only water requirement for the Gila River system in Arizona is the item No. 3 of 2,270,000.

The CHAIRMAN. Does that complete your statement, Mr. Matthew?

Mr. MATTHEW. That completes my statement; yes, sir. Pardon me, that completes my estimates on water supply. If it pleases the chairman and the committee, I would like to make a few observations in regard to Mr. Debler's presentation, or the Arizona statement, in regard to water supply.

Senator KERR. I want to ask some questions as to this statement at the proper time.

The CHAIRMAN. Yes, if the witness will bear with us, I think probably it would be well to ask a few questions at this point about the material thus far presented.

Senator McFarland a moment ago indicated that he wanted to ask some questions, but he seems to have left the room. He will be back shortly, I think.

Let me ask you, for clarification: Referring to your first page:

> The data now readily available do not include sufficient information to permit reliable estimation of the available water supplies at the different places of use within the Colorado River Basin.

How would it be possible to obtain such data, Mr. Matthew?

Mr. MATTHEW. Actually, I think there are stream-gaging stations that have been operated for some years, which would give some of the data I have in mind.

Answering your question directly, first, you would get that data by putting in stream gaging stations at strategic points all along the main river, and at different points on the tributaries.

The CHAIRMAN. Well, to do it completely, you would have to do more than make a selection of strategic points, would you not? You would have to make a measurement at every place of use, or the different places of use, as you have said in this sentence?

Mr. MATTHEW. Well, that would be a matter for determination and consideration as to how best to select your stations so that you would get the information you needed to have. In other words, it would not necessarily mean that a gaging station would have to be above and below every acre of land irrigated. There would be stations selected which would give you substantially the supply that is available for that area.

The CHAIRMAN. In other words, any feasible method of undertaking to measure this would at best be an educated estimate, is that correct?

Mr. MATTHEW. That is correct.

The CHAIRMAN. Now, then, with respect to page 2, table 1. The title of this table is, "Estimated Water Supply Available for Consumptive Use From Colorado River System Under Full Development." What is your definition of "consumptive use" as used in that table?

Mr. MATTHEW. Well, sir, from an engineering standpoint, consumptive use of water means the actual use of water dissipated by transpiration and evaporation in the growing of the crop. It is water that is actually consumed, as distinct from the amount of water that might be diverted from the river, for instance, which usually is a much larger amount on account of other losses, some of which losses, of course, return to the river and become available for reuse.

The CHAIRMAN. Therefore, the figure 16,300,000, under item No. 1 in the column "Long-term period, 1897–1943," does not mean the amount of water that has been consumptively used or is available for consumptive use above Lee Ferry?

Mr. MATTHEW. No, sir. I have had to use it as best representing, with the data readily available in the Bureau reports, what the water supply for consumptive use at places of use would be. The actual water supply would probably be larger than that; I would expect it would be larger, that is, that would collectively or in the aggregate, be available for use.

The CHAIRMAN. In other words, this table purports to show the water supply that may be available and does not purport to show consumptive use?

Mr. MATTHEW. No, sir; the water supply available.

Senator KERR. For a consumptive use.

Mr. MATTHEW. For a consumptive use.

The CHAIRMAN. Now, I observe with respect to items 1 to 3, that in the case of 1 and 2, there was a considerable diminution for the critical periods 1931–40, and 1930–46, below the figure that you give for the long-term period. But with respect to item No. 3, the Gila River System, there is no diminution. How does it happen that the Gila System is apparently in a very different category from any other part of the Colorado River System and does not suffer any diminution in the critical periods?

Mr. MATTHEW. Well, actually, the flow during that period, Mr. Chairman, is less than the 2,300,000 acre-feet. But as I meant to explain—perhaps I did not do it thoroughly—in my testimony, we have estimated the same long-term average supply to be available in the critical period because we believe it is possible in central Arizona, with the surface storage reservoirs and with a full utilization of the large underground storage capacity that they have there, to fully conserve and use the 2,300,000 acre-feet long-term average.

The CHAIRMAN. You will recall that Mr. Nielsen in his testimony presented us with tables showing the measured flow of the Gila River at Dome, Ariz., from 1904 to 1945, and that this table showed that for each of the years 1940 through 1945, the Gila delivered no run-off at Dome.

Mr. MATTHEW. That is right.

The CHAIRMAN. Its contribution was zero?

Mr. MATTHEW. That is right.

The CHAIRMAN. And in spite of that fact, am I to draw the conclusion that Arizona still had available for use, estimated water supply available for consumptive use, of 2,300,000 from the Gila system?

Mr. MATTHEW. Yes, sir. Dome, Mr. Chairman, is just a little way above the mouth of the Gila River. The flow actually available for use in central Arizona is indicated in table 146 of House Document 419, on page 285, which shows the natural inflow into the Phoenix area, 2,279,000 acre-feet. That figure has the same validity and significance of any of the other figures in this Bureau report. It has the same validity and significance as the estimated flow at Lee Ferry, at Boulder Dam, or at any of the other points.

This estimate of the flow into the Phoenix area is the best indication that we have.

Senator MCFARLAND. For what period is that, now?

Mr. MATTHEW. That is for the period 1897 to 1943.

Senator MCFARLAND. That does not answer the Chairman's question as to the critical period.

Mr. MATTHEW. I am trying to answer the Senator's question.

Senator MCFARLAND. Pardon me.

Mr. MATTHEW. This estimated flow into the Phoenix area is the best indication we have of the amount of water available for use at the place of use in central Arizona. Now, the flow at Dome has no relation to the water supply that is available for use in central Arizona, because it is miles downstream.

The CHAIRMAN. Then let us take that figure, Mr. Matthew, that table. The column on total natural inflow to the Phoenix area, in the Nielsen table, 146, shows that for the period 1922 to 1943, the average annual inflow at that point was 1,916,000. Now, bear in mind that that is for the whole 21 years. The figure that I used in my question to you was for the average delivery of water at Dome for each of the years 1941 through 1945. But this average 1922 to 1943 was only 1,916,000, and for the years 1931 to 1940, was 1,804,000, as compared with your undiminished 2,300,000.

Mr. MATTHEW. That is right.

The CHAIRMAN. How do you explain that?

Mr. MATTHEW. Mr. Chairman, may I explain again: We believe that with full conservation measures in central Arizona the long-term average flow can be conserved and put to use.

The CHAIRMAN. Then do you recommend additional conservation construction in Arizona in order to bring that about?

Mr. MATTHEW. Yes, we do.

The CHAIRMAN. You might suggest an amendment to the Senator's bill.

Senator ANDERSON. What is the nature of those suggestions?

Mr. MATTHEW. Well, Senator, they are twofold. In the first place there is at the present time a large loss of water in the central Arizona

area from water-loving vegetation that the scientists call phreatophytes. The United States Geological Survey has indicated that the loss in that area from phreatophytes will run anywhere from 250,000 to 350,000 acre-feet annually. I understand they have made a more recent estimate which would increase that figure.

The United States Geological Survey also points out the possibility of salvaging that water. Now, that is not a new idea. It has been demonstrated it can be done in other areas.

The plan for the so-called Safford Valley improvements, which is included in the project as proposed by the Secretary of the Interior, contemplates the salvaging of water now lost by such vegetation in the Safford Valley area.

In addition to that we believe there are possibilities for storage, by proper utilization of the underground basin which is of vast extent in central Arizona, of flood flows which now go to waste under the present methods of operation.

Senator DOWNEY. Mr. Chairman, could I intervene with this question?

As a matter of fact, do not the present plans of the Bureau as re-.ealed in this bill, show additional storage capacity of about 150,000 acre-feet, or 106,000 acre-feet?

Mr. MATTHEW. Yes, sir. In the report by the Bureau of Reclamation on this proposed project they do propose additional surface storage on the Verde River and on the Gila River, which would provide an estimated amount of 132,000 acre-feet more water.

The CHAIRMAN. I would like to ask you a few more questions about table No. 3, Mr. Matthew.

Preliminary, I refer to page 447 of the hearings on Colorado River water rights of Friday, May 14, 1948, when Mr. Ely was testifying, and I addressed to him this question:

We are dealing here with a water system, a river system which has a flow inadequate to meet all of the demands that are being made up it. Now, from the point of view of California, how much water have you actually put to use under contract?

Mr. Ely responded:

I would prefer to place that figure in the record, if I may. It is available, I am sure, and I do not have it accurately in mind.

Whereupon I said:

Let me ask you to put it in the record in this form: (a) The amount of water to which you feel California is entitled, and (b) the amount of water which has already been apportioned and utilized by existing systems, and (c) the amount of additional water which California desires to use, and (d) the source from which that additional water will come; and, finally, whether or not the sum of all of these is, in the opinion of California, within the existing law and limitation.

Now, far more response was made to that, to question (a):

The amount of water to which you feel California is entitled.

Answer. California maintains that it is entitled to a beneficial consumptive use within the State of not less than the total amount of water for which contracts with the United States are outstanding, that is, 5,362,000 acre-feet per year.

That, Mr. Matthew, appears to be the figure which you have given us under item 13 in table 3.

Question. (b) The amount of water which has already been apportioned and utilized by existing systems (present uses)?

Answer. At the present time the total beneficial consumptive use in California amounts to about 3,230,000 acre-feet per year.

It is my understanding from your testimony, and particularly from this additional table which you submitted at the end, that you contend 3,600,000 acre-feet, which would be the amount you would get in California if Arizona, according to your computation, had 2,800,000 acre-feet, would be less than the historic use before Hoover Dam was built. I ask you to reconcile your testimony that 3,600,000 acre-feet were being used in California before the Hoover Dam was built, with the formal written response to my question of Mr. Ely, that "the present use in California on May 14, 1948, was 3,230,000 acre-feet."

Mr. MATTHEW. Mr. Chairman, there is a representative in our group, Mr. Dowd, the consulting engineer of the irrigation district, who can explain that more clearly. But the actual diversions by Imperial irrigation district, as I understand it, through the Alamo Canal, exceeded 3,500,000 acre-feet annually before Hoover Dam was built. The rights to that amount of water were established. In addition, water was used by the Palo Verde area and by the Yuma project in California.

Senator MCFARLAND. Mr. Chairman, might I ask one question which might clear this up?

Did that not include the uses in Mexico?

Mr. MATTHEW. Yes, it included the losses in transit in Mexico.

Senator MCFARLAND. And uses?

Mr. MATTHEW. The water was used, yes, but that was a necessity because of the fact that the canal had to run around through Mexico. In order to get the permission to run the canal through Mexico, the contract provided that half of the water in the canal would be given to Mexico.

Senator MCFARLAND. That is what I wanted to bring out.

The CHAIRMAN. Now, your computation in table 3, which shows in item 13, the California total use of 5,362,000—the same figure that was given by Mr. Ely—is apparently based upon the estimated available water supply to the lower basin of 11,830,000 acre-feet, which is in excess of the long-term average of 11,700,000, but only by 130,000, given in your table 2. The total supply given in your table 2 for the critical periods, however, 1930–46, is only 10,100,000 acre-feet. My question is, Why would it not be reasonable in attempting to allocate these waters among the contending States, to use the figures of the critical periods as the base for assured rights, rather than to use the figures for the long term?

Mr. MATTHEW. It would be not only better, but I think it is absolutely essential. But the figure appearing in the table, Senator, is the estimate of the actual flow available in that period, on the average. Now, it is anticipated that water will be available in hold-over storage reservoirs, particularly in the lower basin, Lake Mead, which can be drawn upon to supplement that supply. Mr. Bashore, in House Document 39, stated that it was the Bureau's expectation that they could withdraw 1,500,000 acre-feet from Lake Mead over a period of 10 years, which was the critical period at the time.

Just how much—as I previously stated in my direct testimony—we can hope to obtain during a critical period, such as 1930–46, is a matter

of conjecture. Mr. Debler's figure was 900,000 acre-feet. But whatever amount could be drawn from hold-over storage during the critical period would, of course, add to this supply.

However, you are perfectly correct in judging how much water you are going to have that you can depend on. You must base it on a critical period.

The CHAIRMAN. Very well. Now, let me ask you this question: Referring now to your figure and Mr. Ely's figure of a total California use of 5,362,000, am I right in my understanding that this represents the maximum contractual use, the maximum amount available under the contracts?

Mr. MATTHEW. That is correct.

The CHAIRMAN. Now, what is the amount available to California under the Limitation Act?

Mr. MATTHEW. California believes that this 5,362,000 acre-feet covered in the several contracts with the agencies is well within the limitation as specified by the Boulder Canyon Project Act and adopted by the California Legislature.

As I previously explained in my direct testimony, these amounts, aggregating 5,362,000 acre-feet, were the estimated requirements of actual projects at the time the contracts were entered into.

The CHAIRMAN. Did these contracts not contain the phrase or the contingent reference, "If the water was available"?

Mr. MATTHEW. Subject to availability under the Colorado River compact; that is right.

The CHAIRMAN. Where do I get the figure 4,400,000 as the supposed Limitation Act figure?

Mr. MATTHEW. I think you get that chiefly from statements by Arizona representatives, because they usually state California's limitation in terms of 4,400,000 acre-feet. California disagrees very completely with that statement.

The CHAIRMAN. Well, I thought so, but where do they get that figure; do you know?

Mr. MATTHEW. Well, the Limitation Act, which is in the exact words of the first paragraph of section 4 (a) of the Boulder Canyon Project Act, states that California shall limit herself to 4,400,000 acre-feet of the water apportioned to the lower basin by article III (a) of the compact. Then it says "plus one-half the excess or surplus unapportioned."

The CHAIRMAN. That is what I understood, and that is why I asked you why it would not be pretty good sense to fix our definite rights on the basis of the water supply in the critical years and then hope that we might have no more critical years, and that the water supply would be sufficient to give us this additional supply, so that California under her contracts would be able to say "the water is available, the contingency has been met, but we stand on our rights, and the other States in the basin can also stand on the rights fixed in the Limitation Act for the years of critical flow."

Mr. MATTHEW. Yes. Well, Senator, may I point this out: California believes that during the critical period, the water supply that can be made available to the lower basin, will provide excess and surplus waters in which California's share of one-half will easily be enough to serve the 962,000 acre-feet, in addition to the 4,400,000 acre-feet, during the critical period.

The CHAIRMAN. Why am I then not at liberty to consider this matter in the light of the words which you use, "excess and surplus water"?

Mr. MATTHEW. May I explain further?

The CHAIRMAN. Certainly.

Mr. MATTHEW. California's position is that the 1,000,000 acre-feet which the lower basin was given the right to use in addition to the water apportioned under article III (a) is a part of the excess or surplus referred to in the Limitation Act, to which excess or surplus California has a right to at least one-half. That is a combination of the million acre-feet of III (b) water, which the lower basin is given a right to use under that compact, and the excess water above that. California has a right to one-half of that total water.

The CHAIRMAN. Now, last night I was listening on the radio—on ABC; I might as well put the American Broadcasting Co. into the record—at 7 o'clock. There was an interview, the whole of which I did not hear. I think it came from Los Angeles or from Hollywood. The radio commentator was interviewing a gentleman whose name I did not get, but he was saying that one of the universities in California is about to use some $200,000 to carry on experiments to make fresh water from salt water. He expressed the belief that the time had come when that ought to be done. He said the Hoover Dam will silt up in a few years—I have forgotten how many years—and we had better begin to make this fresh water out of the Pacific Ocean right next to our door.

Mr. MATTHEW. There is also a lot of water in the Gulf of California, right next to Arizona. If that proves to be feasible, Mr. Chairman, of course, it would be a wonderful thing, and certainly any scientist would not disagree in investigating the possibilities of those things.

But we feel, with our present knowledge of things, that we had better depend on the water that we have already staked out.

The CHAIRMAN. Let me ask this additional question:

Why would it not be good common sense if the Hoover Dam is in danger of eventually silting up, for California and Arizona to cooperate with all the other States in the basin to build additional storage upstream, so as to hold back this silt and prevent the Hoover Dam from silting up, thereby saving to you the supply you presently have by reason of the large expenditures which the Congress of the United States has already made for this project?

Mr. MATTHEW. I think that would be a very good idea, Senator.

Senator MCFARLAND. We certainly agree to that.

Mr. Chairman, I had a few questions I wanted to ask.

Senator ANDERSON. I would like to ask one question which follows the Chairman's question.

Senator MCFARLAND. You have not completed, have you?

The CHAIRMAN. Yes; I had.

Senator ANDERSON. Along the line that Senator O'Mahoney was talking, he asked you something about this 4,400,000 acre-feet. You said that was plus one-half the excess or surplus waters.

Mr. MATTHEW. That is right.

Senator ANDERSON. Then the committee would have a right to believe that in any critical year California's limit was 4,400,000, because there could not be excess or surplus in a critical year.

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Mr. MATTHEW. Oh, yes, there is, because we are going to have water in storage, Senator.

Senator ANDERSON. That is not surplus.

Mr. MATTHEW. Oh, yes; it is part of the supply.

Senator ANDERSON. But you borrow it out of the bank.

Mr. MATTHEW. Pardon me, Senator, we are talking at cross purposes.

Senator ANDERSON. What would excess and surplus waters be over the 16,000,000, it would not be something in storage in Lake Mead, would it?

Mr. MATTHEW. Oh, yes.

Senator ANDERSON. It would?

Mr. MATTHEW. It is all the water available, that can be made available in a critical period, certainly.

Senator ANDERSON. Has there ever been a legal definition to that effect, that water in storage behind the dam is part of a surplus flow of the river?

Mr. MATTHEW. Well, I didn't say that.

Senator ANDERSON. Well, that is what it would have to be.

Mr. MATTHEW. No, it is just a part of the total water supply available for use.

Senator ANDERSON. But it does not say the total water supply in the act, it says "excess and surplus waters." By your testimony, if it is not surplus and excess water you recognize the effective limitation on California of 4,400,000 in any 1 year.

Mr. MATTHEW. The phrases you are referring to in the compact have certain definite meanings, aside from the physical situation that we have been examining here, Senator. It refers to the waters of the Colorado River system. Now, in recent days, in talking physical quantities of water that might be available by the building of works, and so on, we referred to that amount which might be made available for use.

Senator ANDERSON. Am I to understand, then, that water held in the dam is regarded as surplus and excess water?

Mr. MATTHEW. No, sir; I didn't say that.

Senator ANDERSON. Then where do you get the water? You said you would take it out of Lake Mead. Now, in a critical period when it is flowing low, if it is only surplus and excess waters that will add to California's 4,400,000, can we regard that California does hold itself limited to 4,400,000 acre-feet, in any critical year when the flow is low?

Mr. MATTHEW. No, sir; the total amount of water available in the critical period for the lower basin is the actual flow, for instance, which is indicative of—well, let us just take the main stream, it would be 7,800,000 acre-feet.

Senator ANDERSON. Can we take a year on the main stream?

Mr. MATTHEW. In addition to that, you draw on storage to augment that supply.

Senator ANDERSON. But that does not make excess and surplus, does it?

Mr. MATTHEW. Yes; that is a part of supply.

Senator ANDERSON. Now, you testify it is surplus. We recognize it is a part of the supply, everyone knows that, but is it surplus or excess?

Mr. MATTHEW. We are talking about the whole water supply, the amount available in the streams.

Senator ANDERSON. No, we are not; we are talking about critical years.

Now, let us take the year of 1931 when the estimated virgin flow at Lee Ferry was 7,936,000.

Mr. MATTHEW. That is right.

Senator ANDERSON. That is sufficiently small so that it can be no question but what if there had been utilization in the upper stream there would have been a shortage in the lower stream.

Mr. MATTHEW. Yes.

Senator ANDERSON. Now, does California recognize that in that year its limitation would have been 4,400,000 acre-feet?

Mr. MATTHEW. Certainly not.

Senator ANDERSON. What other water does it have?

Mr. MATTHEW. It has available to it all of the water that is available to the lower basin, that is, a part of it, as determined by the Limitation Act.

Senator ANDERSON. Under what rule, because it would be surplus or excess water?

Mr. MATTHEW. Oh, no; under the whole formula, under the entire formula.

Senator ANDERSON. Well, what part of it would give it water? You testified that California was limited to 4,400,000 acre-feet plus one-half the excess or surplus water. Now, here is a year in which there had been full development of the upper basin, some 2,500,000——

Mr. MATTHEW. Pardon me, may I——

Senator ANDERSON. May I finish the question? Some 2,500,000 acre-feet of water would have flowed past Lee Ferry. Now, that certainly would not be excess or surplus, would it?

Mr. MATTHEW. Well, let me try to clarify it for you, Senator.

Senator ANDERSON. All right.

Mr. MATTHEW. The statement I made was, I was referring to the language of the compact and Limitation Act.

Senator ANDERSON. Well, that is pretty good language.

Mr. MATTHEW. Now, the excess or surplus; that is just a definition there. I was referring to the Limitation Act. Four million four hundred thousand of III (a) water plus not more than one-half of the excess or surplus unapportioned; in other words, unapportioned by the compact.

Senator ANDERSON. Whether it is unapportioned or not, if there is no excess or surplus, what is your limitation?

Mr. MATTHEW. What I am trying to clarify for you is that that has nothing to do with the water in Hoover Dam, which we are talking about.

Senator ANDERSON. Do you still regard the Hoover Dam water as excess or surplus?

Mr. MATTHEW. No; certainly not.

Senator ANDERSON. Then if you do not regard that as such, why does Hoover Dam come into the picture?

Mr. MATTHEW. Well, it is a part of the physical works to develop a water supply.

Senator ANDERSON. But it is not excess or surplus; is it?

Mr. MATTHEW. No.

Senator ANDERSON. Therefore, in this critical year, you do recognize the limitation as 4,400,000.

Mr. MATTHEW. No, because——

Senator ANDERSON. Where do you get your plusses, then?

Mr. MATTHEW. Well, California has rights in the water stored in Lake Mead, very definitely.

Senator ANDERSON. Now, it is limited to 4,400,000 plus part of the excess or surplus. So you say you can let some out of the Lake Mead in that year?

Mr. MATTHEW. Certainly.

Senator ANDERSON. And that would be excess and surplus water?

Mr. MATTHEW. No.

Senator ANDERSON. Then how do you claim it, under what title above the 4,400,000?

Mr. MATTHEW. Well, we claim that under the terms of the Limitation Act.

Senator ANDERSON. Which are excess and surplus water. Now, you just said it is not excess and surplus water. How do you make it excess and surplus?

Mr. MATTHEW. Senator, part of the 4,400,000 or maybe all of it, would have to be obtained out of storage.

Senator ANDERSON. I am not arguing about that. I recognize that might happen. You might have to draw two-thirds of that 4,400,000 from Lake Mead, but about that, where do you get it?

Mr. MATTHEW. The other water is no different.

Senator ANDERSON. Oh, yes, it is, if surplus and excess mean anything.

Mr. MATTHEW. Surplus and excess mean what they say in the Limitation Act, surplus and excess unapportioned.

Senator DOWNEY. Senator Anderson, might I interrupt? I think it is most important that you at least get our idea in California. I wonder, Mr. Chairman, if I might ask that Mr. Ely, who is a lawyer who has grown up with this, might just state California's position.

Senator MCFARLAND. Well, I have some questions that I want to ask.

Senator ANDERSON. I am willing to cease my questioning.

Senator DOWNEY. Senator Anderson, I do not want you to, because certainly the witness has not fully given to you the legal theory of California's position. This will not take over 2 or 3 minutes.

Senator ANDERSON. I will be happy to wait until Mr. Ely comes on to satisfy me on that question.

Senator MCFARLAND. I have some questions I want to ask here.

Senator ANDERSON. I am very sorry, I broke in on Senator McFarland, and I think I should stop.

The CHAIRMAN. I was about to interrupt Senator Anderson several times, because I saw the questions were going into a legal interpretation. I think, Senator Downey, that if we will have an understanding that Senator Anderson may resume this examination, then Mr. Ely will be heard, but I really think we ought to give Senator McFarland an opportunity.

Senator MCFARLAND. I do not want to stop Senator Anderson, but I do not want another witness put on here before I have a chance to ask him my questions.

Senator ANDERSON. I am sorry I broke in on you, Senator. You go ahead.

Senator MCFARLAND. No; you go ahead.

The CHAIRMAN. That is all right. The Chair was going to exercise a prerogative which he does not possess to ask Senator Anderson to defer the further examination, so that the Senator from Arizona may ask his questions while we have fresh in mind the testimony of Mr. Matthew about water supply.

Senator ANDERSON. You are absolutely right.

Senator MCFARLAND. I am a little embarrassed by that.

Senator ANDERSON. No, no; the chairman is absolutely right.

Senator MCFARLAND. Well, Mr. Chairman, I think the point being made was very good. I just want to state this before starting my questioning: I did not want to interrupt Senator Anderson, but I just objected to other witnesses being called on before we were through asking questions of this witness.

The CHAIRMAN. That is perfectly all right.

Senator MCFARLAND. Now, Mr. Matthew, in your table 1 you give the figure of 2,300,000 acre-feet as the supply of the Gila River system. As I understand the testimony you gave, that was an estimate of the flow into the Phoenix area.

Mr. MATTHEW. That is the Bureau's estimate.

Senator MCFARLAND. And you have no figure of measurement as to how much of that water was used up by unavoidable losses along the river channel?

Mr. MATTHEW. Which river channel do you mean, Senator?

Senator MCFARLAND. Well, the Gila and the Salt tributaries.

Mr. MATTHEW. But I mean where?

Senator MCFARLAND. Well, you are the one giving the testimony, Mr. Matthew. Do you not make estimates? I do not know what places you had in mind.

Mr. MATTHEW. That figure is in the Bureau's table 146, House Document 419, Senator. It was explained by the Bureau engineers here as being made up of the flow of the Salt River at Granite Reef Dam, the flow of the Gila River at Kelvin, plus estimated unmeasured natural inflow presumably at similar points around the periphery of the area, making the total of 2,279,000 acre-feet annually on the average.

Senator MCFARLAND. All right, now let us take one example there. You mention a measurement at Kelvin. Do you make any allowance for the natural channel losses from Kelvin on down to the San Carlos project where it would have to be used? There is no dam at Kelvin, you could not divert it at Kelvin.

Mr. MATTHEW. I understand. The diversion dam was a little bit below.

Senator MCFARLAND. Yes, quite a bit below.

Mr. MATTHEW. The actual dam. But most of that water, of couse, we believe, is available for conservation and use.

Senator MCFARLAND. But you do not make any estimation. You make no estimation of any losses whatever along the channel?

Mr. MATTHEW. I do not believe, Senator, that the loss along the channel between Kelvin and the Ashurst Dam would be enough to affect these figures which, after all, are estimates, and would be subject to that much error.

Senator MCFARLAND. I grant that, but the fact is you make no estimate of losses?

Mr. MATTHEW. I am accepting the Bureau's estimate as having the same validity for that point as the figure for Lee Ferry.

Senator MCFARLAND. Of course, Mr. Matthew, if you will not answer my question I just cannot do anything about it, and will not try to; but I would like to have answers to my questions, if I could.

Mr. MATTHEW. I would be glad to.

Senator MCFARLAND. Which you did not do.

Now, at other places, without going into each one of them separately—I gave that as an example. In other words, there is no estimate of any channel losses any place and taken from that figure of 2,300,000.

Mr. MATTHEW. No.

Senator MCFARLAND. Do you make any estimation for the amount of waters that must be released for salt balance?

Mr. MATTHEW. There is no question but what some water has got to be released for salt balance. It is estimated by the Bureau at 150,000 acre-feet. But there again most of the water indicated to be available by this figure here can be conserved and put to use. The small losses below that, I believe, are not within the range of the accuracy of the figures.

Senator MCFARLAND. At any rate, you make no estimate of that, and you subtract no figure for either channel losses or the amount that must be released for salt purposes?

Mr. MATTHEW. No. My conception is that most of that water will be conserved and put to use above these places of loss that you mention, except for the salt balance.

Senator MCFARLAND. But you do grant there are some channel losses and some must be released for salt purposes?

Mr. MATTHEW. To the extent that water goes down there, yes. That would be only a small percentage of the total.

Senator MCFARLAND. Will you again explain the item of 600,000 acre-feet? I am referring to table 3, the 600,000 acre-feet from Lee Ferry to the mouth of the Gila? Pardon me, that is on table 1.

Mr. MATTHEW. Yes, I would be glad to. According to the Bureau figures, in the long-term period, the net gain between Lee Ferry and Hoover Dam is 1,100,000 acre-feet. From Hoover Dam to the mouth of the Gila River, we have estimated that in-flow, a rounded figure, of 100,000 acre-feet. It is variously estimated from 125 to 150, but here we have used 100,000 acre-feet.

Senator MCFARLAND. That makes a total, then, of 1,200,000 acre-feet.

Mr. MATTHEW. That is right. The channel loss is 600,000 acre-feet.

Senator MCFARLAND. How do you break that down?

Mr. MATTHEW. That is estimated by Mr. Bashore in House Document No. 39. It is not my estimate, it is Mr. Bashore's estimate.

Senator MCFARLAND. I understand, Mr. Matthew, I was just trying to get the figure in my mind. How much of that would be lost from Lee Ferry to Boulder Dam?

Mr. MATTHEW. That 600,000 is entirely below Hoover Dam.

Senator MCFARLAND. And you subtract that from the 1,200,000 leaving a figure of 600,000?

Mr. MATTHEW. That is right.

Senator McFARLAND. Turning now to your table 2. You say that 2,300,000 acre-feet is the supply in the critical period?

Mr. MATTHEW. Yes.

Senator McFARLAND. You carry that right through, regardless of whether the water is there or not?

Mr. MATTHEW. No, the water will be there because the average run-off there will have been fully conserved.

Senator McFARLAND. Well, the water was not there during the critical period.

Mr. MATTHEW. Yes, it would be there. The average would be equated just like the average is supposed to be equated or anticipated to be equated in surface storage reservoirs like Lake Mead and those projected in the upper basin. That is their purpose.

Senator McFARLAND. Do you make any estimate as to the amount of losses that are made by evaporation through storage to hold it over those years?

Mr. MATTHEW. Yes.

Senator McFARLAND. Is it still 2,300,000 acre-feet?

Mr. MATTHEW. It will approximate that, I think, yes.

Senator McFARLAND. In other words, that 2,300,000 acre-feet in central Arizona is a good figure any time, regardless of the droughts?

Mr. MATTHEW. Put it this way, Senator: We do not know with certainty what the total water supply available is, in the first place. We have the Bureau's figure which I think is probably a fairly close approximation of it, but there may be more water than that. Also, the amount of water that would be lost below the points of diversion along the channels will depend upon how completely the flood flows are conserved above these channel areas. Also, it is going to depend upon whether measures are adopted for eliminating the losses from the large areas of phreatophytes.

Senator McFARLAND. In your estimation, on table 3, of 2,270,000 acre-feet, have you subtracted any losses from those causes?

Mr. MATTHEW. No, this estimate is based upon the proposition that that much water can be fully conserved and used.

Senator McFARLAND. In other words, you do not contend that 2,270,000 acre-feet are now being used?

Mr. MATTHEW. No, I do not.

Senator McFARLAND. You just state that that amount could be used?

Mr. MATTHEW. That is right.

Senator McFARLAND. You do not contend that a State under any circumstances would be charged with water because someone said it could be used, do you?

Mr. MATTHEW. Well, it is part of a water supply of the system, just like any other water.

Senator McFARLAND. Yes, it is part of the water supply, but supposing they do not use it? They are not charged with it, are they?

Mr. MATTHEW. This is under full development, you understand, in the future.

Senator McFARLAND. I understand, but if water was not used, you would not contend for one moment that Arizona could be charged with it, if Arizona were not using it?

Mr. MATTHEW. I think it has to be done, with the scarcity of water and the need for water.

Senator McFARLAND. I understand your theory, Mr. Matthew, but you would not contend—and let me put it this way, so we can get a real answer—for one moment that if central Arizona did not use any of the water of the Gila River and its system, that they could be charged with it?

Mr. MATTHEW. No, certainly not. This is our estimate of what we believe is capable of being used consumptively from the Gila River system, in Arizona, from the entire Gila River system.

Senator McFARLAND. And that, of course, is only an estimate and not actual measurements of the water that is being used?

Mr. MATTHEW. No, it has no relation to that, that is a different thing.

Senator McFARLAND. Now, with regard to item 6 on table 3, do you give Arizona any credit for the return flow to the river, which return flow helps supply the water for Mexico?

Mr. MATTHEW. Yes, to answer your question. We give the Yuma project credit for any return flow from the project, which gets in the river, that will serve the Mexican treaty at the points of delivery specified under the Mexican treaty.

Senator McFARLAND. But does that figure represent such a deduction?

Mr. MATTHEW. Yes, that is our estimate of what their consumptive use would be, the diversions less returns to the river.

Senator McFARLAND. Well, what are the diversions for the Yuma project at this time?

Mr. MATTHEW. The area irrigated in the Yuma project in 1943 is given in House Document 419, as 52,300 acres. We have estimated the consumptive use at 5 acre-feet per acre, or in rounded figures, 250,000 acre-feet.

Senator McFARLAND. In other words, this is just an estimate here and not actual measurements?

Mr. MATTHEW. It is an estimate, insofar as the rate of use per acre, yes, but it is based upon knowledge that a large part of the return flow from the Yuma project does not reach the river.

Senator McFARLAND. I am talking about how the figure is arrived at. As I understand you, it is based upon an estimate of the duty of the water on the land.

Mr. MATTHEW. That is right, on the basis of diversions less returns to the river.

Senator McFARLAND. But not on actual measurements?

Mr. MATTHEW. The actual measurements of water are available, so far as diversions into the Yuma project are concerned. They are very much larger than 250,000.

Senator McFARLAND. What I am trying to get at, Mr. Matthew, is that this figure is not based on actual measurements, it is an estimate figure.

Mr. MATTHEW. Yes, it is partly based on an inspection of actual measurements of diversions into that project.

Senator McFARLAND. By whom?

Mr. MATTHEW. By the USGS, and the Bureau of Reclamation.

Senator McFARLAND. Now, there is another item, item 11, the All-American Canal project, 3,800,000 acre-feet.

Mr. MATTHEW. Yes.

Senator McFARLAND. Does that include the East Mesa?

Mr. MATTHEW. Yes.

Senator McFARLAND. That project has been rejected by the Bureau of Reclamation and the Secretary of the Interior as being nonirrigable, has it not?

Mr. MATTHEW. I cannot answer you as to whether it has or has not, Senator.

Senator McFARLAND. At least there was a press release to that effect.

Mr. MATTHEW. My understanding is that there is not any final rejection.

Senator McFARLAND. I do not want to argue the point with you, but item 11 does include that East Mesa land which is not now being irrigated?

Mr. MATTHEW. That is right, but land which was contemplated.

Senator McFARLAND. And which presently has been classified as nonirrigable by the Bureau of Reclamation.

Mr. MATTHEW. But which presently is being demonstrated to be land which is comparable to the lands of the Gila project on the Yuma Mesa.

Senator McFARLAND. I would question that very much, Mr. Matthew, but I do not want to get into any argument with you. I am just trying to establish facts here, rather than to argue the matter.

I notice that in Arizona you say we should put to beneficial consumptive use all of the 2,300,000 acre-feet which you say flows into that area. Have you used the same rule-of-thumb in regard to the approximately 1,000,000 acre-feet that is now wasting into the Salton Sea?

Mr. MATTHEW. The present amount of waste into the Salton Sea is not representative of what will occur under ultimate development, Senator. At the present time there are large quantities of water flowing unused into the Gulf of California, and it hurts nobody for any of the projects, Yuma, Palo Verde, or All-American Canal, to use additional water at this time.

Ultimately, when the entire area is under irrigation, the total amount of water used will be limited by this amount, substantially 3,800,000 acre-feet.

Now, the outflow under ultimate development will not be far different in percentage from that anticipated, for instance, in the central Arizona project report—376,000 acre-feet, Senator, is estimated to be required as an outflow from the central Arizona project, which is about the same in percentage of gross diversion that would have to flow out of any project.

Senator McFARLAND. Do you expect to dry up the Salton Sea and totally use that water in the same manner that you would require Arizona to use the Gila water?

Mr. MATTHEW. We were going to have a representative from the Imperial Irrigation District testify as to those details, Senator, if you do not mind.

Senator McFARLAND. That is all perfectly satisfactory.

Do you, in making these estimates, contend that California should be charged with the water that could be salvaged along the California side of the river, as you are attempting by these figures to charge Arizona with the water that you said could be salvaged?

Mr. MATTHEW. We contend California should be charged with the actual consumptive use of water.

Senator MCFARLAND. And not with the water that she could salvage?

Mr. MATTHEW. Well, those hypothetical determinations of that kind are so devious that I think most anybody would get lost in trying to figure out what they mean.

Senator MCFARLAND. Yes; but Mr. Matthew, you did not get lost in figuring out what they meant when they were applied to Arizona, the water that could be salvaged.

Mr. MATTHEW. Oh, no; it is an entirely different thing.

Senator MCFARLAND. Oh, sure, it is entirely different. I understand that. It depends on whose shoe it is.

The CHAIRMAN. You forget that Arizona is the wettest State in the basin. [Laughter.]

Mr. MATTHEW. We have not offered any testimony about how salvage water should be treated, Senator. I have presented here estimates of consumptive use of projects. I did not testify as to who should be charged or not charged with salvaged water. That is a matter for legal determination.

Senator MCFARLAND. That was my understanding of your testimony, that you had charged that water to Arizona because it could all be salvaged and placed in use.

Mr. MATTHEW. No, that was not my testimony, sir, and let me make it very clear: I testified that was the amount of water that could be made available for use. I said nothing about charging under the compact. This is an engineering tabulation and has nothing to do with the compact interpretations.

Senator MCFARLAND. In other words, you do not for one moment contend that the 2,270,000 acre-feet of water should be charged to Arizona just because more of it might be salvaged?

Mr. MATTHEW. As far as the charge for salvage water, I would say that is a legal question to be determined in each case. There is going to be salvage water all through the basin. There is going to be water conserved in reservoirs which now runs to waste in the Gulf of California. That is a matter that involves a lot of legal considerations.

Senator MCFARLAND. Mr. Chairman, I might state this: I see no use in arguing the legal points with the witness. I want to shorten the testimony, but because I do not point up all of the various parts of his testimony does not mean that I agree with him; we have to get through with this sometime.

Now, I would just like to pursue one other question in regard to the questions that Senator Anderson was asking. I was very interested in those questions. I did not want to stop him. I just objected to bringing on other witnesses to answer for you, because after all you are doing the testifying and you are a good engineer.

You stated that the water stored in Lake Mead could be surplus water and excess water, as I understood your testimony, in critical years.

Mr. MATTHEW. No, I did not state that.

Senator MCFARLAND. What did you state?

Mr. MATTHEW. I stated that the waters stored in reservoirs, plus the water flowing in the streams in any year, were a part of the total water supply available for use in that year.

Senator MCFARLAND. Then let me ask this question, because I want to understand your testimony. Let us suppose that in 1950 there was only 5,000,000 acre-feet of water in Lake Mead—and you had a right to use 4,400,000 acre-feet—would you contend that 600,000 acre-feet was surplus and excess water which you would have a right to use, even though it would dry up Lake Mead and there would be no water on hand for the next year?

Mr. MATTHEW. You mean you would not have any flow in the river at all, and all you had was 5,000,000 acre-feet at Lake Mead?

Senator MCFARLAND. Yes.

Mr. MATTHEW. That would be a terrible situation.

Senator MCFARLAND. Yes, it would.

Mr. MATTHEW. I just cannot contemplate that.

Senator MCFARLAND. Yes, but that is the way you arrive at these answers sometimes.

Mr. MATTHEW. Well, it would have to be divided up in accordance with the priority of rights.

Senator MCFARLAND. And there would not be any excess and surplus water under those circumstances, would there?

Mr. MATTHEW. I do not imagine so.

Senator MCFARLAND. That is what I thought Senator Anderson was trying to elicit from you, that there would be critical periods in which there would not be any excess or surplus water and under those circumstances, you could not use the water that was stored.

Mr. MATTHEW. Well, if there is not any excess and surplus water over the III (a) water, the lower basin is in a sorry plight, indeed, because nobody is going to have any water.

Senator MCFARLAND. Well, we grant that, but that was not the question, as I understand it.

Now, there was one other thing with respect to your answer to the chairman's question, regarding the use in critical periods. Did I understand you to say that in building projects they should only be built on an estimation of the amount of water in critical periods?

Mr. MATTHEW. I suppose you partly understood what I meant—maybe I did not make it clear. But on any water supply project, certainly the critical period should be considered in estimating the total amount of water that can be obtained, with the storage and other works provided by the project; that would be the determining factor on the amount of water you should plan for and the project you should plan for.

Now, the total amount of water in the critical period on any project that involves the storage of flood flows in the wet years, for use in the dry periods, that total amount of water in the critical period is what the flow is during the critical period, plus the amount that you can draw from storage.

Senator MCFARLAND. Otherwise there would be no use in building the project?

Mr. MATTHEW. That is right.

Senator MCFARLAND. So we have to take some range of years which would reflect a reasonable amount of storage to carry over for the drought years?

Mr. MATTHEW. That is exactly right.

Senator MCFARLAND. I thought that would be your testimony, but you gave me a little different impression, and I wanted you to clear it up.

Mr. MATTHEW. I did not mean to give you a different impression. Most projects and developments cannot be predicated on averages. Generally speaking it is impossible to fully equate and conserve the average run-off of any stream. We have been somewhat concerned with the apparent idea expressed in Bureau reports that the Colorado River system could be fully equated.

Senator MCFARLAND. Mr. Chairman, I feel we can further save time in presenting our views with regard to these matters, if we do it by rebuttal engineering data, rather than to argue the points with the witness. I will not ask any more questions at this time.

The CHAIRMAN. Are there any other questions?

Senator DOWNEY. Mr. Chairman, if I might attempt to rehabilitate my witness by a few questions.

The CHAIRMAN. Your witness needs no rehabilitation.

Senator DOWNEY. He is one of our ablest engineers, but in explaining the law of the compact, while I think that he knows it thoroughly, I do not think that he and Senator Anderson had a meeting of the minds.

Mr. MATTHEW. Well, I know that.

Senator ANDERSON. So do I.

Senator DOWNEY. First, I want to ask you this, Mr. Matthew. I am reading here from a definition of consumptive use as found in the Mexican-American treaty on the Colorado River:

> Consumptive use means the use of water by evaporation, plant transpiration, or other manner, whereby the water is consumed and does not return to its source of supply. In general, it is measured by the amount of water diverted less the part thereof which returns to the stream.

Is that your idea and the idea of the California people on the meaning of consumptive use?

Mr. MATTHEW. Yes, sir; it is.

The CHAIRMAN. Evaporation?

Senator DOWNEY. Well, what is lost in the production of plant life and in evaporation, the actual loss of the water. That is what we have always thought, and I might say that up until the immediate present, what everybody agreed was consumptive use and that is what was put in the Mexican treaty.

The CHAIRMAN. Let me ask the Senator from California whether he believes there was consumptive use in the Colorado River system before the advent of man?

Senator DOWNEY. Why, certainly. The natural vegetation consumed water and evaporation naturally consumed water.

The CHAIRMAN. So that all of the evaporation which took place before any irrigation, power works, or reservoirs of any kind were constructed, and all of the water that was used in the natural virgin plant life of the area, is to be regarded as consumptive use?

Senator DOWNEY. Well, the compact, Mr. Chairman, refers to beneficial consumptive use. Now, applied directly to the Gila, to the extent that Arizona gets beneficial consumptive use out of the waters of the Gila, we believe you should be charged with it.

The CHAIRMAN. That is what I was driving at. There is a difference then between consumptive use, as defined in the treaty, and beneficial consumptive use?

Senator DOWNEY. No; I don't think there is, as defined in the treaty, because under the compact we award beneficial use and do not award water supply. We award uses or beneficial uses.

The CHAIRMAN. I should like to have the California representatives, when they talk about consumptive use and beneficial consumptive use, in whatever terms they desire to do so, talk also in the terms of consumptive use which is brought about by the structures made by man, irrigation and reclamation.

Senator DOWNEY. Yes, Mr. Chairman. I might say this, that to the extent on any of these streams, if there is a consumption by an act of nature, that is one thing; to the extent that there is a beneficial consumptive use by the farmers of any State, I think that is a very different thing. All we are attempting to charge Arizona with is the actual amount of water that she uses beneficially.

I do think now that we are dealing with a risky proposition that certainly we have the right to consider whether there are several hundred thousand acre-feet of water in the Gila which could cheaply be salvaged and put to beneficial use.

The CHAIRMAN. I thought possibly you had some other idea in mind when you quoted from the treaty, the consumptive use depending on natural evaporation.

Senator DOWNEY. No; I follow the logic of our very worthy chairman in making that discrimination, and he is undoubtedly right. I am not in disagreement with him.

Now, Mr. Matthew, I will ask you this:

The compact does not apportion between the Upper and Lower Basin States any supply of water; it apportions consumptive use, does it not?

Mr. MATTHEW. That is right.

Senator DOWNEY. It gives a certain beneficial consumptive use, stated in certain amounts of water?

Mr. MATTHEW. That is right.

Senator DOWNEY. Now, without getting involved in the intricate legal argument between Arizona and California, do we not claim that surplus water is that which is used in any particular year above this apportionment of beneficial use?

Mr. MATTHEW. That is right.

Senator DOWNEY. And Arizona interprets the surplus water as that amount above 16,000,000 acre-feet that is actually used; is that not right?

Mr. MATTHEW. That is right.

Senator DOWNEY. And we take the figure of 15,000,000 acre-feet because there is a controversy between us?

Mr. MATTHEW. That is right.

Senator DOWNEY. So that if, in any particular year, according to California, there is a beneficial use exceeding 15,000,000, and, according to Arizona, above 16,000,000, that is what we would call surplus water?

Mr. MATTHEW. Under the Limitation Act.

Senator DOWNEY. Yes. And if you can conceive—which, of course, I do not think you can—that that whole fifteen or sixteen million acre-

feet came from stored water and water above that, it would still appear under the terms of the compact and Limitation Act that that was surplus use, not surplus water, but surplus use?

Mr. MATTHEW. That is right.

Senator DOWNEY. That is apportioned to each State. I want to say, Mr. Chairman, I am not at all making a claim to being an expert on the Colorado River. I think we have men who are experts.

The CHAIRMAN. Until a better one comes along, you will do.

Senator DOWNEY. Thank you very much. The chairman is always logical and kind, both.

Now, Mr. Matthew, did you discuss where the difference lay between you and Mr. Debler in the necessity of using the 1,700,000 acre-feet instead of 1,500,000 to satisfy Mexico's demand under the treaty? Did you tell why you thought Mr. Debler was wrong in his contention?

Senator KERR. Yes, he did; he told us that.

Senator DOWNEY. You stated that you cannot use certain dams for regulating?

Mr. MATTHEW. Yes.

Senator DOWNEY. Did you answer that?

Mr. MATTHEW. No, Senator; I did not refer to Mr. Debler's answer to you yesterday, that in his opinion there would be regulatory capacity behind the structures clear down to Laguna Dam. In my opinion, neither the Laguna Dam nor the Imperial Dam would have the regulating capacity necessary to take care of this 200,000 acre-feet we are talking about. Those dams are diversion dams and the water level behind those dams has to be held within very narrow limits in order to get the diversion quantities out and into the canals. They do not have leeway for regulation.

Even Parker Dam does not have too much leeway for regulation, because they need to keep the stage as high as possible in order to reduce the pumping lift into the Metropolitan aqueduct for one thing, and another thing, to preserve their head for power development.

There is some provision at the present time for storage of flood flows coming out of the Bill Williams River at certain seasons of the year on Lake Havasu, but ordinarily they hold that level within very narrow limits, or try to.

Senator DOWNEY. And in the opinion of the California engineers, the amount of capacity is so small and the possibility of varying the level of the dams, that they could not be used for the purpose of regulation as indicated by Mr. Debler?

Mr. MATTHEW. Well, certainly not Imperial Dam or Laguna Dam, with the rapid silting up of what capacity is there, and the fact that their operating levels have to be held within very narrow limits in order to get the water out in the canal in specified quantities, would not permit of the regulation necessary. So that deliveries would have to be made in accordance with the Mexican treaty demands and for all of these canals, from Davis Dam far upstream.

Senator DOWNEY. Mr. Matthew, may I ask you this question:

Charging Arizona with the amount of beneficial use that she has on the Gila River, under Arizona's admission or under our contention, state it any way you want, would she be charged with the amount lost in evaporation, losses of the reservoirs?

Mr. MATTHEW. I believe so. You mean on the Gila River?

Senator DOWNEY. Yes.

Mr. MATTHEW. That would be a part of the consumptive use; yes.

Senator DOWNEY. That is, if the Bureau of Reclamation officials give a figure there of 2,200,000, or 2,300,000 beneficial use, you would think that would include, at least as far as your testimony is concerned, the amount that would be lost in the evaporation of the reservoirs?

Mr. MATTHEW. Yes. The 2,300,000 acre-feet is supposed to represent the natural flow without upstream depletion. So after the works are put in, of course, the losses in the reservoirs in conserving that supply and making it available for use, are a part of the operations of consumptive use that must be taken account of.

Senator DOWNEY. Now, you are familiar with table B–23, Water Requirements, Ultimate Development for the Central Arizona project, are you not?

Mr. MATTHEW. Yes.

Senator DOWNEY. As a matter of fact, we discussed this table with Mr. Larson and Mr. Nielsen of the Bureau of Reclamation and asked their interpretation of the figures yesterday, did we not?

Mr. MATTHEW. That is correct.

Senator DOWNEY. Under their first column the heading is "Annual surface water supply, acre-feet." They have, "Present average for 1940–44' a total of 1,676,600 feet, is that correct?

Mr. MATTHEW. That is correct.

Senator DOWNEY. Was it not true that they stated to us that their best estimate was that all of that water was diverted by surface diversion?

Mr. MATTHEW. That is correct.

Senator DOWNEY. But that 100,000 acre-feet of it had returned to the streams after the original application and was rediverted, is that not correct?

Mr. MATTHEW. That is right. About 100,000 acre-feet was their estimated reuse of water.

Senator DOWNEY. Then this table shows, does it not, that they expect to store 42,000 acre-feet with the Horseshoe Dam; 64,000 by the Butte Dam; 7,000 by the Charleston Dam; and 19,000 by the Safford Valley Improvement and Hooker Dam?

Mr. MATTHEW. That is correct. That is, that would not be just the water stored, but the new water made available.

Senator DOWNEY. Thank you, Mr. Matthew.

Now, what is your estimate of the evaporation on these reservoirs that are already constructed, according to the information you may have gleaned from the Bureau representatives or from your own engineers?

Mr. MATTHEW. Well, the Bureau representatives were not able to answer the question specifically, Senator, but indicated somewhere around 200,000 acre-feet.

Mr. NIELSEN. We were guessing at the time. It seems to me that Mr. Ely furnished the figure of 200,000 acre-feet.

Senator MCFARLAND. May I suggest, Mr. Chairman, it would be much better in putting this evidence on, to ask the Bureau of Reclamation questions rather than asking the California witness what the Bureau may have said yesterday. This is all hearsay, and it is not competent evidence. It would not be competent evidence before a court, and it should not be competent evidence before a committee

The CHAIRMAN. I would say, by the experience of this committee, almost anything is competent.

Senator MCFARLAND. Maybe so, but I am sure California would not want us to base the building of a project on evidence of that nature. That is second-hand evidence, which could be gotten directly.

Senator DOWNEY. Very well, Mr. Chairman. I think there certainly is a degree of plausibility in what the Senator from Arizona has said. I will merely ask to have put in the record at this point table B–23.

Senator MCFARLAND. It is already in the record. The whole report is in the record.

Senator DOWNEY. Is it printed as a part of the record?

Senator MCFARLAND. I asked that it be printed as a part of the record, and I think it certainly should be.

The CHAIRMAN. That is being printed as a House document.

Senator DOWNEY. Then I will merely call to the attention of the committee members that under the heading "Annual safe yield ground water supply," under the column marked "Present," there is another item of 694,600 acre-feet. Now, there are additional columns that I will not read, "Increase due to potential devolpment." I will not read that.

I now want to call to the attention of the committee the fact that in the Bureau of Reclamation chart we have a present annual surface water supply for the average 1940–44, of 1,676,000 acre-feet; additions by anticipated expansion of present reservoirs or building, 42,000 acre-feet, 64,0000 acre-feet, 7,000 acre-feet, 19,000 acre-feet, and an item of 694,600 acre-feet for present ground water supply. Then also in conection with this—and I do not think it is entirely relevant to the point we have been making, that there are substantial evaporation losses off several large reservoirs. In addition to that, it is my recollection that the United States Geological Survey states that in the Salt River and the Gila Valley, there is the loss of at least 600,000 acre-feet by reason of the absorption of moisture by plant growth along the stream beds. We will later, Mr. Chairman, place that in evidence.

I think that is all I have at this time.

Senator MCFARLAND. Mr. Matthew, this 1,676,600 acre-feet represents reuse water, does it not?

Mr. MATTHEW. According to the report of the Bureau of Reclamation, this report, 100,000 acre-feet of that is reuse water.

Senator MCFARLAND. As I understood it, it was 200,000 acre-feet, but that can be cleared up later on.

Mr. MATTHEW. I can get that for you and read it, if you like.

On page B–4 of the appendix to this report is a summary at the bottom of the page in regard to 1,236,100 acre-feet, which is in the Maricopa unit. It goes on to show an item for average miscellaneous diversions, 201,900 acre-feet. Continuing on page B–6:

> These miscellaneous diversions are made from a combination of tributary inflow downstream from the main diversion dams, spills and return flow from the irrigated area. A study has been made of the tributary drainage areas, chronological data, precipitation records, and stream-flow records available for Hassayampa, New River, Cave Creek, Queen Creek, Santa Cruz River, Centennial Wash, and various unnamed washes contributory to the area. The study indicates that a reasonable estimate for the contribution to the surface-water supply by the miscellaneous streams of the area would be 100,000 acre-feet a year. Diversions made from return flow thus average 101,900 acre-feet a year.

Senator McFARLAND. But, Mr. Matthew, I call your attention to the fact, as I understand it, that is in the full development of the project. But I would like to ask, after the project is fully developed, is that not what it should be then? If you will turn to page B–1 of the report you will see the figures appearing in the fourth column.

Mr. MATTHEW. Yes; these are the same figures.

Senator McFARLAND. Yes; but look over under Arlington Canal Co.; that is reuse water. That is 27,600 acre-feet. And Buckeye; that is reused water, 88,700 acre-feet. Then we get down to the Gillespie item of reuse water which is 81,200 acre-feet. Then we go down to the Goodyear Farms, which is 27,800 acre-feet. That is all reuse water.

I think the time will come when the Reclamation Service can explain that, but I just want to call attention to the fact that the figures are not correct as given.

I would also like to call attention to the fact——

Senator DOWNEY. Senator, I am sure what you have read does not contradict the statements we have just made.

Senator McFARLAND. No, Senator; it does not contradict the statements. As I understand it, there can be an explanation. The figures you have just given are the figures which are contemplated after full development of the project.

Senator DOWNEY. No.

Mr. MATTHEW. This is the present supply.

Senator DOWNEY. This is the present supply, Senator.

Senator McFARLAND. I know what these figures here represent, because I have been out there and tried the cases myself. I think I am about as competent a witness on that as anyone, so far as the usage in those districts is concerned, and that is reuse water.

Senator DOWNEY. You are talking about something that we are not. We are only talking about this present surface diversion.

Senator McFARLAND. That is what I am talking about. Now, all the items I named were present surface diversion, after the full diversion at the Granite Reef Dam, and the return flow down at the Buckeye Dam. It is reuse water that is diverted there. All down to the Arlington it is reuse water that is diverted. It is all diverted, then it goes on down to Gillespie.

The CHAIRMAN. Do I understand you to mean, Senator McFarland, that at these various dams the water which is return flow at dam A is used again?

Senator McFARLAND. That is correct.

The CHAIRMAN. And then what is return flow at dam B is used again?

Senator McFARLAND. That is correct.

The CHAIRMAN. And so on.

Senator McFARLAND. That is correct.

The CHAIRMAN. You feel that Arizona should not be charged with original diversion of the sum of the diversion at dam A, plus the rediversions at the succeeding dams?

Senator McFARLAND. That is correct. Nor should we be charged with this water that is in this other table which was mentioned here, the underground water, which is also water that has been diverted.

Senator DOWNEY. Mr. Chairman, I do not differ with what the Senator has just said.

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The CHAIRMAN. I was trying to divine the contention of the Senator. Now, is there any different contention on the part of California?

Senator DOWNEY. No; not on the conclusion that he states and from the facts that he has stated. But I would like to reiterate the statement that I have already made, which was the interpretation of this table given in about a half-hour or an hour's conversation by representatives from the Bureau. They give the present average annual surface-water supply for 1940 and 1944. Their first figure is 1,676,600 acre-feet.

Now, they stated to us—and I have their specific figures down in my office; they documented it all—about 100,000 acre-feet of that counts for reuse. In other words, they have a surface diversion of about 1,576,000 acre-feet. Approximately 100,000 acre-feet comes back into the streams, and is not pumped from underground, but from the surface. That makes that diversion.

Now, it is true that of that a certain amount then goes into the underground and of course they would be charged with that. That is then repumped.

But I do not want to detain this committee with a technical discussion of these figures. When the Bureau engineers come on the stand, they can explain their own chart.

The CHAIRMAN. Are there any other questions?

Senator KERR. I have a few when my turn comes.

The CHAIRMAN. Senator Kerr, your turn is here.

Senator KERR. Mr. Matthew, on page 4, table 3, as I understand it, you indicate California claims 5,362,000 acre-feet of water from the main stem of the Colorado.

Mr. MATTHEW. That is correct; but the table also means that is the water requirement of the California projects which are built and in operation.

Senator KERR. Are these projects completely built?

Mr. MATTHEW. Almost entirely built; yes.

Senator KERR. Then your claim is that 5,362,000 acre-feet of water is from the main stem of the Colorado?

Mr. MATTHEW. This is not supposed to be set up on the basis of claims, Senator; it is the set-up of water requirements independent of legal interpretation.

Senator KERR. I take it the gist of this whole thing is to fix it so that California will have that amount of water from the main stream of the Colorado?

Mr. MATTHEW. Well, California still anticipates to have that much water; yes.

Senator KERR. Does that answer my question in the affirmative or in the negative, or on a qualified basis?

Mr. MATTHEW. I did not mean to qualify it. Would you repeat your question?

Senator KERR. I asked you if this indicates that California's position is that she is entitled to 5,362,000 acre-feet of water per year from the main stem of the Colorado River?

Mr. MATTHEW. This table was not supposed to indicate that, but that is California's position, certainly.

Senator KERR. Well, then, if I can ask the question in a way that will be satisfactory to you: Is it California's contention that she is

entitled to 5,362,000 acre-feet of water of the main stem of the Colorado?

Mr. MATTHEW. That is right; yes, it is.

Senator KERR. How much of that water falls on California?

Mr. MATTHEW. How much of that water falls on California?

Senator KERR. Yes.

Mr. MATTHEW. Very little.

Senator KERR. How much?

Mr. MATTHEW. Well, I could almost say less than 1 percent or half of 1 percent. It is a very small amount.

Senator KERR. Well, it would not be too great an effort to say none of it; would it?

Mr. MATTHEW. No.

Senator KERR. Then where does it come from?

Mr. MATTHEW. It comes from the Colorado River Basin.

Senator KERR. Now, in order for that much to be available to California, how much has to pass through Lee Ferry?

Mr. MATTHEW. Well, somewhat more than that amount.

Senator KERR. Did I understand you to say that there was 900,000 acre-feet of evaporation to be charged against the 7,500,000 acre-feet minimum that was deliverable to the lower basin, in the flowage of the water, in order that this amount would arrive at and be available to California?

Mr. MATTHEW. The estimated evaporation loss of 900,000 is correct; yes. That is the Bureau's estimate. That would be out of the total supply in storage and flowing into the stream.

Senator KERR. Is that an item which would reduce the ultimate deliverability of that 7,500,000 acre-feet to the places where it was to be consumptively or beneficially used?

Mr. MATTHEW. Certainly.

Senator KERR. Well, then, if we add 900,000 acre-feet to 5,362,000 acre-feet, we get a total of 6,262,000 acre-feet of the 7,500,000 acre-feet annually deliverable to the lower basin; do we not?

Mr. MATTHEW. That is right.

Senator KERR. How much does that leave of the 7,500,000 acre-feet?

Mr. MATTHEW. That would leave one point two.

Senator KERR. Does that mean 1,200,000?

Mr. MATTHEW. Yes; 1,200,000.

Senator KERR. How many States are there, in whole or in part in the lower basin?

Mr. MATTHEW. Five.

Senator KERR. Then do I understand that California is one of five States that, in whole or in part, comprises the lower basin?

Mr. MATTHEW. That is right.

Senator KERR. Your position, or California's position, is that being one of five States in the lower basin she is to receive four-fifths of all the water deliverable to the lower basin?

Mr. MATTHEW. Well, your premise is wrong, Senator. In addition to the 7,500,000 passing Lee Ferry we also have, or are expected to have, large quantities of water in Lake Mead which can be drawn on at a time when there is only 7,500,000 passing Lee Ferry.

Senator KERR. As I read the compact, the upper basin agrees to deliver 7,500,000 acre-feet a year at Lee Ferry.

Mr. MATTHEW. Well, that is the minimum amount that must flow past Lee Ferry.

Senator KERR. That is all they agree to deliver; is it not?

Mr. MATTHEW. No, sir. They also have the obligation, as we understand it, to allow the flow of the stream over and above their apportionment of 7,500,000 acre-feet for consumptive use, to pass down to the lower basin.

Senator KERR. I am talking about the actual commitment.

Mr. MATTHEW. That is what I am talking about, too. The obligation is twofold; the commitment is twofold. As a minimum, not less than 75,000,000 acre-feet in any 10 years must pass Lee Ferry.

Senator KERR. Well, they do not agree to deliver any more than that; do they?

Mr. MATTHEW. Oh, yes.

Senator KERR. As an absolute obligation?

Mr. MATTHEW. Yes. Under the compact they are——

Senator KERR. Show it to me, will you, please?

The CHAIRMAN. State first how much.

Mr. MATTHEW. Well, the upper basin under the compact is apportioned 7,500,000 acre-feet per annum.

Senator KERR. Who is?

Mr. MATTHEW. The upper basin.

Senator KERR. I am talking about the lower basin.

Mr. MATTHEW. You were talking to me about the obligation of the upper basin, sir, and I am trying to answer you.

Senator KERR. Well, none of this water falls in the lower basin; does it?

Mr. MATTHEW. None of the water flows in the lower basin?

Senator KERR. Of this 75,000,000 acre-feet deliverable every 10 years?

Mr. MATTHEW. No; that originates in the upper basin.

Senator KERR. As I understand it, the compact is to bring about an obligation on the part of the upper basin to deliver that much water to the lower basin each 10 years, or an average of 7,500,000 acre-feet a year?

Mr. MATTHEW. That would be the minimum, sir. On the average it is expected an anticipated——

Senator KERR. I am not talking about what is expected and anticipated. I am talking about the language of the compact whereby it is agreed to deliver water at Lee Ferry for the benefit of the lower basin.

Mr. MATTHEW. Yes; I understand that entirely. The compact also specifies that the upper basin is apportioned 7,500,000 acre-feet for beneficial consumptive use. The result of that is that the water arising in the upper basin, over and above 7,500,000 acre-feet of consumptive use, will pass on to the lower basin. So, you see, there are the two elements in the compact.

Senator KERR. Well, does not the same paragraph that apportions 7,500,000 to the upper basin apportion 7,500,000 acre-feet to the lower basin?

Mr. MATTHEW. That is right, and there is further provision——

Senator KERR. Now, then——

Senator DOWNEY. May he finish his answer, Senator?

Senator KERR. He never has started it yet.

Senator DOWNEY. I beg the Senator's pardon. The answer was directly responsive, in my opinion, and he was trying to complete his answer.

Senator KERR. I will be glad to let him do it but, as I say, he never has yet started the answer to my question, and that was this: Where is the obligation in this contract for the upper basin to deliver any more or any specific item of water other than that at Lee Ferry, for the benefit of the lower basin?

Mr. MATTHEW. The compact provides that the upper basin shall not withhold water from the lower basin, nor the lower basin demand of the upper basin, any water that cannot be put to beneficial consumptive use. If I have a copy of the compact here I will read that.

Senator MCFARLAND. I will lend you my copy.

(Handing witness document)

Mr. MATTHEW. Article 3, paragraph (e), states as follows:

The States of the upper division shall not withhold water and the States of the lower division shall not require the delivery of water which cannot reasonably be applied to domestic and agricultural uses.

That is what I referred to, Senator.

Senator KERR. Tell me what part of that constitutes an agreement by the upper States or the uper basin to deliver at Lee Ferry for the benefit of the lower basin, any specific amount in addition to the 7,500,000 acre-feet per year average?

Mr. MATTHEW. Mr. Chairman, if these questions are going to be on legal matters I prefer to have them answered by legal counsel. I am testifying here as an engineer on engineering data. I have——

Senator KERR. Let me interrupt right there to say this: You testified that based on the figures California was entitled to 5,362,000 acre-feet of water net after evaporation. I was asking you where she was going to get it. Is that a legal question?

Mr. MATTHEW. I think it is, yes.

Senator KERR. Where did you get the information that she was to have 5,362,000 acre-feet?

Mr. MATTHEW. Senator, you asked me a simple question.

Senator KERR. That is what I thought.

Mr. MATTHEW. You asked me whether California's position was that she was entitled to 5,362,000 acre-feet. My answer was yes.

Senator KERR. Then I asked you where she was to get the water under this compact.

Mr. MATTHEW. But then your questions went on to involve long legal questions about the compact. I would prefer to have those legal matters handled by an attorney.

Senator KERR. Then is it your answer that you do not know where she is to get it?

Mr. MATTHEW. No, that is not my answer. All of the engineers, including the Bureau of Reclamation engineers who have worked on this thing, have worked on the assumption that all of the water flowing past Lee Ferry——

Senator KERR. Now, how much is that?

Mr. MATTHEW. May I complete my answer, please?

Senator KERR. You certainly may. May I interrupt if I please?

Mr. MATTHEW. Certainly, sir.

Senator KERR. You do not need to talk any louder than you are and I will not either.

Mr. MATTHEW. Well, I will talk much lower if you would like.

Senator KERR. No; I just say you will not need to. You can do as you like.

Mr. MATTHEW. Senator, I was trying to make a statement, that all of the engineers who have worked on the Colorado River, including the Bureau engineers, have assumed that of the water supply originating in the upper basin, that everything over and above 7,500,000 acre-feet of beneficial consumptive use in the upper basin would flow past Lee Ferry and be available to the lower basin.

Senator ANDERSON. I just challenge that. I just do not admit that it is right at all. You cannot prove a statement like that and you know you cannot.

Mr. MATTHEW. That all the engineers assume that?

Senator ANDERSON. That is right.

The CHAIRMAN. Senator Anderson correctly states my own feeling. The engineers may assume that but if they do they are completely wrong, in my judgment.

Mr. MATTHEW. Well, let me say this——

Senator ANDERSON. Here are the engineers from the Bureau of Reclamation. Why do you not ask four or five of them and see if they have all worked on that assumption, that all water beyond 7,500,000 belongs to the lower basin States?

Mr. MATTHEW. Well, Senator, every one of these——

Senator ANDERSON. Here they are.

Mr. MATTHEW. Every one of these statements handed in to the committee started with 16,300,000 acre-feet at Lee Ferry virgin flow, on the average, and they deducted 7,500,000 acre-feet for upper basin use, with the remaining flow of 8,800,000 acre-feet for the lower basin. That was in every one of these statements.

Senator KERR. Where, then, was the million and a half acre-feet coming from that was going to Mexico?

Mr. MATTHEW. It has to come out of the 8,800,000.

Senator KERR. Then would that be available to the lower basin States?

Mr. MATTHEW. It would have to serve Mexico, too, if it is sufficient.

Senator KERR. But that 1,500,000 acre-feet, if it were able to go to Mexico would it be available to the lower basin States?

Mr. MATTHEW. Of course it would have to serve the lower basin States and Mexico if that water supply is sufficient. And if it is not then some additional water would have to come down from the upper basin to serve half of any deficiency in the surplus as defined by article III (c) of the compact in meeting the Mexican treaty requirement.

Senator KERR. Over and above the 8,800,000?

Mr. MATTHEW. No, that is not what I said, if there was a deficiency——

Senator KERR. You said there was how much virgin flow, 16,000,000?

Mr. MATTHEW. Sixteen million three hundred thousand was the estimated virgin flow by the Bureau of Reclamation at Lee Ferry.

Senator KERR. And how much is not kept in the upper basin?

Mr. MATTHEW. I think it is assumed in all these tabulations that there would be retained in the upper basin 7,500,000 acre-feet of consumptive use.

Senator KERR. Leaving how much?

Mr. MATTHEW. Leaving 8,800,000 acre-feet as an available supply for the lower basin.

Senator KERR. But does that not include 1,500,000 acre-feet for Mexico?

Mr. MATTHEW. It is the water that has to service the lower basin——

Senator KERR. Answer my question, will you, Mr. Witness, if you know, but if you do not know why you do not.

Mr. MATTHEW. I know it very well and I am trying to answer if you will allow me.

Senator KERR. Does it include 1,500,000 acre-feet a year for Mexico?

Mr. MATTHEW. It does.

Senator KERR. Then how much would that leave for the lower basin?

Mr. MATTHEW. That would leave 7,300,000.

Senator KERR. Of how much is going——

Mr. MATTHEW. That is in the main stream alone. Now, the lower basin also has the other tributaries of the Colorado and the compact deals with the Colorado River system and not the main stream only.

Senator KERR. I am talking about the amount they agreed to deliver at Lee Ferry.

Mr. MATTHEW. I appreciate that.

Senator KERR. Then according to your evidence there would be 7,300,000 acre-feet a year?

Mr. MATTHEW. For lower basin projects, plus the tributaries in the lower basin.

Senator KERR. I am talking about the water at Lee Ferry, Mr. Witness.

Mr. MATTHEW. Surely.

Senator KERR. 7,300,000.

Mr. MATTHEW. I have answered your question.

Senator KERR. And you estimate that 900,000 acre-feet of that will evaporate?

Mr. MATTHEW. I don't estimate it, that is the Bureau of Reclamation estimate.

Senator KERR. What do you estimate?

Mr. MATTHEW. I have not made an estimate.

Senator KERR. Then do we disregard your figures here with reference to evaporation?

Mr. MATTHEW. Not that I would assume, sir. I have used official estimates.

Senator KERR. Do you take the position that the committee can assume its correctness?

Mr. MATTHEW. I think that is a reasonable approximation, yes,

Senator KERR. Then how much of the Lee Ferry water would there be left for use by the five States in the lower basin?

Mr. MATTHEW. You mean net water?

Senator KERR. Yes. This is net water you are talking about here, 5,362,000 acre-feet for California, is it not?

Mr. MATTHEW. Yes.

Senator KERR. How much net water do you calculate, on the basis of what you have told me, there is left for the five States in the lower basin?

Mr. MATTHEW. You mean after deducting reservoir losses?

Senator KERR. After deducting the reservoir factor.

Mr. MATTHEW. That would be about 6½ million.

Senator KERR. It would be 6,400,000, would it not?

Mr. MATTHEW. Yes.

Senator KERR. And California's position is that she, being one of the five States, should have 5,362,000 acre-fee of that water, and that the other four States would thereby take what was left, which would be 1,038,000 acre-feet per year.

Mr. MATTHEW. Well, that is not such a simple thing as you are trying to make it.

Senator KERR. Suppose you simplify it for me.

Mr. MATTHEW. The lower basin has other waters besides the main stream waters.

Senator KERR. That California is going to get?

Mr. MATTHEW. No.

Senator KERR. I am talking about the water California is going to get.

Mr. MATTHEW. You were talking about the other States, too.

Senator KERR. But I am talking about this amount of 6,400,000 per year.

Mr. MATTHEW. Yes, sir.

Senator KERR. I am asking you if it is California's position that of that water she is to receive 5,362,000 acre-feet and the other States 1,038,000 acre-feet?

Mr. MATTHEW. That is right, of the main stream, that is correct.

Senator KERR. That is correct?

Mr. MATTHEW. Yes; that is right.

Senator KERR. Then instead of this compact being between the upper basin and the lower basin it would be between the upper basin and California, insofar as 80 percent of the water was concerned, would it not?

Mr. MATTHEW. Well, I do not follow you on that, sir.

Senator KERR. What percent of 6,400,000 acre-feet is 5,362,000 acre-feet?

Mr. MATTHEW. I do not follow you on the compact between the upper basin States and California.

Senator KERR. Can you calculate that for me?

Mr. MATTHEW. I would be very glad to. That would be about 84 percent.

Senator KERR. Then as I understand it, California's position is that the compact, insofar as the water delivered or deliverable at Lee Ferry is concerned, was made one-half for the upper basin, and of the half for the lower basin it was made 84 percent for the benefit of California and 16 percent for the benefit of the other four States?

Mr. MATTHEW. Under the compact and the limitation act; yes.

Senator KERR. I have no further questions.

Mr. MATTHEW. That provides 1,000,000 acre-feet for Arizona.

Senator KERR. Now, there is only 1,038,000 acre-feet left?

Mr. MATTHEW. Yes; I know.

Senator KERR. You say 1,000,000 of that is for Arizona?

Mr. MATTHEW. Pardon me. We ended up with a figure of 6,400,000, did we not?

Senator KERR. Yes; you did, I did not.

Mr. MATTHEW. All right, you check me on it. California's share is 5.4. Yes; according to your computation that is right——

Senator KERR. No, no, no; not mine; according to yours. Let us get that part of it straight.

Mr. MATTHEW. That is right.

The CHAIRMAN. Senator Downey, are there any further questions?

Senator DOWNEY. Well, Mr. Chairman, I do not know. I do not think the distinguished Senator from Oklahoma understands California's theory or understands the figures. I think this whole cross-examination has left the whole subject most confused and bewildering. I know the Senator believes he has been clarifying this, but it is the opinion of the unhappy Senator from California that he has been confusing it.

I do not want to take the time of the witness or the committee to try to clarify it.

The CHAIRMAN. Of course, this witness is not a lawyer, and he should not be asked to testify on legal questions.

Senator DOWNEY. Well, let me ask a few questions.

Mr. Matthew, the compact comprehends all of the waters of the Colorado River system; does it not?

Mr. MATTHEW. That is right.

Senator DOWNEY. In so many words?

Mr. MATTEW. That is right.

Senator DOWNEY. Does not every engineer concede that the Gila River is a part of the Colorado River system.

Mr. MATTHEW. Yes.

Senator DOWNEY. Can there be any argument or doubt about that.

Mr. MATTHEW. Not at all.

Senator DOWNEY. And do not the figures of the Bureau of Reclamation show that the virgin flow of the Gila River in the Phoenix area is somewhat around 2,300,000 acre-feet?

Mr. MATTHEW. That is right.

Senator DOWNEY. Is it not true that all of the large users on the Colorado River, going back to the turn of this century, were in California on the Colorado River, low down, with minor uses in Arizona at that same place?

Mr. MATTHEW. That is right.

Senator DOWNEY. Is it not a fact that the All-American Canal diverted 10,000 second-feet of water there and had a right to and was capable of diverting 10,000 second-feet of water?

Mr. MATTHEW. Approximately that; yes.

Senator DOWNEY. And that at times it employed its full capacity?

Mr. MATTHEW. That is right.

The CHAIRMAN. Senator Downey, may I interrupt you. I think, as a matter of fact, that you, Senator Kerr, and the witness and the California delegation are all actually in agreement. May I propound a question to see if that is not so in order that we may save time?

Senator DOWNEY. Oh, certainly, I would defer to the chairman. All I wanted to do was develop the equities of this thing.

The CHAIRMAN. All right, see if I do not develop the equities as California sees them and see if Senator Kerr gets what he wants.

Mr. Ely responded in a written memorandum to my question:

Question. (c) The amount of additional water which California desires to use?

This is what he wrote and this, of course, was in the examination of May 10, 1948:

Answer. The amount of additional water California desires to use is the difference between the total amount of water specified in existing contracts (and for the utilization of which projects are now constructed) of 5,362,000. acre-feet per year and present users of 3,230,000 acre-feet, or 2,132,000 acre-feet per year.

Question. (d) The source from which that additional water will come?

Answer. The source of the addtional water is the same as that for the present uses; i. e., the Colorado River system.

Question. Whether or not the sum of all of these is in the opinion of California within the existing law and limitation?

Answer. California is firmly of the opinion that the total of the foregoing amounts, 5,362,000 acre-feet per year, is definitely within existing law of which the limitation act referred to is a part.

Now the witness, Mr. Matthew, has used this same figure, 5,362,000 acre-feet. What Senator Kerr did was to point out that that 5,362,-000 acre-feet and the water for Mexico, constitute in the computation of the witness 84 percent of the 7,500,000 acre-feet deliverable at Lee Ferry. Am I right, Senator?

Senator KERR. It constitutes that percentage of the total amount deliverable at Lee Ferry after the 1,500,000 acre-feet for Mexico has been deducted or set aside.

Mr. MATTHEW. Mr. Chairman, I would like to correct my responses to the figures I gave to Senator Kerr because I neglected, or it escaped my mind right at the moment, that besides the flow at Lee Ferry in the main stream there are also inflows below there. We have previously estimated those at 600,000 acre-feet. So that my responses to the figures which Senator Kerr gave me would have to be corrected by 600,000 acre-feet.

Senator KERR. You have also estimated it at 300,000 acre-feet, have you not?

Mr. MATTHEW. 600,000 on the average, sir, where we started out with 8,800,000, so that the total supply for the main stream in the lower basin would be 9,400,000 acre-feet. Now if we go through these computations that Senator Kerr asked me to do, we start with 9,400,000 and deduct the reservoir losses, which makes 8,500,000. Then he asked me to deduct the Mexican treaty at 1,500,000——

Senator KERR. Your estimate on that is 1,700,000; is it not?

Mr. MATTHEW. You asked me to use 1,500,000.

Senator KERR. I did not ask you to use anything. I asked you what the result would be using 1,500,000.

Mr. MATTHEW. That is right.

Senator KERR. But since you have gone back to your estimates supposing we stay with them at the 1,700,000, which you said was——

Mr. MATTHEW. Pardon me; you do not seem to understand. I inadvertently neglected to take into account the water available in the

main stream below Lee Ferry, and that is the only correction I am making.

Senator KERR. Did you inadvertently estimate that it required 1,700,000?

Mr. MATTHEW. No.

Senator KERR. To be delivered to Mexico?

Mr. MATTHEW. No; I said "inadvertently" in answer to your question.

Senator KERR. Then I ask you further, what significance does the 1,700,000 acre-feet have?

Mr. MATTHEW. That is our estimate of the requirements of the Mexican treaty, the demands on the river.

Senator KERR. Then that would be deducted from the eight point four, would it not?

Mr. MATTHEW. I will use that.

Senator KERR. It is not my figure. If it is not yours it is nothing. If it is yours I suggest you use it.

Mr. MATTHEW. I will stand behind our figures.

Senator KERR. All right.

Mr. MATTHEW. We have arrived at that 8,500,000 net supply. Now, then, you want to deduct——

Senator KERR. No, I do not want to, but I think you are compelled to.

Mr. MATTHEW. You have asked me to deduct the Mexican treaty so we will deduct that at 1,700,000. That leaves 6,800,000. California would be 5,400,000, which leaves 1,400,000 for the other States.

Senator KERR. What percentage of that total amount of water is it that California believes she is entitled to?

Mr. MATTHEW. Well, it would be approximately 64 percent.

Senator KERR. Let me see if I can verify that. How much was the total, 6,800,000?

Mr. MATTHEW. 8,500,000.

Senator KERR. Less 1,700,000?

Mr. MATTHEW. You want to deduct the Mexican treaty first?

Senator KERR. I don't want to, and I don't want you to, if it is available to the lower States?

Mr. MATTHEW. Well, the Mexican treaty obligation is, of course, an obligation on any and all sources in the basin, you understand that.

Senator KERR. That is what I understood, that that water was not available to the lower basin, but 6,800,000 acre-feet are, as you have told me.

Mr. MATTHEW. Well, let us take the percentage on that basis.

Senator KERR. That is the actuality, is it not?

Mr. MATTHEW. On the figures that you are asking me to use.

Senator KERR. On the figures that you have furnished me. I would like to have the record clear on that.

Mr. MATTHEW. About 78 percent.

Senator KERR. Then that gets us back to the conclusion that when the compact was written it was written for the upper basin on the one hand, and for California 78 percent and for the other four States 22 percent. That is the conclusion that we reached, is it not?

Mr. MATTHEW. I do not know anything about a compact between the upper basin States and California.

Senator DOWNEY. Mr. Chairman, I would like to ask permission to make a brief statement here, not exceeding 5 minutes in length, that I believe is necessary to clarify certain of the issues that have just been developed.

In the first place I would like to point this out to Senator Kerr, that under the recognized irrigation law of the West, which the Supreme Court of the United States has repeatedly recognized, it is immaterial how much water falls in any State, as to the amount of water that the people of that State may be entitled to. We live under the doctrine of prior appropriation. We disregard States' rights and whichever farmers have the first appropriation on an interstate stream have established what we have always recognized as a legal—and I would assume a moral—right.

Senator KERR. May I ask a question right there?

Senator DOWNEY. Yes, certainly.

Senator KERR. What is the extent of the water which is now being used or has been used by the farmers of California?

Senator DOWNEY. Before Hoover Dam was put in—and while the records are somewhat uncertain—we think we were using under established appropriative rights somewhat more than 3,600,000 acre-feet of water annually. There was very little use at any other place on the Colorado River. There was a minor amount in Colorado and a minor amount in Arizona and by the doctrine of prior appropriation which every State has availed itself of—even Wyoming, Colorado, Kansas, for I have been through some of the cases—that right is recognized.

Senator KERR. As a matter of fact, that is only 3,000,000, is it not, Senator?

Senator DOWNEY. May I continue, Senator?

Senator KERR. I would be glad for you to.

Senator DOWNEY. That use was under the early rights that California had. I might say this: When the Hoover Dam was put in, because of the tremendous floods and the small run-off in the summer, no more water could be utilized any place along the stream. The amount California was using—plus the minor amounts in Arizona, Colorado, and other places— exhausted and overexhausted all of the available water in the stream during the months of low flow. Because that stream came down in tremendous floods, maybe 80 or 90 percent of it came down in 2 or 3 months.

None of us ever even thought of making the claim that because not one drop of water fell in Mexico, that Mexico morally was not entitled under the doctrine of prior appropriation to six or seven hundred thousand acre-feet.

Under those conditions, with California having probably 80 percent of all appropriative rights in the Colorado River and with the Colorado River overappropriated, the California people, in my opinion, assisted materially by people in the Bureau of Reclamation, took the lead and took all the financial responsibility for building Hoover Dam.

Senator KERR. Who built Hoover Dam?

Senator DOWNEY. The Reclamation Bureau built it.

Senator KERR. You said the financial responsibility. Would you enlighten me on that?

Senator DOWNEY. Yes, I will.

Senator KERR. I thought the Government built it, Senator.

Senator DOWNEY. The Government built it, but insisted that before it be built the State of California and its agencies must enter into solvent and enforceable contracts to pay back not only every dollar of the principal that went into Hoover Dam, but 3 percent interest on top of that. California people are now paying that.

There was 18 percent of the power set over to Arizona and 18 percent of the power over to Nevada, which they can have whenever they want it, but California has been taking it and California has been paying for it.

The building of that dam probably increased three times over the amount of water that could be used for irrigation and any other purposes on the Colorado River. In addition to that, the State of California—or, I guess, our power users, I have forgotten how it was worked out—agreed to pay, as I recall, $500,000 a year for 50 years, to Arizona and Nevada, for the use of the dam site. Are those figures right?

A VOICE. Six hundred thousand.

Senator DOWNEY. Six hundred thousand for 50 years.

We likewise agreed to pay very large sums, I think for another period of 50 years, to provide for investigation and construction of new projects in the Colorado River Basin.

Mr. SHAW. Five hundred thousand a year.

Senator DOWNEY. Five hundred thousand a year.

Now, I want to call this to the attention of the Senators who are not entirely familiar with this, that enterprises are now getting power money interest-free. We are paying it back at the rate of 3 percent. If for any reason power would become valueless through the development of atomic energy or some new force, our California agencies, the Metropolitan Water District, the southern California utilities and the city of Los Angeles might find themselves burdened with payments of millions of dollars a year for which they got no return.

At that time everybody acted in good faith. We thought the flow of the river for the lower basin was a million acre-feet more that it has turned out to be. All of us assumed that Mexico, upon whose soil not one drop of Colorado River water fell, should not have more than 6 or 7 hundred thousand acre-feet of water because that is all she had used before Hoover Dam and all she could ever have used from the uncontrolled flow.

Well, with a higher flow expected, it being believed that Mexico would not be entitled to more than 6 or 7 hundred thousand acre-feet of water, everybody went ahead in good faith. And the Secretary of the Interior, believing the water was there in the river and believing California was entitled to it under the compact and limitation act, gave us these contracts.

The Metropolitan Water District alone—how much did it spend to carry the water to Los Angeles?

A VOICE. Roughly two hundred million.

Senator DOWNEY. Roughly $200,000,000, on which we pay all of the interest and we pay all of the principal.

Now, Senator, let me say this: That aqueduct was constructed to take water to the southern California area, we thought, for a period of

50 years ahead of time, as I recall. We are only using now maybe 15 percent of the Metropolitan source, but we have no other source in California from which we can ever hope to get water, unless perhaps we get from the Columbia or out of the ocean, or something of that kind.

Consequently, while we are only using, perhaps, 200,000 acre-feet of that 1,200,000 acre-feet, under valid contracts, with the belief that the water was there, with the belief that we knew what Mexico's rights were, we constructed that Metropolitan aqueduct.

On the All-American Canal, the Bureau of Reclamation, after a thorough investigation of all of our lands and our water rights, built itself, as a Bureau of Reclamation project, the All-American Canal to carry all of this water allocated under the American Canal right. As I understand it, that was built under the Bureau of Reclamation law with interest-free money. None of the other money was interest-free money.

We are now going ahead with the Coachella area; we are going ahead with the Palo Verde area. We have already utilized, I guess, 60 to 70 percent of the water that is available.

Now, Senator Kerr, I just want to add this because it does seem to me from your attitude and your implications that you do think—and pardon me for saying this—that California's attitude and California's position here is wrong.

Senator KERR. Senator, I was only inquiring what their attitude was. I was not judging it.

Senator DOWNEY. Then I withdraw that suggestion.

The CHAIRMAN. The hour of 1:30 having arrived——

Senator MCFARLAND. Mr. Chairman, I would like to have 2 minutes. I do not like statements to be made, such as have been made here, without Arizona having at least 2 minutes to reply to them.

Senator DOWNEY. I think he ought to have 20 minutes, if he wants, Mr. Chairman.

Senator MCFARLAND. No; I just asked for 2 minutes and that is all.

The CHAIRMAN. All right.

Senator MCFARLAND. I just want to say this: That the information developed by Senator Kerr was very valuable. It showed California's position to be that, after excluding the uses of the Gila water, which Arizona was already using, there was no more than about a million acre-feet of water left for Arizona and the other States. Of that 1,000,000 acre-feet, Arizona was already using in Yuma, according to the witness, about 250,000 acre-feet, which means this, Mr. Chairman: It means that under California's interpretation, when the compact was signed, we of the other lower basin States were excluded from using for future development more than 1,000,000 acre-feet of water, additional water.

I want to point this out to you. The witness here developed from the evidence and admitted that these diversions in the Alamo Canal included the uses in Mexico, and California cannot under any circumstances claim to have built up a use for water that is used in the Republic of Mexico for the irrigation of the land.

I want to further point out, Mr. Chairman, that California was awfully glad to get that cheap power. It is the cheapest power that has ever been sold. All she is doing is paying for the power. The

other States would be very glad now to get it, because even California was clamoring for more of Davis power—which ran around how much? Five mills?

Mr. LARSON. It is a little under 5 mills.

Senator MCFARLAND. A little under 5 mills, which is much more than Boulder Canyon power. So California has profited very handsomely by this structure which was built by the Government. All she is doing is paying for the power she is using, and let us make no mistake about it.

I thank you.

Senator ANDERSON. Mr. Chairman, before we recess could we have 5 or 10 minutes of executive session? I have a suggestion I desire to make, and I would like to make it in executive session, if I might.

The CHAIRMAN. I think that will be the case. Off the record.

(Discussion off the record.)

The CHAIRMAN. That portion of the hearings of May 10, 1948, to which reference has been made will be made a part of the record.

(The matter above referred to is as follows:)

ANSWERS TO QUESTIONS ASKED OF MR. ELY BY SENATOR O'MAHONEY AT HEARINGS ON SENATE JOINT RESOLUTION 145, MAY 10, 1948

Following is a copy from the transcript of the hearings showing the form in which certain questions were asked by Senator O'Mahoney:

"Senator O'MAHONEY. We are dealing here with a water system, a river system which has a flow inadequate to meet all of the demands that are being made upon it. Now, from the point of view of California, how much water have you actually put to use under contract?

"Mr. ELY. I should prefer to place that figure in the record if I may. It is available, I am sure, and I do not have it accurately in mind.

"Senator O'MAHONEY. Let me ask you to put it in the record in this form: (a) The amount of water to which you feel California is entitled, and (b) the amount of water which has already been apportioned and utilized by existing systems, and (c) the amount of additional water which California desires to use, and (d) the source from which that additional water will come; and finally, whether or not the sum of all of these is, in the opinion of California, within the existing law and limitation."

In answering these questions it is assumed that question (b) relates to present uses and that any reference to "uses" or quantities of water in the questions means "consumptive uses" under the Colorado River compact and as defined in the Boulder Canyon Project Act (diversions less returns to the river) and not as Arizona seeks to define "consumptive uses" as being depletion of the Colorado River at the international boundary.

"Question. (a) The amount of water to which you feel California is entitled?

"Answer. California maintains that it is entitled to a beneficial consumptive use within the State of not less than the total amount of water for which contracts with the United States are outstanding; i. e., 5,362,000 acre-feet per year.

"Question. (b) The amount of water which has already been apportioned and utilized by existing systems (present uses)?

"Answer. At the present time the total beneficial consumptive use in California amounts to about 3,230,000 acre-feet per year.

"Question. (c) The amount of additional water which California desires to use?

"Answer. The amount of additional water California desires to use is the difference between the total amount of water specified in existing contracts (and for the utilization of which projects are now constructed) of 5,362,000 acre-feet per year and present uses of 3,230,000 acre-feet, or 2,132,000 acre-feet per year.

"Question. (d) The source from which that additional water will come?

"Answer. The source of the additional water is the same as that for present uses; i. e., the Colorado River system.

"Question. Whether or not the sum of all of these is in the opinions of California within the existing law and limitation?

"Answer. California is firmly of the opinion that the total of the foregoing amounts, 5,362,000 acre-feet per year, is definitely within existing law of which the Limitation Act referred to is a part."

Senator O'Mahoney also asked the following question of Mr. Ely:

"Senator O'MAHONEY. I would like to know whether in your opinion there is any difference in the amount of water which California claims in the Limitation Act and under the compact, and the Boulder Canyon Act?

"Answer. No; there is no difference. These three instruments are interrelated and combine to fix the quantity of water which California may use."

The CHAIRMAN. The committee stands in recess except for an executive meeting.

(Whereupon, the hearing in this matter was adjourned at 1:35 p. m., to Saturday, April 2, 1949, at 10 a. m.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

SATURDAY, APRIL 2, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Miller, Anderson, Watkins, Malone, Millikin, Ecton, Kerr.

Also present: Senator Knowland.

The CHAIRMAN. The committee will come to order.

Mr. Howard, will you come forward, please.

STATEMENT OF JAMES H. HOWARD, GENERAL COUNSEL, METROPOLITAN WATER DISTRICT, SOUTHERN CALIFORNIA

The CHAIRMAN. You may proceed, sir.

Mr. HOWARD. To identify myself for the record, I am James H. Howard, general counsel for the Metropolitan Water District of Southern California.

Mr. Chairman, I came specifically to answer certain questions of law that were presented to our engineer, Mr. Matthew, particularly by Senator Anderson and Senator Kerr. I very much regret they are not present this morning. In fact, under the circumstances unless I have the opportunity to discuss the situation with them personally I may ask for leave to present some material when those Senators are present.

The CHAIRMAN. Off the record.

(Discussion off the record.)

Mr. HOWARD. Further identifying myself, Mr. Chairman, and indicating my reason for interest in the matter, I call your attention to the map on the wall and the green areas spotted along the coast all the way from Burbank and Santa Monica, down through Los Angeles, Compton, Long Beach, to the Laguna Beach area, Oceanside, and San Diego. Those green areas which lie west of the mountain range are parts of the Metropolitan Water District of Southern California. That is a public and municipal corporation, incorporated under State law for the specific purpose of importing water from the Colorado River to the coastal area of southern California.

It has a population of, roughly 3½ million people and an assessed valuation running to about $3,000,000,000.

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The local water supplies and the Owens Valley Supply are becoming exhausted.

The CHAIRMAN. What were those supplies?

Mr. HOWARD. The ground water supply in the area and the Owens Valley supply which is imported to the city of Los Angeles.

The CHAIRMAN. What is the source of the ground water supply?

Mr. HOWARD. The rainfall and run-off from the mountains in the local area. That is, the mountain ranges there produce a certain amount of the run-off. The valleys consist in large part of detrital material which, in the course of the ages, has filled up with ground water but that water has been overdrawn to the danger point.

In many of the coastal areas it has been drawn down so far as to invite salt water intrusion into the valley.

The CHAIRMAN. What is the ground-water level now?

Mr. HOWARD. That question could not be answered specifically, Senator, because it varies in the different areas. The area is made up of a great many ground-water basins and it is at various depths in various local basins. No specific answer to your question could be given.

As a typical basin and one that I happen to be very familiar with there in the Pasadena area, bounded on the south by that escarpment that runs through Raymond Hill, the Huntington Hotel and on out to the east, the levels have dropped from the surface where they used to be, what we call in the West, cienegas, that is, little swamp areas, down to depths of 150 feet and greater than that.

As these basins are drawn down the surface area of the ground-water storage diminishes so that for each foot you go down it results in less production of water.

In any event, the population that can be sustained by those ground-water basins and by the importation of about 400 second-feet of water from the Owens Valley area for the city of Los Angeles will be somewhat less than that we now have there. The future growth of the area—and by the way, it is an extremely vital defense area—is dependent upon the importation of water.

I realize that in discussing the need of water we are merely echoing what our friends on the other side of the river in Arizona can say, that they also need water. We do not question that in the slightest degree.

The metropolitan water district was incorporated in 1928. The district made an estimate of the cost of imported water from the Colorado River and arrived at a figure of $220,000,000. That covers the cost of the construction of the aqueduct indicated by the heavy line across the center of the map, running from Lake Mathews, which is a regulating storage reservoir, over to the Colorado River in the vicinity of Parker. The aqueduct consists of a series of open canals, covered canals, siphons, and tunnels. I think the tunnels aggregate about 90 miles.

Then, after passing Lake Mathews there is a distributing system, the upper line running across the foothills where the words "Morris Dam" and "Pasadena" appear, with the feeder lines going down to the areas served.

The district serves water on a wholesale basis, the actual distribution being handled by the local agencies, the cities. The people of the district, in the year 1931, in response to a resolution of the governing

board of the district, approved a bond issue of $220,000,000 for the purpose of financing the construction of these works. The bonds were sold in the first instance to the Reconstruction Finance Corporation. I think everyone will recall that in the early thirties there was no municipal bond market. No one was buying the bonds of cities or municipal corporations.

In the summer of 1932—and I may say we had a little to do with it—the Reconstruction Finance Corporation was authorized to buy the bonds of self-liquidating public-works projects. The bonds, aggregating about $180,000,000, were sold to the Reconstruction Finance Corporation.

The CHAIRMAN. Mr. Howard, did you say, "We had little to do with it," or "a little to do with it"?

Mr. HOWARD. A little to do with it. I must confess that we had substantial influence in that, I hope.

The CHAIRMAN. That is what I thought.

Mr. HOWARD. At any rate, the Reconstruction Finance Corporation acquired the bonds and when later the general municipal bond market, that is, the public market, had been restored the Reconstruction Finance Corporation sold our bonds to syndicates—the Chase National Bank headed one of them—at a substantial profit. That is, the bonds at that time carried an average of 4 percent interest and carried sufficient premium so that the Reconstruction Finance Corporation made about $14,000,000 on the deal, which far from being a Federal subsidy has enabled the Government to make a small profit on its operation.

The district proceeded to enter into contracts with the Federal Government through the Bureau of Reclamation, pursuant to the Boulder Canyon Project Act, as to both water and power. First, because it is somewhat simpler, let me mention the power.

You will all recall that under the terms of the Boulder Canyon Project Act the Secretary of the Interior was not permitted to do any work, expend any money, or, in fact, the act was not to become operative for construction purposes until the Secretary of the Interior had in hand contracts with responsible agencies, providing sufficient revenue to retire the capital investment in the dam and power plant, within a period of 50 years, which will terminate in 1987.

The metropolitan water district, together with the city of Los Angeles and its department of water and power, and the Southern California Edison Co., three smaller municipalities and the California Electric Power Co. entered into such contracts, so that all of the firm energy output of the Boulder Canyon project is now sold. That sale includes rights in the secondary energy. The firm energy is specifically defined in figures and the rest of the energy is called secondary, that is, the less dependable energy. The contracting agencies have rights in that secondary energy so that the whole project, every kilowatt-hour produced there, is disposed of.

The States of Arizona and Nevada were accorded the privilege of withdrawing energy when they required it, a very valuable privilege because the California agencies underwrote the entire transaction. The States of Arizona and Nevada have the privilege, on certain prescribed notices, of cutting in and cutting out so that they have no permanent responsibility. But they do have the privilege of acquiring the energy as they need it, in which case primarily the city of

Los Angeles, or the Southern California Edison Co. has to yield to them.

Senator MALONE. Mr. Chairman, are we following the policy of the witness completing his testimony before we question him?

Mr. HOWARD. Mr. Chairman, if I may speak on that subject, having listened to some of the discussions here I think it would expedite matters if I were permitted to complete the statement. However, I yield to the practice of the committee.

The CHAIRMAN. We have taken no specific stand this morning.

Senator MALONE. I think it would be very helpful to the committee for us to understand what you mean by firm energy.

Mr. HOWARD. The regulations promulgated by the Secretary of the Interior at the time the Boulder Canyon Project Act was put into effect, contained a definition or limitation on firm energy in the amount of 4,330,000,000 kilowatt-hours per annum. That is subject to a fixed diminution—I do not recall the exact amount, something like 8,000,000 kilowatt-hours per year—because of anticipated upstream diversions and the resulting diminution of the water supply at Boulder. The rest of the energy is classified as secondary energy and when taken is paid for at a lesser rate than the firm energy.

Senator MALONE. How would you define firm energy, as distinguished from secondary energy?

Mr. HOWARD. The firm energy was arrived at, I think, by considering the dependable output of the power plant; that which might be there occasionally or during years of excessive run-off, but not dependable, is classified as secondary.

The secondary energy is sold at a much lesser rate and largely because the purchaser of secondary energy has—if I may use an engineering term—to firm up the secondary energy by steam supply so that they have a dependable supply of energy.

Senator MALONE. Now, does the return to the Government of the expenditure in the construction of Hoover Dam and the appurtenances, depend on the sale of this firm power, as distinguished from secondary power?

Mr. HOWARD. The calculations upon which the present rates are based make certain assumptions as to revenues from secondary energy. I can supply those figures. They all appear in the regulations and contracts but I haven't them in mind.

Senator MALONE. It is a relatively small amount in comparison with the firm energy?

Mr. HOWARD. Oh, yes.

Senator MALONE. To phrase my question perhaps a little differently, the firm energy is the dependent source of revenue to repay the cost of the dam and appurtenances?

Mr. HOWARD. That is the basic source of revenue, that is, the returns from the sale of firm energy. There is an allowance for returns from the sale of secondary energy. Also a small allowance for the returns to the Government for water storage.

Senator MALONE. At 25 cents an acre-foot?

Mr. HOWARD. Yes, sir.

Senator MALONE. Just one more question. In computing this firm energy does that take into account the computations presented the committee by Mr. Debler in reducing the amount of water in Lake Mead over a 20-year period, or over any period, as a matter of fact?

Mr. HOWARD. I was not present at those conferences.

Senator MALONE. I think it was figured on the 20-year basis.

Mr. HOWARD. There have been various assumptions made as to the possible draw-down on the river. You will recall that under the Colorado River compact the production of energy is subservient to irrigation and domestic use requirements.

Senator MALONE. That is true, but will you answer the question? In the production of that firm energy of 4,000,000,000 kilowatt-hours a year, was the capacity and content of the water in Lake Mead taken into consideration?

Mr. HOWARD. I am unable to answer that question specifically, Senator. I assume it was, but I wouldn't want to be specific.

Senator MALONE. How could it be taken into consideration with practically no power being developed at Lake Mead?

Mr. HOWARD. Well, I assume the power output was figured on the basis of the use of the reservoir for regulatory purposes and that all of those factors were taken into consideration. But, as I say, that is merely an assumption on my part. I would have to discuss the matter at some length with the engineers.

Resuming my statement, if the Senator has finished——

Senator MALONE. Yes.

Mr. HOWARD. The metropolitan water district undertook to buy and pay for, whether used or not, roughly one-third or, to be more specific, about 36 percent of the firm energy at the Hoover project. The balance was taken by the city of Los Angeles, its department of water power, Edison Co., and the other agencies.

We are fortunate enough now to have negotiated resale contracts so that the energy unused by the district is sold to the city and the Edison Co. primarily at cost, so that we do not have that burden of paying for unused energy, although for about 5 years we did have it, and we have paid in somewhere between 4 and 5 million dollars for energy which we were unable to consume.

At about the same time; that is, in the same period——

Senator Malone.

Senator MALONE. Do I understand that in California now you have an oversupply of electric energy?

Mr. HOWARD. Oh, no. We are not oversupplied with electric energy. I am speaking specifically of the metropolitan water district. Under the contract we made with the United States, we were limited in the use of energy to the pumping of water into and in the aqueduct, so that our consumption of energy depends upon the building up of our distribution of water.

Senator MALONE. You have had no trouble disposing of any surplus power at any time, have you?

Mr. HOWARD. We did have some trouble, but we succeeded in doing it. The troubles were more or less technical.

Senator MALONE. Did the troubles have anything to do with the demand for power? What I am trying to find out is whether there is a shortage of power or too much power in southern California.

Mr. HOWARD. There will be and is now a shortage; that is, we could use more hydro and conserve oil.

Senator MALONE. What date was this when you had this trouble?

Mr. HOWARD. It was in the forties, 1944 and 1945—in the period at the close of the war. At that time those who had the duty of com-

puting the requirements for power assumed that after the war was over there would be a sharp drop in the demand for energy. For that reason they were unwilling to buy the energy as freely as we thought they would. That forecast has proved false, and the demand for energy has gone up, so that, while we now are not short of energy—I say "we"; I am speaking of southern California, not the metropolitan water district. In southern California there are steam plants to provide energy that is not supplied by hydro. But that does not mean the city and the Edison Co. would not be looking for a sound hydroelectric project.

Senator MALONE. To clear this up without any deviation from the main theme, are you familiar with the testimony presented by both the Southern California Edison Co. representatives and the bureau of power and light in Las Vegas a couple of years ago, when they refused to relinquish any power to Nevada except under about a 5-mill rate, and the power they were getting at 2 mills at the switchboard, under the theory they had it under their technical contract until a certain notice was given and they were short of power.

Mr. HOWARD. I was not present at those conferences and have not read the record of them.

Senator MALONE. Well, as a matter of fact, are you not familiar with the fact that they are short of power and have been for 3 years down there?

Mr. HOWARD. I will say that we are short of power.

Senator MALONE. Yes; that is enough.

Mr. HOWARD. If that is the object of the question.

Senator MALONE. That is the object of the question.

The CHAIRMAN. Mr. Howard, you observe that Senator Anderson is here, so you may proceed to answer the questions which he propounded.

Mr. HOWARD. If I may further outline our relationship, that is, the metropolitan water district's relationship to the problem.

In 1928, when the district was incorporated, there were existing and had been existing for a long time agricultural uses on the Colorado River in the area known as the Palo Verde irrigation district. I think that is the oldest right on the river, and in the Imperial irrigation district, and the Coachella area. Those priorities were of long standing.

When the time came to negotiate water-delivery contracts with the Secretary of the Interior, the Secretary insisted that the California agencies agree among themselves upon a scale of priorities. By reason of the fact that the agricultural interests had long-established priorities, the metropolitan water district accepted a junior position, so that the first three priorities went to the Palo Verde area, the Imperial area, Coachella, and the Yuma area in California—there is a Yuma area in California and one in Arizona. Those priorities aggregated by agreement 3,850,000 acre-feet per annum. So the district is bound by an agreement, a seven-party priority agreement among California agencies, which puts the district into the fourth and fifth priorities, junior to the 3,850,000 of agricultral priority.

There is a sixth priority beyond the district's fourth and fifth, which is 300,000 acre-feet for agricultural purposes in those same areas. That 300,000 acre-feet is included in the total of 5,362,000 acre-feet.

Senator MILLER. What period of time does that 3,000,000 acre-feet cover that you are speaking of?

Mr. HOWARD. That is based on the annual use, 3,850,000 acre-feet per annum. I should have said that.

Senator MILLER. In other words, you are operating under an entirely different system there than most of the arid States with respect to the measurement of water, where they use exclusively the second-foot?

Mr. HOWARD. We use the second-foot measurement, which is a rate of flow, and the acre-foot measurement, which is a measure of quantity. That is, an acre-foot is just 1 acre 1 foot in depth. The second-foot is a rate.

Senator MILLER. I am merely interested in the period of time in which you got this 3,000,000-plus that you mentioned.

Mr. HOWARD. Well, being in the exposed position, you can readily understand the metropolitan water district's interest in protecting the California rights in the Colorado River. If, by any chance, the Arizona computations should be found to be accurate and their theory of interpretation accurate, they would scale the California water down to about 3,900,000 acre-feet, which would leave about 50,000 acre-feet beyond the conceded agricultural priorities on the California side and virtually leave no water for the district's works.

There has been some suggestion here which indicated a certain lack of equity on the part of California. I would like to say this: At the time we made our water-delivery contract with the Secretary of the Interior, which was completed in 1931, there was no difference of opinion between the people of Arizona and the people of California as to the two major points that are now in controversy. Those two points, which will be elaborated on in later testimony, relate to the status of the III (b) water; that is, the water apportioned or the water described in article III (b) of the Colorado River Compact. There was no quarrel about that. Our views were identical.

Senator ANDERSON. What were those views?

Mr. HOWARD. That California had not, by the terms of the California Limitation Act, renounced its right to participate in the use of the water mentioned in article III (b) of the compact. That makes a very substantial difference in the availability of water to California.

Senator ANDERSON. Do you have anything written from Arizona where they agreed to that?

Mr. HOWARD. Yes. I will say, Senator Anderson, and to the chairman and the committee, that one of my associates, Mr. Ely, has prepared a very detailed, accurate, and scholarly treatment of the whole subject of the controversy between the States. That will be presented to the committee in due course.

I would really prefer that Mr. Ely be given the opportunity to make his statement on those points.

Senator MCFARLAND. Mr. Chairman, I do not want to interrupt the witness, but I think this is more a presentation of legal matters which can be met in a more orderly manner, probably, by replies. I just want to state that Mr. Howard's view is not our understanding at all, and we do not agree with the statement made by the witness—never have agreed with it. The records will show the understanding was different when the Boulder Canyon Project Act was passed.

Mr. HOWARD. In response to Senator McFarland's statement, I will say that, at the time Arizona attempted to have the Colorado River Compact and the Boulder Canyon Project Act declared unconstitutional, the allegations of their bill and the brief in support of the bill took the clean-cut position which is exactly in accordance with the position we now take, that the III (b) water was not apportioned water, from which it would follow that the California Limitation Act does not renounce claim to it.

Mr. Ely will follow that up and show you the exact text of the various documents to support that statement.

That occurred at about the same time, contemporaneously with the making of our water delivery contracts, so that at that time we had no reason to suppose there was any difference of opinion on that point or any reason to suppose we would not participate in the water described in article III (b) of the compact.

Also, the matter of consumptive use was treated at that time very much in the manner that we want to treat it now. There has been a complete shift in the Arizona position since that day.

When we made our contracts, we were relying upon the contemporary interpretation of the documents, which can be fully substantiated by the record and will be fully substantiated.

I want to turn now specifically to the Colorado River compact and try to correct an impression that seems to have developed. Let me say in general that the Colorado River compact does not divide water in terms of supply. It does not divide virgin flow of the river or reconstructed virgin flow. Those words do not appear in any way in the compact.

The water is divided not on the basis of supply but on the basis of use.

You will note in article III (a) of the compact—the volume I have before me is The Hoover Dam Documents, published as a House document, I think. Yes; House Document No. 717 of the Eightieth Congress, second session.

Senator MILLER. What are you reading from?

Mr. HOWARD. I was trying to locate the compact. The compact, in article III (a) says this——

Senator DOWNEY. What page is that?

Mr. HOWARD. I am reading from page A19:

> There is hereby apportioned from the Colorado River system in perpetuity to the upper basin and to the lower basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may not exist.

Senator MALONE. Mr. Chairman, I do not like to interrupt the witness, but I listened very carefully to Mr. Nielsen's testimony. It seems this consumptive-use term has been ruled out. What does the witness understand about consumptive-use?

Mr. HOWARD. I accept the definition that was before the Congress when the Boulder Canyon Project Act was passed, in Senator Malone's paper—I think it was Senate Document 186; is that correct?

Senator MALONE. I think so.

Mr. HOWARD. And also the definition which was similarly before the Congress in Delph Carpenter's report. He was a commissioner from the State of Colorado and made a report to his State government which was published in full in the record. That definition might be

epitomized by saying, "diversions less returns to the river measured at the site of the use." The Carpenter statement is slightly more elaborate than that, but that is the effect of it. I think that is also the effect of the definition used in Senator Malone's and the State engineer's documents.

Senator MALONE. You then still understand there is such a term as consumptive use to indicate that water is completely utilized and not available for any other use at any other time?

Mr. HOWARD. That is right. We have been misquoted to a degree by saying that we are adding up reuses in doing that. That is not the case. What we are doing is adding up the losses. That is, water is diverted for use on a project, some of it is transpired through the foliage, some of it lost by evaporation, and some of it works its way back to the source of supply. The return to the river is deducted from the diversion, the result being the consumptive use.

I think it is the water, as Mr. Tipton put it, that is burned up in the process of irrigation.

Senator MILLER. Could it be a consumptive use without a beneficial use?

Mr. HOWARD. I do not think so, Senator. In my conception of it the word "use" implies the actual use of water under direction. There is loss of water through plant growth and one thing and another, but I have never been able to classify that as use. It seems to me when you say a "consumptive use," you mean a directed operation which results in the loss of water. The natural loss through meadowlands, deep seepage, and evaporation, which existed in the state of nature, would not be considered consumptive use or beneficial consumptive use.

The CHAIRMAN. As a matter of fact, Mr. Howard, is that not the opinion of the Supreme Court? Is not that the definition?

Mr. HOWARD. I think that is the definition used in *Nebraska* v. *Wyoming*.

The CHAIRMAN. That is right.

Mr. HOWARD. In which they said consumptive use meant diversions less returns to the river.

The CHAIRMAN. It takes no account of natural plant use?

Mr. HOWARD. I think that is correct.

The point I am trying to impress upon the members of the committee now is that the apportionment of the water was in terms of beneficial consumptive use at the site of the various uses. Now, in that we differ very radically from our friends on the Arizona side. They use a theory that has been invented relatively recently; that is, the so-called depletion theory. They are attempting to make this apportionment of water not an apportionment of use, but an apportionment of main-stream depletions. That is exactly what the compact framers sought to avoid.

In the main, in the computations that appear in the minutes of the compact commission, consumptive use was ordinarily the result of assuming a duty of water, that is, the net duty of water, diversions less returns to the river, on certain acreage and multiplying the acreage by the duty of water; then putting that down as consumptive use. Those tables appear repeatedly in the proceedings of the commission.

Senator MALONE. The committee you referred to, was that the original committee in 1922?

Mr. HOWARD. That is correct. The 1922 Colorado River Commission that negotiated the compact.

Senator MALONE. That negotiated the compact and adopted the compact, the one you have just referred to?

Mr. HOWARD. Yes. It happens that during the early stages of the negotiations there was a compact presented to the commission for consideration which did merely divide the main-stream water at Lee Ferry. But that was discarded and the idea of apportioning use developed.

Senator ANDERSON. You mean they discarded the theory of dividing the water of the canyon?

Mr. HOWARD. Yes; just the wet water in the river.

Senator ANDERSON. Would you be interested in reading President Hoover's statement? It is on page 19 or 20, in which he said precisely what they did do was to divide the water in the canyon. Let me have it, please, I can find it easily.

The CHAIRMAN. It is on page A34. Let me read it into the record. This is in the analysis of the compact by President Hoover.

Question 5. Why is the basis of division changed from the "Colorado River system" to the "river at Lee Ferry" in paragraph (d) of article III, the period of time extended to 10 years, and the number of acre-feet multiplied by 10?

(a) I do not think there is any change in the basis of division as the result of the difference in language in articles III (a) and III (b). The two mean the same. By reference to article II (f) it will be seen that Lee Ferry, referred to in III (d), is the determining point in the creation of the two basins specified in III (a). The use of this term makes it plain that the 75,000,000 are to be delivered in the main channel of the river above the various tributaries which contribute water below.

I think that is a very important remark. Then he goes on to paragraph (b):

The agreement as to the flow of 75,000,000 acre-feet at Lee Ferry during each 10-year period fixes a definite quantity of water which must pass that point. Under III (a) each basin is entitled to the use of 7,500,000 acre-feet annually. Judging by past records there will always be sufficient flow in the river to supply these quantities, but in the improbable event of a deficiency, the lower basin has the first call on the water up to a total use of 75,000,000 acre-feet each 10 years. While there was in the commission a firm belief that no such shortage will ever occur, still this provision was adopted as a matter of caution. The period of 10 years was fixed as a basis of measurement, as being long enough to allow equalization between years of high and low flow, and as representing a basis fair to both divisions.

Mr. HOWARD. May I inquire, is that the statement the Senator referred to?

Senator ANDERSON. No. I wanted to read from page 22. I was a page off. This is in the volume entitled "The Hoover Dam Documents," by Wilbur and Ely. This is the 1948 edition of it. This is Mr. Hoover speaking:

The major legal dispute lies between the upper and lower basins. Indeed, all the problems very naturally divided themselves into the two parts, that is, into the two basins of the river separated by the canyon. The character of agriculture, industry, and the engineering problems in the two basins are of widely different nature, and it became the natural and logical thing to divide the Colorado River into two parts at the canyon, and to assign to each part a certain portion of the flow of the river permanently, and to develop the two basins as two separate principalities.

It is because of that last statement, "to develop the two basins as two separate principalities," that some of us in the upper basin are dis-

turbed over the fact that there is development in California, development in Arizona, 300,000 acre-feet to Nevada, but not one structure and not one diversion, not one storage dam, not one thing done in any of the upper basin States; no attempt to develop the upper basin principality in a separate fashion.

Senator MALONE. Mr. Chairman, in line with that statement it might be of interest to the committee to say that the opposition of the upper basin States to the construction of Boulder Dam in the first instance sprung from the fact that the lower lands, with the longer growing season, naturally could be developed first if the water was available. The water was not available to go any farther than the lower lands could develop with the natural flow there, without any storage.

The Colorado River would go down to as low as 3,000 second-feet and 1,500 second-feet in the late summer. They would be very short of water for the lands that were under cultivation in the Imperial Valley and Yuma.

It was recognized by the upper basin States—I have not documented this data that I am repeating from memory—that if they allowed Boulder Dam to be constructed as a regulatory reservoir then the water would be available below to be used—some thought practically all the water in the river.

So until such a provision was made and documented, such as the Colorado River Compact Act, violent opposition to any lower basin storage was entered, and properly so, I think.

Delph Carpenter at that time was very active and was one of the best attorneys on water law that I have ever seen. He was the chief defender of the upper basin. They rallied around Delph Carpenter. So as soon as this document was signed by enough States—six States finally; that is all a matter of record—then they felt safe to allow anything in the lower basin, that is, a construction like Boulder Dam. They then went along with us in the construction of Boulder Dam.

Many things have happened since then. We thought just a reasonable amount of money per acre in Nevada, New Mexico, Arizona, and various other States would be the limit of expenditure. Now we have come up to over $2,000 an acre in expenditure for water for irrigation, which makes an entirely different situation in all of the States.

Also, one other thing has happened. The precedent was set in the upper basin for transmountain diversions in the State of Colorado. It was a considerable amount of water. It is not necessary to know the amount at the moment, but it was a considerable amount of water. They opened up a very interesting field. There is no limit now, practically, for domestic water cost, and irrigation water, too, with the food supply getting shorter.

So, instead of the situation Mr. Hoover so aptly outlined with the information at his disposal at that moment, that there probably never would be any shortage of water at Lee Ferry, I believe if Mr. Hoover were called as a witness now in the light of later events he would say there is every likelihood that the upper basin will not only use all the water allocated to them but could use, 25, 30, or more years from now, much more than is allocated.

We are discussing the matter of water division in the light of a lot more information than I had when we documented the information

in 1927, and that Mr. Hoover had in 1922. I think that will all come out as we go along.

Mr. HOWARD. Commenting first on the response to question No. 5, appearing on page A34 of the Hoover Dam Documents, which the chairman read, that refers to paragraph (d) of article III of the contract, and not to paragraph (a), which I was considering.

I want to comment later on this 75,000,000 acre-feet every 10-year period, but for the moment I was confining my statement to the meaning of paragraph (a) of article III.

I do not think there is any difference of opinion between Senator Anderson and myself as to the fact that using Lee Ferry as a division point, the areas were divided into, to quote Mr. Hoover, "two principalities," having different climates, different agriculture, and a different economy in general.

Senator ANDERSON. Do you find yourself in agreement with the statement Mr. Matthew made the other day that the upper basin States could never claim more than 7,500,000 acre-feet a year, and that all the rest of the water belonged to California and Arizona?

Mr. HOWARD. No; that was not correct.

Senator MALONE. And Nevada?

Senator ANDERSON. No; he did not specifically bring you in, Senator.

Senator MALONE. Then we are still outside.

Mr. HOWARD. Senator O'Mahoney asked several of the witnesses about the use of that surplus and I want to comment on that later. I do not agree with the statement that was attributed to Mr. Matthew.

Senator ANDERSON. It is not just attributed to him, it will be in the record.

Mr. HOWARD. I was not present when that statement was made.

The point I am trying to emphasize now is that in these two principalities the flow of the river was divided in terms of use, not in terms of reconstructed virgin flow. That, I think, summarizes the thought I am attempting to convey. I realize fully there is an upper and lower basin with a division point at Lee Ferry and there is another covenant which relates to water at Lee Ferry, wet water in the river.

But I am speaking now of the apportionment in article III (a) of the compact, which is in terms of beneficial consumptive use. There is a difference of opinion as to what that term means and one which, I am very sure, will have to be settled by judicial action. We are willing to take our chances on that because I think the record is with us.

Senator MALONE. Mr. Chairman, there is one other point that might have to be made at this time, if I am correct, and that is that the Colorado River compact, regardless of any interpretation put upon it by Mr. Hoover or Delph Carpenter, who wrote the compact—and if my memory serves me correctly there never was any amendment to the compact, is that correct?

Mr. HOWARD. Well, in a minor particular that is not correct. I think as to navigation the Congress did change the effect of the compact.

Senator MALONE. But as to the division of water there was no change?

Mr. HOWARD. Not after it was signed.

Senator MALONE. The chairman being an attorney could help us with that. It could take on the complexion of a mortgage, a deed,

or anything, regardless of what they thought they were signing. It will take the interpretation of the Supreme Court or a court of competent jurisdiction to determine what the compact actually means. Is that about the way it is understood?

Mr. HOWARD. It will be governed by the ordinary rules of contract interpretation. Without enumerating them they all shoot at the question: What did the parties mean at the time they signed the document? How did they interpret the words used at that time and what did they mean by them at that time? Not what did somebody else mean later.

Senator MALONE. Yes; let us clear that up while we are on it. If they signed something which clearly means something other than what one or two members thought, such as a State engineer or the chairman of a current committee, then it will depend upon the Supreme Court or other court of competent jurisdiction, once the question is raised and in court. Is that true?

Mr. HOWARD. That is correct. There are various well-established rules of contract interpretation.

Senator MALONE. Would that not be true if it were simply a matter of interpretation of words?

Mr. HOWARD. If there is any doubt about what those words mean, they could look into collateral matters as to just how they were used. They may have been used in a confined sense in some cases and in a popular sense in other cases. But the primary rule of a compact interpretation—and a compact is a contract—is to ascertain the intent of the parties at the time they made the deal.

Senator MALONE. Is this a matter of fact that that is only one factor in the interpretation of the compact?

Mr. HOWARD. It is the primary factor, the ascertainment of the meaning of the parties. Of course, the words they use are the primary indication of their intent.

Senator MALONE. That is true. But, if we disagree here as to what the compact means, then we go back to see what they thought they meant. But if it is a clear compact—that is, if it was signed and they did not word it to mean what they thought it meant—the Supreme Court might put any interpretation on it that they thought the compact meant. Is that correct?

Mr. HOWARD. They would attempt to ascertain what the contract meant to the parties who signed it as of that time.

Senator MALONE. Seven of them signed it. Let us pursue that a little further——

Mr. HOWARD. Only six.

Senator MALONE. No; there were seven, and one later withdrew. I will give you the names.

Mr. HOWARD. You are correct, sir; pardon me.

Senator MALONE. Later Arizona withdrew and did not approve the compact through its legislature. But its representative signed at that time, and his name was Norviel, I believe. To go just a little further; I am not trying to confuse you but I am trying to bring out the fact that what Norviel thought he was signing at the time would perhaps have just as much to do with an interpretation as what Mr. Hoover thought he was signing, and he did not sign it at all. He was simply the chairman.

Senator ANDERSON. I think he did sign it.

Senator MALONE. He may have signed it as chairman, but he had nothing to do with the States making the compact legal. He was simply acting as chairman in a neutral capacity.

Mr. HOWARD. If we may accept what the Supreme Court says as the law, the matters discussed by the committee that wrote the document would have no bearing on the proposition. You are correct in saying that the document was signed by representatives of the seven States. However, until 1944, when a purported ratification of the document occurred in Arizona, six of the States ratified it.

In the case which was brought by Arizona for a bill to perpetuate testimony, the Supreme Court held that what was said and done at Santa Fe, N. Mex., and in the preceding conferences would not be material in interpretation because the compact derived its life from the action of the State legislatures and of the United States in consenting to the contract, and it is only those matters which were before those State legislatures that would be pertinent or material in interpreting the compact document.

Senator MALONE. That was exactly my point. In other words, the State Legislature of Nevada ratified the compact. I think we could dig up the debate and the testimony at that time. Mr. J. G. Scrugham, who was later a Congressman and a United States Senator from Nevada, was one of the original signers. Whatever he said to the legislature in his report and whatever Frank C. Emerson said to the State of Wyoming Legislature, R. E. Caldwell for the State of Utah; Stephen B. Davis, Jr., for the State of New Mexico; Delph E. Carpenter for the State of Colorado, and W. F. McClure for the State of California, plus W. S. Norviel for the State of Arizona, would have just as much—and probably a lot more—weight than what Mr. Hoover said; is that true?

Mr. HOWARD. Yes. Mr. Hoover made some very valuable contributions in his replies to Senator Hayden. In fact, we ourselves quote them now and again in support of this and that phase of the dispute.

But, when you come right down to it, it is what the legislatures of the ratifying States meant at the time they ratified. We might include in that what the Congress understood as of the time the Congress consented to the compact.

Senator MALONE. Then nothing that Mr. Hoover said would take precedence over what Mr. Norviel reported to the State Legislature of Arizona, as a matter of fact?

Mr. HOWARD. No. I do not recall at the moment, but I think Mr. Norviel's report was not before the Congress at the time the compact was consented to. I was thinking of your comment on Mr. Hoover's statement.

Mr. Hoover's answers to Senator Hayden—then a Member of the House—were before the Congress at the time the Congress consented to the compact and hence might have some bearing on interpretation. But it would be merely one of the many factors which would be used in the compact interpretation.

Senator MALONE. That was my first question. Thank you.

Mr. HOWARD. It would be one of many factors.

The CHAIRMAN. Now, Mr. Howard, if you will proceed to answer the questions for which you were called here this morning.

Mr. HOWARD. Yes.

Senator MALONE. I think, Mr. Chairman, this is very important. It is the insinuation of the chairman that we were getting off the subject.

The CHAIRMAN. I beg the Senator's pardon; there is no insinuation at all. I am merely asking this witness to proceed now to a discussion of the specific questions for which he was called here this morning.

Senator MALONE. I think he was called for the specific purpose of interpreting what he thinks was the intent of the compact. He is a lawyer and he is here for that purpose.

The CHAIRMAN. There were certain questions raised by Senator Anderson and by Senator Kerr, as to which Senator Downey asked the permission of the committee to have Mr. Howard respond.

Senator MALONE. I have since asked a question, and I hoped it would be accorded equal weight. He has answered it.

The CHAIRMAN. Of course.

Senator MALONE. Thank you.

The CHAIRMAN. There is no objection to that. I am merely asking him now to proceed to these others.

Senator MALONE. Thank you.

Mr. HOWARD. May I answer the questions the chairman suggests—one asked by the chairman himself—as to our views of the status of surplus water and its availability to the Upper Basin States?

Because I believe it is true, and not particularly because Mr. Hoover said it, I want to quote what Mr. Hoover said on that point in this same series of questions.

Senator MALONE. We all recognize the standing in the engineering profession of Mr. Hoover. I defer to him as having much more experience than anyone in this room.

Mr. HOWARD. Question 10, which appears on page A36 of the Hoover Dam Documents which have been referred to heretofore, contains a statement which rather succinctly, I believe, states the status of surplus water. I will not read the question, but paragraph (b) in the answer says this:

> The right to the use of unapportioned or surplus water is not covered by the compact.

That, to my mind, means it is entirely outside the compact except as the compact refers to possible subsequent possible treatment in 1963. Going on with the quotation:

> The question cannot arise until all the waters apportioned are appropriated and used, and this will not be until after the lapse of a long period of time, perhaps 75 years. Assuming that each basin should reach the limit of its allotment and there should still be water unapportioned, in my opinion, such water could be taken and used in either basin under the ordinary rules governing appropriations, and such appropriations would doubtless receive formal recognition by the commission at the end of the 40-year period.

He there refers to the 1963 time when the additional apportionment of surplus may be considered by the States. Mr. Hoover might well have added there that such appropriations of surplus would no doubt be recognized by the Supreme Court in the event the States were unable to agree on additional apportionment and sought additional equitable apportionment in the Supreme Court.

I think the appropriations would receive the same recognition that they received in *Wyoming* v. *Colorado*, one of the earliest cases on that point.

The CHAIRMAN. Does that mean you agree that, in the event there are unapportioned surplus waters in the upper basin for which the upper-basin States may make use for domestic purposes or for irrigation purposes, such waters may be used in the upper-basin States above the 7,500,000 acre-feet of apportioned water annually, and 75,000,000 acre-feet of apportioned water in any 10-year period; provided, of course, that no prior use has been established elsewhere?

Mr. HOWARD. I would like to delete from the question the reference to the 75,000,000 acre-feet every 10-year period. I think that has nothing to do with apportionment or surplus. That is a separate covenant. Otherwise I think the chairman's statement is in accordance with my views.

The CHAIRMAN. I asked the question because, as I understood the colloquy here the other day, some doubt had been raised in the minds of some of us around here that there was an intention on the part of some in the lower basin to limit the upper-basin States, in any and all events, to 7,500,000 acre-feet. Now, if that is not the meaning of Mr. Hoover's answer, then I take it it is not the meaning of your answer.

Mr. HOWARD. You are quite correct. I think it is entirely clear from a reading of the document that the unapportioned water was left entirely free; that is, it is unrestricted by the compact. And, while the compact has the effect of cutting across our western law of appropriation to the extent that it operates, it does not cut across the law of appropriation beyond the limits of its treatment of the use of water.

The CHAIRMAN. So that there is nothing in this controversy, the solution of which you are asking of the Supreme Court, which affects the rights of the upper-basin States to this type of water?

Mr. HOWARD. Oh, you are quite correct in that; yes.

Mr. Hoover goes on in his statement:

> There is certainly nothing in the compact which requires any water whatever to run unused to Mexico, or which recognizes any Mexican rights, the only reference to that situation being the expression of the realization that some such rights may perhaps in the future be established by treaty.

They since have.

The reason I read that is to indicate that Mr. Hoover thought, as I now believe, that there is nothing in the compact which would require the upper basin or the lower basin to permit excess and surplus water to flow unused to Mexico. Of course, we are bound to satisfy the Mexican treaty, but other than that I do not believe we are in any way restricted when either basin gets up to the point of using its apportioned water.

The effect of the apportionment, sir, is that the upper basin is fully protected in its future development up to 7,500,000 acre-feet of beneficial consumptive use, whether it uses that water or does not use it. It could let a hundred years go by and it would still have the right to claim that water. Beyond that point its right would depend upon appropriation. All of the waters used within the 7,500,000 acre-feet would be considered within its apportionment until it reached that time, and then it would go into the field of appropriation.

The CHAIRMAN. That is the position California takes with respect to the upper basin?

Mr. HOWARD. I think that is the official California position.

The CHAIRMAN. The other question, then, has to do with the 1,000,000 acre-feet set forth in III (b)?

Mr. HOWARD. Yes. The status of that particular water is in controversy. I do not think that question was specifically asked of any of the witnesses here. Mr. Ely is going to treat of that subject in considerable detail with all the documentary material. If consistent with the chairman's views, I would like to take up the status of the 75,000,000 acre-feet.

The CHAIRMAN. Very well.

Mr. HOWARD. You will notice that is a separate covenant. That is to say, III (a) treats of the apportionment in terms of use. There is an entirely separate covenant which appears in paragraph (d) of article III, in which the States of the upper division—a term which is not synonymous with upper basin—the States of the upper division are by definition the States of Colorado, Wyoming, Utah, and New Mexico. Arizona, while it is to a small degree part of the upper basin, is not considered a State of the upper division.

The States of the upper division—not the upper basin—covenant that they shall not deplete the flow of the Colorado River at Lee Ferry to a point below 75,000,000 acre-feet every 10-year period, reckoned in a continuing progressive series. That is a covenant which was put in as a protective covenant. It does not relate to apportionment. That water is not apportioned water. It is merely an additional and protective covenant which goes to assure the lower basin of at least that much contribution, regardless of upper basin use.

And I take it this would be the case: The more restrictive covenant would control. That is, let us assume for the moment the water supply is such that the upper basin can only use, for a figure we will say 6,000,000 acre-feet per year, and still make the required delivery. Then the required delivery would control over the beneficial consumptive use in the upper basin.

On the other hand, as a result of the opinion expressed a few minutes ago, if there is ample water up there and the 75,000,000 acre-feet can be provided and still leave not only the 7,500,000 but excess and surplus available for appropriation, that could be done.

The covenant is not in terms of use, as is the case with III (a). It is in terms of water flowing in the river at a given point, which is an entirely different thing.

Senator ANDERSON. What difference is there between the 7,500,000 acre-feet per year, plus a million acre-feet per year, totaling 8,500,000, and this 75,000,000 every 10 years? What difference is there in feet or measurement? What difference is there in the kind of water?

Mr. HOWARD. The aggregate of 8,500,000 acre-feet referred to in paragraphs (a) and (b) of article III are determined in terms of use in the lower basin. The 75,000,000 every 10-year period is water flowing in the river at a certain point.

Now, there is a perfectly natural tendency—we have seen it time and again—for anyone picking up this document to immediately identify, say 75,000,000 acre-feet to be delivered at Lee Ferry every 10-year period. Well, one-tenth of that is 7,500,000 acre-feet. Therefore the assumption is, by a casual or even some thoughtful readers, that the apportionment to the lower basin in article III (a) is identical with the delivery of water guaranteed by the upper basin at Lee Ferry.

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Senator ANDERSON. As a matter of fact, it was arrived at in exactly that way, was it not?

Mr. HOWARD. No.

Senator ANDERSON. Oh, it was not?

Mr. HOWARD. No. Now let me get to the nut of that.

Senator ANDERSON. In the compact at Santa Fe and the discussions at Santa Fe, it was not arrived at in that way?

Mr. HOWARD. No. Let me illustrate how that cannot be.

Senator ANDERSON. How it cannot be?

Mr. HOWARD. How it cannot be. The lower basin consists of the main stream running from Lee Ferry down to the international boundary. There are tributary to that river between those points certain other streams. There are the Virgin, the Muddy, the Bill Williams, and primarily the Gila. All of those streams by definition are part of the Colorado River system. Water is used from all of them. So that that 7,500,000 acre-feet of consumptive use in the lower basin would include uses on the Gila, however, they are measured—and that water never passes Lee Ferry; uses on the Bill Williams, however they are measured—and that water never passes Lee Ferry, and so on up the stream.

So that the beneficial consumptive use permitted on the Colorado River system in the lower basin involves water which never passes Lee Ferry.

Senator ANDERSON. That is true but what they were doing in the basin, as I have always understood it, was what Mr. Hoover apparently understood, that they were dividing it into two principalities. The upper basin States were to be allowed to use 7,500,000 acre-feet. In arriving at the amount that was going to flow by Lee Ferry, instead of saying they had to deliver that exact amount every year they gave them a 10-year period to balance it out they multiply the 7,500,000 acre-feet to be used in the upper-basin States by 10 and said they should deliver that every 10 years to the lower-basin States, which ignored completely this matter of tributaries.

They are not dealing with the water in the lower basin, they are dealing with how much the upper basin could use and trying to make the same amount deliverable at Lee Ferry. So they multiplied it by 10.

That is theory, of course, but I think we have just as much right to take that as theory as for you to say it was not even considered, that it was just a figure they pulled out of thin air and said, "this much should be delivered." I cannot subscribe to that at all.

Mr. HOWARD. It was not pulled out of thin air.

Senator ANDERSON. Where did it come from then?

Mr. HOWARD. I never suggested that.

Senator ANDERSON. Then where did it come from?

Mr. HOWARD. The thing I am trying to get over is that I am talking about the lower basin.

Senator ANDERSON. I am talking about the upper basin.

Mr. HOWARD. All right, we will talk about the upper basin, then. The upper basin's beneficial consumptive use of water was considered, roughly, we would say, 50 percent of the average flow at Lee Ferry. To that extent the theory is applicable. There were various figures mentioned in those negotiations—75,000,000 was finally hit upon as

the guaranteed delivery, but other figures were mentioned. It might have been 80,000,000 or 60,000,000, but they finally settled on 75,000,000.

The point I am trying to clear up is that the tendency to identify the lower-basin apportionment, that is, the beneficial consumptive use in the lower basin, with the amount of water delivered at Lee Ferry, cannot possibly be correct because the apportionment in the lower basin is in terms of consumptive use on all of the tributaries.

The water at Lee Ferry includes water that is destined for use under (a), under (b). It includes excess and surplus. It includes water which, as long as the surplus is sufficient, would go to satisfy the Mexican burden. In the event the surplus is not sufficient the 75,000,000 would have to be increased under the terms of the compact.

But that water is not entirely water destined for a consumptive use under article III (a) of the compact and that is clear on the face of the document. There are other waters involved in that 75,000,000 acre-feet than the waters in the lower-basin apportionment under article III (a).

There are also waters in the river system below that point which are charged against the lower basin and should be charged against the lower basin, that never pass Lee Ferry at all. They originate in tributaries below that point.

Senator ANDERSON. Is this water that passes Lee Ferry measured on some different basis than 7,500,000 acre-feet to the upper-basin States?

Mr. HOWARD. Yes.

Senator ANDERSON. It is a wholly different measurement?

Mr. HOWARD. Yes. The apportionment to the upper basin States is measured in terms of beneficial consumptive use. There is a dispute as to what that means but it is measured in terms of use. The water guaranteed at Lee Ferry is water flowing in the stream measured by a gage. That is an entirely different basis of measurement. It is an entirely separate covenant and the confusion that results in identifying that delivery at Lee Ferry with the apportionment of the lower basin results in no end of misunderstandings and misconceptions of what this compact means.

Senator DOWNEY. Mr. Chairman, I wonder if Senator Anderson would let me ask one question to develop his line of thinking. Is it not true, Mr. Howard, that in order to have available 7,500,000 acre-feet of consumptive use in the lower basin you physically would require more than 7,500,000 acre-feet of physical water to accomplish that?

Mr. HOWARD. Oh, yes, yes.

Senator DOWNEY. Because you are bound, of course, to have losses?

Senator ANDERSON. Both above and below Lee Ferry?

Mr. HOWARD. No, below Lee Ferry.

Senator ANDERSON. Just below?

Mr. HOWARD. Primarily below. We are getting into a very involved mathematical computation here. The thing I particularly wanted Senator Anderson to understand—and if he does not I am willing to devote all the necessary time to it—is to get the idea across that the two covenants with respect to the lower basin, the one relating to beneficial consumptive use and the covenant on the part of the upper basin to deliver 75,000,000 acre-feet every 10 years at Lee Ferry, are

not identical. That is, they do not refer to the same type of measurement, they do not refer to the same water.

There is water included in that 75,000,000 acre-feet that is not apportioned water and there is a great deal of apportioned water that never passes Lee Ferry. So the two just do not fit together.

Senator ANDERSON. I can realize they may not dovetail all the way through but I do think it is a little significant that in the first attempt to sign the compact they decided there would be 7,500,000 acre-feet above and 7,500,000 acre-feet below. We all know that 1,000,000 acre-feet written in III (b) was written in subsequently because Arizona held out and protested and insisted upon an extra million feet.

We hear stories as to what is inscribed on a photograph out in Arizona, but never mind that. They are least started and got down as far as the 75,000,000 acre-feet every 10 years at a time when they were dealing with 7,500,000 acre-feet above and 7,500,000 acre-feet below.

To suddenly now be confronted with a contention that the 75,000,000 acre-feet at Lee Ferry bears no relationship to that, that they did not have those figures in mind, is unusual to me, to say the least. I am happy to have the point brought out that was brought out a moment ago, that in order to have 7,500,000 acre-feet of beneficial use more than that needs to flow by Lee Ferry, but it does not have to be used above, just below.

Mr. HOWARD. Senator Downey's question went beyond that. In order to beneficially consumptively use 7,500,000 acre-feet in the lower basin we have to take into consideration the tributaries, the Gila and the other tributaries to the Colorado River. It is on those streams as well as on the main stream that beneficial consumptive use is measured and charged against the lower basin.

Senator ANDERSON. No. Your are saying that in order to have 7,500,000—what was your question, Senator Downey?

Senator DOWNEY. I asked, Senator Anderson, if, in order to have 7,500,000 acre-feet of beneficial use in the lower basin, you would not require a greater volume of water.

Senator ANDERSON. At Lee Ferry?

Senator DOWNEY. No, I did not say Lee Ferry. I said in the lower basin, to accomplish that much consumptive use.

Mr. HOWARD. Directing my answer to Senator Downey's question, we do have to have it.

Senator ANDERSON. I am not arguing that, I am talking about Lee Ferry. You do not have to have more than 7,500,000 at Lee Ferry in order to have 7,500,000 acre-feet of beneficial use with all the tributaries below.

Mr. HOWARD. That is correct.

Senator ANDERSON. Then there is no difference. Go ahead.

The CHAIRMAN. May the chairman ask a question at this point in order to clear up his own mind. The difference between the upper basin and the upper division, the lower basin and the lower division, would appear to me—and correct me if I am wrong—to arise from the fact that portions of the States of Utah and New Mexico have streams which flow into the lower division and streams which flow into the upper division, is that not correct?

Mr. HOWARD. Yes, and you will find that matter is crystallized in the compact itself by definition.

The CHAIRMAN. Let me develop it just a little bit more clearly. For example, with respect to the State of New Mexico the San Juan River, which passes Farmington in the State of New Mexico, discharge its supply into the main stream of the Colorado above Lee Ferry. Whereas, the Little Colorado arises in New Mexico, flows across the boundary into Arizona and delivers its supply into the river below Lee Ferry, is that not correct?

Mr. HOWARD. That is correct.

The CHAIRMAN. So that the water of the Little Colorado is never any part of the 7,500,000 acre-feet which must pass Lee Ferry. Likewise, the flow of the Virgin River from Zion National Park and elsewhere in the State of Utah, which flows into Lake Mead, is never to be considered any part of the 7,500,000, is that not correct?

Mr. HOWARD. That is correct.

The CHAIRMAN. And so likewise the flow of the Gila River which delivers itself into the main stream of the Colorado below any of the dams which were ever constructed—below the Imperial Dam, which results in the diversion of the All-American Canal—is not to be computed as part of the 7,500,000 in any way?

Mr. HOWARD. Now, just a minute. That last figure, did you mean 75,000,000 every 10 years or 7,500,000 for the whole basin?

The CHAIRMAN. Both.

Mr. HOWARD. Well they are not the same.

The CHAIRMAN. I mean it does not refer to any of the obligation which the upper division must deliver at Lee Ferry?

Mr. HOWARD. Oh, that is correct.

The CHAIRMAN. That is all I was saying.

Mr. HOWARD. That is a separate matter from the charging against the lower basin for consumptive use.

The CHAIRMAN. I had not raised that question because you specifically wanted me not to do it until Mr. Ely came on the stand.

Mr. HOWARD. I think what the chairman has said can be summarized in this fashion: The State lines, fortunately or unfortunately, do not coincide with the lines determining drainage areas. Consequently the drainage areas result in five States participating in upper basin water and I think five in lower basin water, Utah and New Mexico, in addition to Arizona, Nevada and California——

The CHAIRMAN. Just this additional statement: That under the compact in addition to the amount of water which must be delivered at Lee Ferry, the lower basin or the lower division has the water from the other tributaries that flow into the main stream below Lee Ferry?

Mr. HOWARD. That is correct.

The CHAIRMAN. And it is over the distribution of that that this controversy has arisen?

Mr. HOWARD. That is correct.

The CHAIRMAN. So that the upper basin or the upper division is not involved in this controversy at all?

Mr. HOWARD. That is correct.

Senator MCFARLAND. Well, now, just a moment——

Mr. HOWARD. Senator McFarland, pardon me, if you will. I would like to call your attention to article II of the Colorado River compact. These terms are specifically defined.

In subdivision (c) it is stated:

The term "States of the upper division" means the States of Colorado, New Mexico, Utah, and Wyoming.

The term "States of the lower division" means the States of Arizona, California, and Nevada.

It fixes the Lee Ferry point, and then goes on and defines the term "upper basin" to mean those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming—

within and from which waters naturally drain into the Colorado River system above Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system which are now or shall hereafter be beneficially served by waters diverted from the system above Lee Ferry.

Then there is the corresponding definition of the "lower basin" which depends upon the drainage area.

So this obligation not to deplete the flow of the river at Lee Ferry is an obligation of the States of the upper division. It is not an obligation of the States of the upper basin.

Senator McFARLAND. Mr. Chairman, I have been trying to wait until the end of Mr. Howard's testimony to question him, but there is one point here I would like to clear up.

The CHAIRMAN. I think, as a matter of fact, the witness has now pretty well covered the material for which he was asked to appear, have you not?

Mr. HOWARD. I think there was some additional information that Senator Kerr wanted, that is, he had quite a penetrating cross-examination which resulted in the idea that the water divided among the lower basin States was this same 75,000,000 every 10 years. I think probably that point has been covered in the testimony.

Senator ANDERSON. I do hope that some time you will clear up this question of when the States take 900,000 acre-feet out of Lake Mead, as Mr. Debler said they might have to do for a 20-year period, that that is surplus water and is to be so regarded as surplus water, or excess water. Now, do you get that into excess water when the water is stored there and the stream is below its normal flow?

Mr. HOWARD. I do not, Senator. The situation is this, if I may explain my position there——

Senator ANDERSON. If he does not, why not get the person on who will support Mr. Matthew, who said that is surplus water?

Mr. HOWARD. I want to give you the true faith.

Senator ANDERSON. Then you are trying to say Mr. Matthew did not have on a true faith?

Mr. HOWARD. I think the cross-examination there was based on a misapprehension of just what the word "surplus" in its context in the California Limitation Act means, and with the chairman's permission I would like to explain my position to Senator Anderson.

Senator ANDERSON. It is very difficult, I realize, because being not a lawyer and Swedish at the same time, it is hard. [Laughter.]

Mr. HOWARD. I have noticed with keenest appreciation your diligence in attending the committee hearings here. I have noted that you have taken the trouble to read a lot of rather boring material. I feel very grateful to you for your interest in the matter.

I think there have been—and it is perfectly natural—certain misunderstandings arise out of this very complicated set-up. I am trying to do my best to assist in clearing those.

Dropping back to the situation you referred to, the classification of water in the reservoir, you will note in Mr. Hoover's answers to Senator Hayden's questions—and it is 100 percent true—he says in response to question 13, on page A37 of the Hoover Dam Documents:

> The future development of the Colorado River Basin is dependent wholly upon the creation of storage. The lower States have certainly reached the limit of development by the direct diversion of the flow of the river. Reservoirs are imperative. They must be of sufficient size not merely to equalize the annual flow, but to impound the excessive floods of 1 year to supply a deficiency resulting from a following lean year.

And you might extend that to cycle storage.

So when the Colorado River Commissioners sat down in 1922, they were dealing with a river contemplating virtually complete control. Otherwise it would have been impossible to apportion the amount of water they were talking about, that is, you could not apportion 15,000,000 acre-feet of water, 16,000,000 acre-feet—to take Senator McFarland's position—without vast storage in the river.

Senator MALONE. Storage in both basins?

Mr. HOWARD. That is right. The upper basin States cannot use their 7,500,000 acre-feet a year without vast storage. I have heard figures running to 25,000,000 or 30,000,000 acre-feet as being required in order to enable them to make use of their water and deliver it below.

The thing I am trying to get at now is that storage was contemplated by the framers of the compact as a necessary incident to the apportionment of the use of the amount of water they were dealing with.

Repeating in a way what I said somewhat earlier, the apportionment was made in terms of use, that is, they did not attempt to apportion all of the waters of the river. I do not want to get into an argument with Senator McFarland now as to how much they apportioned—we will take that up—but they apportioned either 15,000,000 or 16,000,000, whichever theory you want to take. We take the 15,000,000 theory.

Beyond that there was excess and surplus unapportioned by the compact. In Mr. Hoover's answers he was asked to estimate that excess and surplus and he put it down as somewhere between 4,000,000 and 6,000,000 and suggested that 5,000,000 could be relied upon as excess and surplus on the whole river system.

That phrase "excess and surplus" therefore becomes somewhat a word of art in this connection. It refers not to excess or surplus in supply; it refers to excess and surplus in use beyond a certain apportioned use.

The function of storage is to equate the flow and to enable the areas involved to maintain a higher degree of agriculture, more agriculture on a sustained basis by reason of the equating of the flow. That is, they are not limited by the great variations in the natural flow.

So that the supply of water impounded in the reservoirs is intended to maintain a higher average use than would be the case if we depended on natural flow. That use may be entirely apportioned water or when we reach the stage of consuming all of our apportioned water—on any theory—then we break into excess and surplus water unapportioned by the compact.

That excess and surplus water is measured in terms of use. The water standing in Lake Mead is water available. It may be destined

by whatever happens to it to be charged as a use of III (a) water, some of it may be charged as a use of excess or surplus water and some of it be charged under other theories. It may be (b) water that we are arguing about.

But the division being in terms of use and the term "excess and surplus" being similarly in terms of use, the words mean something other than surplus over requirements, or surplus over 7,500,000 acre-feet, if that is required. It means excess and surplus measured just by use.

So that in order to carry out the intent of the framers of the compact and in order to sustain the maximum agricultural development this stored water will be applied, conserved from year to year, equated and distributed and as it is used it becomes classified. It is not classified as supply standing in the reservoir, it is classified as it is used, as III (a) water, possibly III (b) water, or possibly excess or surplus water. As it stands there in the reservoir it is just water, supply.

Does that satisfy you?

Senator ANDERSON. I think that satisfies me as to your contention. I think I had become confused over the passage of so much water past Lee Ferry and forgetting that once it passes and goes into Hoover Dam or into Lake Mead it may have a wholly different status.

Mr. HOWARD. There are other contributions to Lake Mead. I think there is roughly 600,000 that comes in between Lee Ferry and Lake Mead.

Senator MCFARLAND. Mr. Howard, there are one or two questions I would like to ask. I see we are approaching the hour of 12. I was interested in what you had to say about there being no connection as to the apportionment of water used in the compact, and the depletion at Lee Ferry. As a matter of fact, you are aware that Judge Stone and many other people in the upper basin States disagree with you as to that.

Mr. HOWARD. We recognize that.

Senator MCFARLAND. I would like to ask you, taking your theory of consumptive use, if this situation might not well develop—this was in response to the chairman's inquiry that the upper basin would not be affected.

Taking your definition, according to Mr. Shaw, the consumptive use as defined in the upper basin compact might result or would result in 8,300,000 acre-feet of use, rather than 7,500,000 acre-feet of use. Now, if, as a matter of fact, all the apportioned water in the compact is being used by the basins, and to take your definition of consumptive use which would reduce your figure below this 8,300,000 acre-feet, they might well have to let down more than 7,500,000, might they not, on the average per year?

Mr. HOWARD. That is a fairly long question, Senator. I am not sure that I got all of the elements in it.

Senator MCFARLAND. I realize I may have complicated the question, but the proposition is that all of the water apportioned to the lower basin is being used and the demand is upon the upper basin to let down all of the water not apportioned to them?

Mr. HOWARD. You are assuming a future condition?

Senator MCFARLAND. Yes; a future condition, surely.

Senator ANDERSON. Oh, no. Do you mean that?

Senator McFARLAND. I am assuming a hypothetical condition. I will put it that way for the purpose of bringing out the point.

Now, the proposition is that then the words "consumptive use" would play an important part as between the upper basin and the lower basin, would they not, as to how much water the upper basin could use?

Mr. HOWARD. Oh, yes.

Senator McFARLAND. And that amounts to 8,300,000 acre-feet, according to Mr. Shaw. In other words, it is very important to the upper basin what construction is placed on the definition of "consumptive use"?

Mr. HOWARD. Yes. I anticipate there will be friends of the court instructing the court as to the meaning of "a consumptive use."

Senator McFARLAND. As Judge Stone points out, the fact that the amount apportioned at Lee Ferry of 7,500,000 to the lower basin, and 7,500,000 to the upper basin, coupled with the provision for the exact amount of water—that is, over a period of 10 years, 75,000,000 acre-feet—that theory can be argued, just the same as you can argue yours, that depletion and consumptive use mean one and the same thing.

Mr. HOWARD. They can argue it but not as effectively, Senator.

Senator McFARLAND. Well, that depends on who the judge is, does it not? I will admit if you were the judge we would not have much chance in court. But I wanted to bring out the point because the upper basin is definitely as much interested in this definition of "beneficial consumptive use" as the lower basin.

The CHAIRMAN. The answer to the question is not yet clear to me. Do you mean to say in response to Senator McFarland that the apportioned division in article III (a) may be expanded as a result of the definition of "beneficial consumptive use," to require the upper basin to deliver more water at Lee Ferry than III (a) says?

Mr. HOWARD. No. Down to a certain point in your question I could agree with you. But as I have been trying to sustain the thesis here all morning, I do not see any relationship between the measure of beneficial consumptive use and the required delivery at Lee Ferry under III (d) of the compact. That is the 75,000,000.

It does make a substantial difference to Arizona and, according to Mr. Tipton and other engineers from the North, a difference in the use of water in the upper basin States.

I have found the easiest way in getting over the difference of opinion is, instead of using the word "depletion" to put it this way: That what Judge Stone, Mr. Tipton, and other advocates of the upper basin position are seeking and what Arizona is seeking, is to avoid being charged with the beneficial consumptive use of water which is made available by conservation and avoidance of natural losses.

To illustrate: Mr. Tipton takes the very startling position that if the State of Colorado diverts, for a figure we will say, 1,000,000 acre-feet through the mountains for use on the east slope in the Denver area, that they are not to be charged with the use of a million acre-feet, because between the point where the water would be taken out of the river and Lee Ferry a certain amount of that water would have been lost by transpiration, evaporation, and so on.

Senator McFARLAND. It never would have reached the main stream.

Mr. HOWARD. Yes. So, he says they are not to be charged with the beneficial use of 1,000,000 acre-feet, but we will say it can be established that 200,000 acre-feet of that water would have been lost; that they are to be charged with the diversion of only 800,000 acre-feet. In other words, if the loss of water is avoided and that water is used it is not to be charged as a beneficial consumptive use.

That situation is very acute on the Gila River and that is the source of one of the major difficulties between Arizona and California. The Gila River in a state of nature was a wasting stream, that is in the lower regions. I think the last 100 miles goes across a sandy desert waste and a vast amount of water is lost there. So that the Gila's contribution to the Colorado at Yuma was much less than the water present and useful in the Phoenix area.

When we signed the compact we were relying upon the term "beneficial consumptive use" as Delph Carpenter had described it, and Arizona set up the same figure, really. Now we are asked to accept a measurement based on an entirely different theory so that Arizona would get the beneficial consumptive use of water in the Colorado River system without being charged for it.

Senator MCFARLAND. I am not trying to labor that point further with you. I just wanted to show that the matter of measurement of consumptive use was the same proposition for the upper and lower basins. But there are a couple of other questions I would like to ask you before we reach the hour of 12, inasmuch as I have sat here patiently and have refrained from asking questions.

Mr. HOWARD. I appreciate your courtesy very much, sir.

Senator MCFARLAND. You stated you would not be charged with the loss of water having uses under natural conditions, that such water would not be included in the beneficial consumptive use; did you not?

Mr. HOWARD. You added the word "uses" at a point in your question where I would want to strike it. My thought is that the word "use" implies use by man; that the natural losses which occur on any stream are not to be considered, as I understand the word, consumptive uses, or beneficial consumptive uses. They are consumptive and they constitute a loss, but to my mind the word "use" means something more than that.

Senator MCFARLAND. I would like to go into that further with you, Mr. Howard, but our time for adjournment is approaching. We will try to meet this matter with other witnesses rather than by cross-examination.

There was another point you made which I was very much interested in. You stated that the statements of Mr. Hoover and these other statements were before Congress at the time the Boulder Canyon Act was ratified. You did not seem to emphasize the part read by the chairman. I have it before me now in the testimony.

Mr. HOWARD. I can give it to you right here, Senator.

Senator MCFARLAND. Thank you very much. This is the answer to question 5:

> I do not think there is any change in the basis of division as the result of a difference in language in articles III (a) and III (b). The two mean the same.

Now, that was before Congress when it was adopted and they were the words of Herbert Hoover, were they not?

Mr. HOWARD. Yes. May I suggest you read the question?

Senator McFARLAND (reading):

Why is the basis of division changed from the Colorado River system to the river at Lee Ferry in paragraph (d) of article III, the period of time extended to 10 years, and the number of acre-feet multiplied by 10?

Now I will read the full answer:

I do not think there is any change in the basis of division as the result of the difference in language in article III (a) and III (b). The two mean the same. By reference to article II (f) it will be seen that Lee Ferry referred to in III (d) is the determining point in the creation of the two basins specified in III (a). The use of this term makes it plain that the 75,000,000 acre-feet are to be delivered in the main channel of the River above the various tributaries which contribute water below.

I understand your explanation that it must have been a typographical error, as you said before, but the point is that that answer was before Congress at the time the compact was ratified, at the time the Boulder Canyon Act was passed. Herbert Hoover's words were there before Congress and appear in the record where he stated that as to III (a) and III (b) water the language meant the same.

Mr. HOWARD. The reason I suggested you read the question, Senator, is that the answer is not responsive to the question. The question relates to the (d) water, and somehow or other it appears there as (b). That is no doubt one of the many factors that can be used in argument on the question of what the status of the (b) water is. But it certainly is not the controlling one.

Senator McFARLAND. Mr. Chairman, there are a lot of other questions I would like to ask, but I will refrain from asking them at this time. Some of the other Senators may want to ask questions, and I see we are approaching the time for adjournment.

The CHAIRMAN. Are there any other questions to be addressed to the present witness?

Mr. HOWARD. I do not want to drag this hearing out at all, Senator, but if I can be of service to the committee I will be here and available for any questions that are desired to be propounded. I had hoped that before closing today I would be able to describe to the committee the situation that existed, so far as the use of water on the Colorado River was concerned in 1922, with the idea of demonstrating that the California position is not an inequitable one. But that would involve some time, and I understand you want to adjourn at 12.

Senator McFARLAND. I have one more question which I forgot.

You stated in regard to these priorities in the Imperial Valley, setting up 3,800,000 acre-feet, that priority which you state is a contractural one includes the water for the east and west Imperial Mesas, does it not?

Mr. HOWARD. I understand that it does; that that area is a part of the Imperial project.

Senator McFARLAND. Which mesas have never been irrigated, and which mesas the Secretary of the Interior has held to be nonirrigable. The Secretary also states, according to the press release, that he is not obligated to deliver water there for that reason.

Mr. HOWARD. I cannot answer you on that, Senator. I am not familiar with that matter.

Senator McFARLAND. I am not trying to bind you. I am just pointing out that that is the report.

Mr. HOWARD. I have been down there and have seen experimental farms on the east mesas where they seem to be doing very well.

Senator MCFARLAND. How much water per acre are they using?

Mr. HOWARD. That I cannot answer.

Senator MCFARLAND. I can tell you it is 15 or 16 acre-feet.

Senator ANDERSON. We have heard about the east and west mesas several times. Would you mind indicating where it is on the map?

Mr. HOWARD. I would call upon Mr. Dowd, who is the chief engineer in that area. He can do it much better than I can.

Senator ANDERSON. Just in general.

Mr. HOWARD. Mr. Dowd will do that for you, I am sure.

Mr. DOWD. The east and west mesas, as their names indicate, lie respectively on the easterly and westerly sides of the Imperial Valley, which is the area shown in green on the map lying between the Mexican boundary and the Salton Sea. The east mesa contains a gross area within the Imperial irrigation district of about 200,000 or 220,000 acres. The west mesa has a gross area of some 175,000 acres. The report which Mr. McFarland refers to is on the east mesa. In that connection I may say the east mesa soil is very representative of the same soil which Arizona is now developing on the Yuma mesa, and which includes about one-half of the area of the development which costs about $105 an acre for the canal system alone.

As Mr. Howard said, we are carrying on developments now which will show the productivity of these mesas.

Senator MCFARLAND. I want to say, as usual, that Mr. Howard made a scholarly presentation of the legal points here, and did the best job that I think anyone could do who is on the wrong side of the case. I want to compliment him. [Laughter.]

Senator MALONE. Mr. Chairman, if that completes the testimony, I should like to read just one short paragraph.

Senator MILLER. May I ask when you calculate to reconvene?

The CHAIRMAN. We will be in executive session Monday morning at 10 o'clock.

Senator MALONE. This is Senate Document 186, which has been referred to often in the matter of consumptive duty of water as relates to the number of acres which could be put under cultivation in each basin, of course realizing that this was calculated in 1927. Since then a lot more information has become available. But it says:

> Duty of water, upper and lower basins: The consumptive duty of water in the upper-basin States is from one and a fourth to one and a half acre-feet per acre. Then with the 7,500,000 acre-feet the upper basin will be able to irrigate approximately 5,500,000 acres, while the lower basin with their 8,500,000 acre-feet, providing there is 1,000,000 acre-feet surplus, could only irrigate approximately 2,850,000 acres, using the total amount for irrigation, and none for domestic supply, since the consumptive duty of water in the lower basin is approximately three acre-feet average.

Now, it was generally understood at that time in conversations—and realizing that a court will pass on all these question at some time, and I certainly make no attempt to pass on them at this time—that the diversions less the return flow of the stream on any particular acreage would give you the net duty of water, that is, the amount of net water that was utilized consumptive.

I was a little perturbed, and then I find that the Bureau of Reclamation has changed the terms and consumptive use of water is no longer

used in that connection. I do intend to proceed just a little further as to how they describe that net duty of water, other than consumptive use. I contribute that for whatever it might be worth, because at that time, 25 years ago, we were using the term.

Senator MCFARLAND. Mr. Chairman, I presume it will be agreeable, if in our hurry we have overlooked an important question, which cannot be answered by rebuttal testimony, to recall Mr. Howard?

The CHAIRMAN. He has made himself available.

Senator MCFARLAND. Thank you very kindly.

The CHAIRMAN. The committee will stand in recess for this proceeding until Tuesday morning at 10 o'clock.

(Whereupon, at 12 o'clock noon, the committee adjourned until 10 a. m., Tuesday, April 5, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

SATURDAY, APRIL 9, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:30 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Kerr, Malone, and Ecton.

The CHAIRMAN. The committee will come to order. Mr. Shaw will be recalled to the stand to finish the statement he was prevented from completing a week or 2 weeks ago when he was here.

Mr. Shaw told me when the committee recessed when he was last on the stand, that he was sitting here for 2 hours with about 10 minutes more to give. So, Mr. Shaw, we will be glad today to hear you without interruption. You may proceed.

Any questions the members desire to direct toward your testimony will be propounded after you have finished.

STATEMENT OF ARVIN B. SHAW, JR.—Resumed

Mr. SHAW. Mr. Chairman, when I was interrupted on March 24, I had just finished the review of the issues which were displayed to this committee at the hearings last year, in terms of the secretarial and departmental reports bearing on last year's hearings.

I now desire to discuss the reports to this Congress by the executive departments, commencing with the report of the Secretary of the Interior.

I might note again that my statement is directed to Senate Joint Resolution 4, rather than the project authorization bill.

In the report of the Secretary of the Interior to the chairman of this committee on Senate Joint Resolution 4, dated March 18, 1949, the Secretary of the Interior makes reference to his report on Senate Joint Resolution 145, dated May 13, 1948, and says:

> In that letter it was pointed out that the United States is an indispensable party to any litigation that may be brought to decide the dispute which now exists among the States of the lower basin of the Colorado River and that that dispute appears to have the elements of a justiciable controversy. There is, therefore, no need for me to elaborate on these matters here.

These two important factors of the legislation before you are, accordingly, in the view of the Interior Department, still definitely settled.

The Secretary proceeds:

Our hope that the dispute will be settled—by amicable means if possible, by the Congress if an amicable settlement is impossible and if it be the judgment of the Congress that the dispute can be effectively disposed of by it, and by litigation only as a last resort—was also made clear in that report.

Two of the three means of settlement of interstate water controversies mentioned in this statement, namely, agreement and litigation, are well recognized and accepted. The third idea, a decision by Congress upon issues of a judicial nature, will be shown by another witness to be untenable. No decision by the Congress can "effectively" dispose of such a dispute. It is interesting, however, to note that the Secretary makes no attempt to support with authority, or to argue, that lawsuits between States can be "effectively disposed of" in the political forum.

The Secretary next seems to drop his suggestion of a congressional decision. He quotes from a decision of the Supreme Court, one among several of like tenor, in which the Court advises States, if possible, to settle differences by agreement.

Continuing on this line of thought, the Secretary next says:

Both the executive and legislative branches of our Government might well consider to what extent they can contribute toward lending new impetus to negotiations among the States. In a letter addressed to you on February 11, Budget Director Pace has made it clear that "the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him."

Although the State governments of California and Nevada have concluded that no serious prospect exists that the differences between California and Arizona can be composed by negotiations, California has never closed the door to negotiation. As is evidenced by Governor Warren's letter to the Governors of Arizona and Nevada dated March 3, 1947, which has been placed before you, California would prefer that method of settlement, were it possible. It is, candidly, difficult to expect that the executive or legislative branches of the Federal Government can exercise such suasion upon Arizona as to convince that State that it should agree to desist from reaching out for the water belonging to other States and stay within its own share of the river. On the other hand, it can be expected that Arizona would abide by a mandate of the Supreme Court.

The secretarial report next states:

This Department is convinced that the proposal that the lower basin controversy be settled by litigation is but part of a larger picture. Of immediate importance is the question whether the institution of such litigation would hinder or expedite the development of the resources of the Colorado River Basin. Although it is not certain that lower basin litigation would inevitably have the effect of delaying progress in the authorization and construction of badly needed works in the upper basin, we are so convinced that it might well have that effect that I cannot say, to repeat a comment made by this Department on the Eightieth Congress resolutions, that there would be no objection to the enactment of legislation along the lines of those resolutions that are now before your committee unless we were fully assured that progress in the development of the basin and in the use of its waters would not be halted or seriously impeded by the litigation. More specific recommendations as to the means by which this assurance could best be evidence are contained in the report of May 13, 1948, to which I have already referred. I may add that, in view of the fact that a compact apportioning the use of the waters of the upper basin has now been negotiated and ratified by all of the States of that basin, there is less reason now than it

may have been thought there was last year for hesitating to give this assurance with respect to, at least, works in the upper basin States.

The Secretary in this paragraph makes a blind reference to a proposal in his report to the Eightieth Congress on Senate Joint Resolution 145. He there recommended legislation giving blank authorization to the Secretary to construct projects throughout the Colorado River Basin, within certain limitations. He now intimates that such legislation might be limited to the upper basin.

The Secretary's report to this Congress does not, nor did the report to the Eightieth Congress, make it plain that the approval of the President was expressly withheld from this portion of his former report. The Director of the Budget wrote to the chairman of the House Judiciary Committee on May 20, 1948, as follows:

It has been called to my attention that the language of the report submitted by the Secretary of the Interior with respect to House Joint Resolution 225 and related resolutions is susceptible of misinterpretation by reason of the fact that, while a clear statement is made of the relationship to the program of the President of the resolutions themselves, no statement is made of the relationship to the President's program of the proposals advanced by the Secretary for the enactment of legislation authorizing construction in and further development of the Colorado River Basin.

To correct any misunderstanding which already has arisen and to prevent further misunderstanding, I have today requested that my letters of May 7 to the Secretary of the Interior and to the Attorney General be inserted in the record of the hearings of the Senate Committee on Interior and Insular affairs on Senate Joint Resolution 145. A copy of my letter to Senator Millikin is attached. I shall be grateful if you will consider these materials and decide whether they should also be inserted in the record of the hearings before your committee.

The appended letter from the Director to the Secretary of the Interior dated May 7, 1948, above-mentioned, makes clear the President's views. He said, in part:

It seems to me that at this time relationship to the President's program of the other matters discussed in your proposed report should be left open. No proposed legislation respecting them, so far as I am aware, is far enough along to be considered at the forthcoming hearing. Accordingly, while there is no objection to the presentation by the Department of the Interior of views respecting such subjects as it believes are pertinent to the consideration of the resolution pending before the Senate committee, such views should not be considered as indicating any commitment, at least at this time, as to the relationship to the program of the President of proposals for legislation to authorize construction in, and the further development of, the Colorado River Basin by agencies of the Department of the Interior.

There is agreement among all agencies concerned as to the urgent need for resolution of the water-rights issues involved. I do not believe, however, that resolution of such issues through litigation inevitably would bar further development of water resources of the Colorado River Basin during the period of such litigation. It also is problematical as to whether all agencies would agree on the need for the general authorizing legislation that you suggest. When agreement is reached on any particular project, I feel that the usual legislative method for authorizing it would be preferable to a general authorization, no matter how carefully circumscribed with the kinds of criteria you suggest on page 3 of the reports before you.

The remainder of the report of the Secretary of the Interior dated March 18, 1949, consists of inconclusive references to the relationship between Senate Joint Resolution 4 and the authorization of the proposed central Arizona project and to a letter from Governor Warren of California.

Nowhere in the Secretary's latest report is there a distinct recommendation for or against Senate Joint Resolution 4. Nor does the letter

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from the Director of the Budget to the Secretary dated March 17, 1949, state whether or not Senate Joint Resolution 4 is in accord with the program of the President. It indicates no objection to the transmittal of the Secretary's report, but calls particular attention to his similar statement with reference to the Attorney General's report.

> The President has authorized me to advise you that while there is no objection to the presentation of your report as submitted to me, he has also authorized me to advise the Attorney General that there is no objection to his report on House Joint Resolution 3 and similar measures pending before the House Committee on the Judiciary. This report of the Attorney General, which I understand was developed in collaboration with your representatives, suggests certain amendatory language for the consideration of the committee if the Congress proceeds to take up the proposed measure.

The Attorney General indicates that there has been no change in his view that under the decision in *Arizona* v. *California*, 298 U. S. 558, the pending resolution is a necessary prerequisite to the proposed litigation. He says:

> The Court made it clear that the type of relief desired by the States in a suit between them cannot be had in the absence of legislation such as here proposed.

He comments on the fact that Senate Joint Resolution 4 has been drafted in compliance with the principal suggestion as to form contained in his 1948 report and continues:

> The first above-mentioned suggestion is incorporated in the present measure. However, as presently proposed, it would contemplate an adjudication of the rights in the lower basin only. Representatives of the Department of the Interior and this Department have recently conferred with regard to this proposed legislation and a proposed draft of substitute wording has been prepared which, among other things, would permit of a complete adjudication of all rights on the Colorado River, including the rights of the United States. In the absence of such provision in the Act, a complete adjudication of the rights of all interested parties could not be had.

Now, departing from my prepared statement, Mr. Chairman, that language is quite significant to us. It raises the question whether the proposed litigation should involve all possible legal questions regarding the Colorado River, including questions among the upper basin States, between the upper basin and the lower basin, and among the lower basin States.

It is doubted that there is any present necessity for the litigation of the breadth indicated by literal reading of this statement. The relations of the upper basin States, as among themselves, appear to have been satisfactorily settled by the upper Colorado River Basin compact. No problems of urgency are known to exist between the upper basin and the lower basin. Any differences of opinion which have been expressed may be resolved by agreement long before they come to constitute threats to peace in the basin.

The Attorney General proceeds:

> While enactment of the proposed legislation is a matter of legislative policy concerning which this Department has no recommendation, if the Congress gives the proposed measure favorable consideration, it is suggested that after the enacting clause the following language be substituted:
>
> "That consent is hereby given to the joinder of the United States of America as a party in any suit or suits commenced in the Supreme Court of the United States within 1 year from the effective date of this joint resolution by any State or States of the Colorado River Basin, as that basin is defined in the Colorado River compact, for an adjudication of claims of rights asserted against any

other State or States of the Colorado River Basin or against the United States with respect to the waters of the Colorado River system available under the Colorado River compact, the Boulder Canyon Project Act, the California Self-Limitation Act, and the Boulder Canyon Project Adjustment Act to any State or States of the lower basin of the Colorado River, as that basin is defined in the Colorado compact, and of any claims of right affecting such availability which are asserted by the defendant States or by the United States. Any State of the Colorado River Basin may intervene in said suit or suits or may be impleaded by any defendant State or by the United States."

This suggested amendment is unclear, but is appears that the subject of the proposed litigation is meant to be—and I am condensing here:

* * * the waters * * * available to any State or States of the lower basin * * *

The text of the amendment, therefore, is not as broad as the description of it theretofore set out.

I mean by that that it is almost inconceivable to me that a State of the upper basin could assert any rights in the water available to any State or States of the lower basin. Their rights are rights in upper basin waters, not in lower basin waters. So that I do not think the Attorney General has drafted a substitute which would actually broaden the scope of the litigation in the way that he describes it.

With that understanding California does not object to the amendment proposed by the Attorney General. California sees no occasion for the upper basin States to be involved in the proposed litigation, unless they so desire, and does not ask that they be involved.

The Attorney General makes no recommendations for or against the enactment of Senate Joint Resolution 4, if amended as he suggests. The letter of clearance from the Director of the Budget to the Attorney General states:

The President has authorized me to inform you that there is no objection to the transmittal of this report to the House Committee on the Judiciary.

Senator MALONE. Mr. Chairman, if I may interrupt there. You do understand that two of the States belong to both basins?

Mr. SHAW. Yes, sir.

Senator MALONE. And to that extent part of the upper basin area might be interested in the suit?

Mr. SHAW. Yes, sir; but only with respect to the waters available to the lower basin.

Senator MALONE. That is right.

Mr. SHAW. That is line with the conception we had in making the original draft and which the Secretary of the Interior had in submitting a very similar draft to this committee last year.

It is particularly noted that the Director of the Budget has not withdrawn the statement made in his letter to the Attorney General of May 7, 1948:

The proposed legislation would be in accord with the program of the President if amended, as suggested by you—

In the Attorney General's 1948 report.

It has been shown that an interstate controversy has existed for over a quarter of a century. The controversy is of vast public importance, concerning as it does the economic life and the future limits of development of the Pacific Southwest.

Efforts of the States to reach an agreement have not been successful. No other way to settle the argument appears to be open, except a suit in the Supreme Court.

In such a suit, the issues would primarily relate to the meaning and effect of an interstate compact, various statutes and contracts. Such issues would be determined upon briefs and oral argument as to statutory interpretation and contract law. It would not be necessary to take interminable testimony as to factual matters. It is believed that the issues can, if the parties desire to expedite a decision, be disposed of within a reasonable time, not to exceed 2 years.

In this connection, it is noted that the three cases between Arizona and California decided in 283 United States 423, 292 United States 341, and 298 United States 558, which involved legal argument only, actually took, respectively, 3½ months, 5 months, and 8 months from commencement to decision.

It is believed that the official reports which have been reviewed show that congressional consent is necessary before the proposed suit can be commenced; that the United States has important interests which are involved, as well as those of the States; that the issues must be settled; and that the case is, within the decisions of the Supreme Court, a justiciable one and therefore within the jurisdiction of the Court.

It is believed that the contending States have probably, in the last 5 years, already expended more energy and money in debating their views in this forum, and more time has elapsed, than would be required to litigate their controversy to a decision in the Supreme Court. It is submitted that they should now, by taking the only course which appears to be effective, get the controversy behind them, so that they can join their efforts to the constructive end of the upbuilding of the Pacific Southwest.

Mr. Chairman, I would like to make one further comment with regard to a point which was made in Senator McFarland's opening statement, which he very vigorously impressed upon the committee, namely—if I can paraphrase his language—that the original resolution, Senate Joint Resolution 145, was only introduced on the last day of the hearings before this committee on S. 1175, the original central Arizona project authorization bill, and from which he proceeded to say to you that California never wanted to litigate. Or, putting it more closely in his language, "Who ever heard of California's wanting to litigate before these hearings came on before this committee?"

The record before you shows that on March 3, 1947, Governor Warren of California addressed a letter to Governors Pittman and Osborn of Nevada and Arizona, suggesting and urging either, first, negotiation, second, arbitration, or third, litigation.

I call your attention to the fact that S. 1175 was introduced in this Senate on April 28, 1947, nearly 2 months after that letter proposing litigation had been written by Governor Warren.

That concludes my statement, Mr. Chairman.

The CHAIRMAN. Senator Malone.

Senator MALONE. Mr. Chairman, I was just going to ask one question.

Is there any other court of competent jurisdiction besides the Supreme Court in this case, in the absence of an agreement?

Mr. SHAW. No, Senator. The exclusive jurisdiction of a suit between the States is in the Supreme Court of the United States. The district court has no authority to entertain a suit against a State. That was not only very strongly to be implied by the terms of the Constitution, but it is also expressly stated in section 233 of the Judiciary Act enacted in 1789, now found as section 341, title 28, United States Code, Annotated.

The CHAIRMAN. Senator McFarland.

Senator MCFARLAND. Mr. Chairman, I do not care to ask any questions; but I do not want it thought or understood that we are agreeing with what Mr. Shaw has stated. I am not going to ask any questions for two reasons. One is the time element. The second is that some of the matters were gone into on cross examination before, and further examination would just take a lot of time.

I would like to call the attention of the committee to the fact that the last statement made by Mr. Shaw was to the effect that this letter by Governor Warren was written in March 1947, and that S. 1175 was introduced in April. S. 1175 was in effect reintroduced in April, Mr. Chairman. Its predecessor was theretofore then pending; and there was a change made in the latter bill, which change provided for postponement of the building of the tunnel from Bridge Canyon southward. Otherwise S. 1175 was pretty much the same as its predecessor. So the proposed legislation was pending before Governor Warren wrote his letter. I do not want the committee to get a false impression about it.

Now, as to the element of the time required to settle these interstate lawsuits, we will rebut Mr. Shaw's views about that at the proper time. Mr. Breitenstein, and others, will point out the period it takes to settle such suits.

As far as the departmental reports are concerned, I think I would only be wasting the committee's time in cross-examining the witness as to what they say. The committee will be able to read them themselves and form their own conclusions. I do not want to waste the time of the committee on this phase except to call attention to the fact that the Attorney General makes no recommendations, as pointed out by Mr. Shaw, and that the Interior Department states that this litigation should not be encouraged.

The CHAIRMAN. Senator Ecton, any questions?

Senator ECTON. I would like to ask one question of Mr. Shaw, Mr. Chairman, to maybe clear up a layman's mind.

You think that this resolution giving consent to the court to try this is sufficient to be a cause of action so that the Supreme Court would go ahead with it, do you, Mr. Shaw?

Mr. SHAW. Yes, sir, and we base that opinion upon the last decision of the Supreme Court in a similar matter, which was the case of *Nebraska* v. *Wyoming and Colorado* decided in 325 United States, just a few years ago, 1944, I believe. That case is so close upon the facts to this situation that we think it is definite authority.

Senator ECTON. I have always had the impression that there had to be a specific cause of action before the Supreme Court would take it, and that mere consent has always been a question in my mind if that was sufficient cause.

Mr. SHAW. The consent does not create a cause of action, it merely unlocks the door of the Supreme Court. The case has to exist independent of the action of the Congress in giving the consent. I might put it that way. We believe that a case exists and that the action of Congress in consenting to this suit simply opens the door of the Court for us.

The CHAIRMAN. To make your reply to Senator Ecton a little more clear, may I suggest that you state for the record why, in your opinion, the consent of Congress is necessary?

Mr. SHAW. The consent of Congress is necessary before any suit, such as we have in mind, can be brought because the Supreme Court, in the last case of *Arizona* v. *California* in 298 United States, specifically held that in any controversy over water rights on the Lower Colorado River, the United States, because of its various interests in the subject, was a necessary party and it could not be sued without the consent of Congress. That decision we think is binding on us and we cannot get into court unless Congress consents that the United States be made a party to the case.

If I may explain it further: The Supreme Court in that case devoted quite a little attention to the various interests of the United States in this particular field. In the first place, Congress has authorized the Secretary of the Interior to take control and charge of this river, to build great works on it, to make contracts for the delivery of stored water, by reason of which the interests and obligations of the United States are concerned.

In addition to that, the United States has large areas of public land involved in the picture. It also has obligations to Indian tribes for water from this river.

Altogether, the Court indicated, and the Secretary of the Interior in his report of last year again described, a considerable variety or interests which the United States has in the subject. Therefore the Court concluded that no decision in a case brought by one State against another should be rendered without the United States present in the case to present its views and claims.

Senator DOWNEY. Mr. Shaw, you have stated to Senator Ecton that, in your opinion, a justiciable cause presently exists by virtue of which California believes the Supreme Court would decide that California had a case against Arizona. But you have not explained why you think a justiciable cause does exist, or what you mean by reference to the case you referred to.

Mr. SHAW. In the case of *Nebraska* v. *Wyoming* the Court in effect said: "Here is a river upon which no compact exists, the rights have not been settled by compact. The area is an arid or semiarid area. There is an overlapping of claims to the water of the river, that is to say, the waters are overappropriated. The Court concludes that that situation of itself presents a difficulty or a controversy which is of such dignity and importance as to justify the Court in taking jurisdiction."

As I pointed out to the committee on the first day of my testimony on March 23, I believe, almost every statement made in that decision of the Court applies specifically and directly to the conditions existing on the lower Colorado River. Each of those facts exists. There is a long, deep-seated, and important controversy here. The Court

indicates that where claims of the States are conflicting and the water is insufficient to serve all the needs, it is necessary for the Court to settle those issues. Therefore it takes jurisdiction.

Senator McFARLAND. Mr. Shaw, the Kendrick project had been authorized in the *Colorado* v. *Wyoming* case, had it not?

Mr. SHAW. A project on the North Platte River had not only been authorized but for a long time built. And as I pointed out in my memorandum on this subject which was presented to you on March 23——

Senator McFARLAND. The Kendrick project had not been built, had it?

Mr. SHAW. Oh, yes.

The CHAIRMAN. It was on the North Platte River.

Senator McFARLAND. It had not been built, had it?

The CHAIRMAN. The North Platte project had been built.

Senator McFARLAND. According to the report of the case it had been authorized; and according to Mr. Breitenstein's testimony it was probably being built during the time the case was going on.

The CHAIRMAN. That is true of the Kendrick project, but not of the North Platte project.

Senator McFARLAND. Yes; I know.

Mr. SHAW. Well, as to that subject, which was claimed by Nebraska to show that Nebraska was being presently damaged, the Court said this:

> The various statistics with which the record abounds are inconclusive in showing the existence or extent of actual damage to Nebraska.

That to my mind dismisses that point from the case. The Court goes on in its opinion:

> But we know that deprivation of water in arid or semiarid regions cannot help but be injurious. That was the basis for the apportionment of water made by the Court in *Wyoming* v. *Colorado* (259 U. S.). There the only showing of injury or threat of injury was the inadequacy of a supply of water to meet all appropriative rights. As much, if not more, is shown here. If this were an equity suit to enjoin threatened injury, the showing made by Nebraska might possibly be insufficient. But *Wyoming* v. *Colorado*, *supra* indicates that where the claims to the water of the river exceed the supply a controversy exists, appropriate for judicial determination. If there were a surplus of unappropriated water different considerations would be applicable—

citing a case—

> but where there is not enough water in the river to satisfy the claims asserted against it, the situation is not basically different from that where two or more persons claim the right to the same parcel of land. The present claimants being States, we think the clash of interests to be of that character and dignity which makes the controversy a justiciable one under our original jurisdiction.

The parallel between that case and this one on the facts is of a remarkable character.

Senator McFARLAND. Mr. Shaw, do you contend Arizona has appropriated the water to which she here claims a right?

Mr. SHAW. Appropriated in what sense? You mean filed applications before the water commissioner?

Senator McFARLAND. Well, you read from the *Colorado* v. *Wyoming* case. You said the water had been overappropriated. Do you contend that we have appropriated the water that we are asking for here?

Mr. SHAW. I understand there are appropriations filed in your State water commissioner's office for water, for such a project.

Senator MCFARLAND. Who filed them?

Mr. SHAW. A gentleman by the name of Colter some 26 years ago.

Senator MCFARLAND. And you think those are valid appropriations?

Mr. SHAW. I haven't the ghost of a notion, Senator, I wish I knew. Do you?

Senator MCFARLAND. You are testifying here. I am contending, Mr. Shaw, that in the North Platte case, and under the testimony of Mr. Breitenstein, which we have here, it is clearly shown that there was a project authorized, and that under the rule of that case there cannot be a justiciable issue here until there is a project authorized. Mr. Breitenstein discusses that case at some length. I would like to ask you if you disagree with what he had to say about it. I am reading now from page 301 of the hearings in the House.

The CHAIRMAN. What date?

Senator MCFARLAND. This was last year. The hearings in the House were on May 17, 20, 26, and 27, 1948.

I would like to call attention to the fact that Mr. Breitenstein was one of the attorneys for Colorado in that case.

Mr. SHAW. He was defeated in that case.

Senator MCFARLAND. But that does not make any difference about the facts, whether he was defeated or not.

The last paragraph on page 301 says:

> The most recent interstate suit in the United States Supreme Court involving interstate streams is the case which is commonly known as the North Platte case, *Nebraska v. Wyoming and Colorado.* The United States was an intervenor in that case. In that case, Nebraska claimed that she was being injured because of out-of-priority diversions in Wyoming and Colorado. By that is meant diversions by upstream users whose priorities or priority dates are junior to downstream users, and the contention was that these junior upstream users were taking water when the supply was insufficient to satisfy the senior downstream. Nebraska also claimed that the Federal reclamation project, known as the Kendrick project, which had been authorized for construction in Wyoming, and for which appropriations had been made, constituted a threat to Nebraska in that that project used water which properly was within Nebraska's share of the flow of the stream.
>
> In that case the State of Colorado argued that the case should be dismissed because no injury was shown. The Court ruled against us on the motion to dismiss. It said, among other things, and I am reading from page 14 of the Court's printed copy of that opinion:
>
> "The Kendrick project plainly is an existing threat to senior appropriators downstream. As we have noted, it is junior to practically every appropriation on the river between Alcova and the Tri-State Dam. Since 1930 there would have been no water for it if it were operated on a priority basis and, in view of the general position taken by Wyoming with respect to Nebraska priorities, it could not be assumed that the Kendrick project would be regulated for the benefit of senior appropriators in Nebraska. Neither Wyoming nor Colorado have ever recognized any extension of priorities across State lines. They have never limited or regulated diversions by their appropriators in subordination to the senior appropriators of a downstream State. Out-of-priority diversions by Colorado have had an adverse effect downstream. We do not know their full extent, but we do know that Colorado appropriators junior to Pathfinder are consuming about 30,000 acre-feet a year, and Pathfinder has never been filled since 1930, and has always been in need of water. This alone negatives the absence of present injury."
>
> So in that case the Court found that there was a present injury because of the out-of-priority diversions and there was a threat of injury because of the authorizations and appropriation of money for the construction of the Kendrick project in Wyoming.

Do you agree with that statement?

Mr. SHAW. No; I do not think so, because the Court later in the opinion made the statement which I just read to you a moment or two ago. After this paragraph the Court says:

> The various statistics with which the record abounds are inconclusive in showing the existence or extent of actual damage to Nebraska.

In my mind that disposes of the previous discussion as an issue in the case. Certainly the emphasis and the bulk of the Court's discussion on this subject are not limited to a case of present injury. The Court spent something like two or three pages of the opinion in coming to the conclusion which I read to you.

Senator MCFARLAND. Mr. Chairman, I do not want to argue the decision with the witness. I think that is a matter we can take care of in our executive session. I merely wanted to emphasize that that case was expressly pointed out by Mr. Breitenstein, one of the attorneys participating therein, as showing that a project was authorized, and that it had to be authorized, and that there had to be a serious threat before there could be a justiciable issue.

There is no question but what there were appropriations and diversions of water, which is not the case here. I know Mr. Shaw will agree with me on that, that Arizona is not diverting the water at this time.

Mr. SHAW. It is not diverting water, but is claiming it. That comes directly within the language of the Supreme Court:

> But *Wyoming* v. *Colorado*, *supra*, indicates that where the claims to the water of a river exceed the supply a controversy exists appropriate for judicial determination.

Senator MCFARLAND. Mr. Chairman, the facts in that case are altogether different. At the proper time I will cite cases on all fours where the Supreme Court has held there must be a project authorized, otherwise there is no threat.

The CHAIRMAN. Mr. Shaw, do you wish the committee to understand that in quoting the phrase you have just quoted you conceive that a mere paper claim, and not a claim the assertion of which has been undertaken by some positive action, is meant by the Supreme Court?

Mr. SHAW. I think that is a correct statement, Mr. Chairman. I see no reason to think that the Court was limiting its statement to claims which had been perfected in accordance with law by formal action and by diligence in prosecution, by construction, and all that.

The CHAIRMAN. My recollection of that case is, the facts show that in Colorado water was actually being diverted and used under claims and that the Court felt those diversions of an inadequate supply of water were cutting into the rights of the lower States to the flow of the stream. So that my question was specifically directed to the point of whether a mere paper claim was within the statement of the Court in your opinion.

Mr. SHAW. I believe that is exactly what the Court had in mind, Senator. May I amplify the answer, please? The Court did refer to the diversion of water in Colorado, but it comes to the final conclusion that the showing of actual damage to Nebraska was inconclusive.

Now, I do not know what the factual situation may have been which led to that conclusion, but it may readily have been that water could

be diverted in Colorado which never reached Nebraska. That is a possibility.

In this case, beyond the paper appropriations I spoke of, which were filed in 1923 and 1924, there is presently in this situation a secretarial contract in favor of the State of Arizona, which, interpreted, as I understand Senator McFarland to interpret it, definitely overlaps the claims of California, Nevada, Utah, and New Mexico to this lower-basin water. Certainly there is a definite claim on the part of Arizona to take water which invades the interests of the other States. That contract is a fearful and wonderful thing. It has so many qualifications, deductions, and minus quantities in it, that it is very hard to reach a conclusion as to just what it does mean.

We interpret, for example, the provisions of 7 (h) of that contract as meaning that Arizona concedes the propriety of the California contracts. May I read that section?

The CHAIRMAN. Before we go into that, may I refer to what you have said with respect to this particular case?

Mr. SHAW. Yes, sir.

The CHAIRMAN. Is your interpretation that the Court in the use of the word "claim" meant to include paper claims, as well as actual diversions? Then you recite the final holding of the Court, that there was no actual damage to Nebraska. Does that not lead to the inference that it was with respect to actual diversions, and not paper diversions, that the Court was thinking?

Mr. SHAW. I think that the Court was pretty definitely thinking of potential diversions, Senator, rather than actual ones—potential interference. I have included in my statement a quotation of something like two pages of the Court's opinion, all of which bears upon this particular matter of potential interference, rather than actual interference. It is that which leads me to believe the Court was working on the theory of a threat rather than an actual present injury.

May I read into the record, please, the provisions of 7 (h) of the Arizona contract? I do this only for the purpose of creating confusion because it contradicts some contentions which have been made on the part of Arizona here.

Senator KERR. May I interrupt just a moment, Mr. Chairman, and ask the witness if he has a copy of that decision?

Mr. SHAW. I am sorry to say I do not have a copy of the Nebraska decision here. I had it at the last hearing, but I did not expect this discussion to develop.

Senator KERR. What is the citation?

Senator MCFARLAND. I can lend you my copy.

Mr. SHAW. It is 325 U. S. 589. The material which I read appears on pages 607, 608, 609, and 610.

Senator MALONE. Mr. Chairman, before the witness reads the material, I am very sorry that I have to leave the committee very soon. Could I ask just a couple of questions?

The CHAIRMAN. Certainly.

Senator MALONE. First, Mr. Shaw, none of us can determine of course with an definiteness what the Supreme Court had in mind. How long would it take? Would it be a long operation if the suit were to be filed and rejected by the Supreme Court? Would that entail very much time?

Mr. SHAW. Our experience has been, in the three cases, that have gone that route between Arizona and the six States which were then parties to the compact, that those cases took 3½ months, 5 months, and 8 months from the day the complaint was filed until the day the Court rendered its decision.

Senator MALONE. Yes; then that would definitely settle it. Then I wanted to ask the witness one further question.

In view of the water-rights discussion which has taken place here this morning, there are, of course, two methods well recognized in the western country, or the arid areas, for the appropriation of water or the right to water. One is direct appropriation under State laws—beneficial use—and the other, through the compact, a recognized right for a State under such a compact for adjudication to reserve water for future use, where it is not actually appropriated. Is that true?

Mr. SHAW. Yes, sir. The method you just mentioned second cuts across the law of appropriation, denies one State or the other the right to progress beyond a certain point in making appropriations under the law of appropriation.

Senator MALONE. Yes. Right in line with that, is that not the whole theory of the Colorado River compact in the first instance? In other words, the lower areas where the growing season was longer and more specialized crops could be grown, would no doubt appropriate the water for beneficial use long before the upper States with a higher elevation could make beneficial use of it? I assumed 20 years ago that was the basis of the opposition of the upper-basin States to the construction of the Boulder Dam—now Hoover Dam—until such time as their future rights were protected.

Is that what the witness understands?

Mr. SHAW. That is the history of the discussions which were had preliminary to the making of the Colorado River compact. That is recorded in any number of historical documents.

Senator MALONE. Now, in line with that, take a State like Nevada, Utah, or New Mexico; naturally there is going to be a very much lower development than in a State like California, or even Arizona, where the growing season is much longer and more valuable crops can be raised. Therefore, I want to point out that Nevada's interest is a preservation or reservation of whatever water it is rightly entitled to, to be used over a long period ahead, or any period that may become feasible and opportune, and when conditions justify the construction. In other words, for some time we have been attempting to enter into a compact and have been unsuccessful. Now, my reason for joining the introduction of this resolution was so that the State of Nevada and other States—we have no desire to injure any other State, as a matter of fact, we would lean over backwards to keep from doing that—but we wanted the water reserved to be then used in Nevada, New Mexico, Utah, Arizona, and California, at whatever time they see fit and when conditions are such that they can make beneficial use of the water.

That is, I think, roughly the position we have taken for 21 or 22 years, since 1927.

Mr. SHAW. I am sure it is, Senator.

Senator MALONE. So if the resolution were to be approved by Congress and the Supreme Court rejected it, there would not be very much

time lost. Then we would be clear to take up anything Congress saw fit to do. Is that about right?

Mr. SHAW. Yes, sir. The question, for example, as to whether the case presents a justiciable issue is one that would very obviously be presented at the very threshold of the litigation, which would mean at the time that the plaintiff State made a motion for leave to file its bill in the Supreme Court. You will understand, the Supreme Court does not allow a State to come in and file a complaint at its pleasure, but requires it to make a motion for leave to file. At that time—as has occurred in a number of instances in the past—the proposed defendant States have the privilege of coming in and satisfying the Court, if they can, that the action should not be filed.

So within a very few months from the time any such complaint is filed or is presented for filing in the Supreme Court, the Court would have opportunity to decide and would decide what it was going to do about the case; whether it was going to permit the case to be filed or not.

The CHAIRMAN. Senator Kerr, do you have any questions?

Senator KERR. Yes, I do.

Mr. SHAW. Senator, might I complete the record on the matter I mentioned a few moments ago?

The CHAIRMAN. Yes; you wanted to complete your statement.

Mr. SHAW. I suggested there might be some materiality to section 7 (h) of the Arizona water contract of February 9, 1944. That subdivision of the contract reads:

> Arizona recognizes the right of the United States and agencies of the State of California to contract for storage and delivery of water from Lake Mead for beneficial consumptive use in California, provided that the aggregate of all such deliveries and uses in California from the Colorado River shall not exceed the limitation of such uses in that State required by the provisions of the Boulder Canyon Project Act and agreed to by the State of California by an act of its legislature (ch. 16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

Senator KERR. I see in the first syllabus of the case, *Nebraska* v. *Wyoming*, to which you referred, the statement—

> And the United States was granted leave to intervene.

Mr. SHAW. Yes, sir.

Senator KERR. Did they ask to be permitted to intervene?

Mr. SHAW. I don't know.

Senator KERR. Was a law passed giving consent that they be permitted to intervene?

Mr. SHAW. I do not know, but I infer not, Senator. It is my understanding that the Attorney General at any time he chooses, upon direction of the Executive or otherwise, may ask the Court for leave to intervene. I do not know of any legislation on the subject.

Senator KERR. If the rights of the United States are invaded, does he not have a rather firm duty to intervene, if the case is before a court?

Mr. SHAW. If I were the Attorney General I would look at it in that way; yes, sir. I do not know why the United States did not choose to intervene in the case of *Arizona* v. *California*. I do not know whether they would in a future case.

Senator KERR. Let me ask you this question: Let us assume for the moment that the position of those parties who say there is no justiciable issue, is correct as of the moment.

Mr. SHAW. Yes, sir.

Senator KERR. The passage of this resolution, as you said a while ago, could not and would not create one; would it?

Mr. SHAW. No, sir. I do not believe Congress can extend the jurisdiction of the Supreme Court. I do not believe Congress can create a lawsuit by its own act, although, of course, the consequences of some kinds of acts of Congress may precipitate a situation which would alter the case.

Senator KERR. If there is a direct authorization of the central Arizona project that would very definitely create a justiciable issue, if one had not previously existed; would it not?

Mr. SHAW. Senator, I am at a loss to give you a positive answer to that question. I say that because the argument which has been made on the other side, that if there is no justiciable cause of action existing now, may lead so far that you would have to have actual construction and diversion of water to such a project before it would create a cause of action, and I cannot accept that view.

Senator KERR. Then let me ask this:

If there is none now, there would more likely be one if an authorization were passed, than exists without one; would there not?

Mr. SHAW. I think on a comparative basis you are correct, sir.

Senator KERR. If, under the compact and under the self-limitation act, and under the language of the congressional enactment in the Boulder Canyon Project Act—is that the proper identification of the act which brought about the enactment of the self-limitation act?

Mr. SHAW. Yes, sir.

Senator KERR. If under those contracts or legislative enactments, or the contract that was created by those enactments, Arizona has the water which she claims, you would not be opposed to her project if it was found to be economically feasible; would you?

Mr. SHAW. Accepting all those if's, I agree with you, sir. I would not be in opposition; if it was an economical project, if it was feasible, and if the water right existed.

Senator KERR. You would have no objection?

Mr. SHAW. We would have no concern with it.

Senator KERR. Then suppose the Congress, recognizing the claims of California as being those which she believes in, and the claims of Arizona, believing in the ones she makes, and the other States proportionately, were to investigate and find that the Arizona project is feasible economically if the water is available, as Arizona claims it is—suppose that based on those assumptions Congress passed a law here which would authorize the central Arizona project on the one hand——

Mr. SHAW. Conditionally?

Senator KERR. But say that in view of the controversy with reference to the water it should not be implemented by appropriations until the controversy had been settled, and in order to expedite that settlement it hereby gives its consent to be made a party to an action, if one is brought by an affected State within a limited period of time, wouldn't that give California her right, her day in court, and her opportunity to establish her rights, and at the same time not impede the progress of the Arizona project in the event it was found to be economically feasible, and in the event the Supreme Court decided that she did have a valid claim to sufficient water?

That is a long and involved question.

Mr. SHAW. That is a very interesting question, and I will give you the best answer I can to it, and the most direct answer that I can.

In my opinion, an authorization which has the kind of hedge that you suggest would not be a genuine or effective authorization, because it would be evident that if the water supply does not exist Congress does not intend to authorize the project; that if it does exist Congress does intend to authorize. It would appear to me that in substance it would be a straddle and not an outright commitment of Congress to any program at all.

For that reason, and since our Supreme Court, as all courts of equity do, takes substance to be more important than form, it would look at this act and find whether in substance it actually did authorize anything, I do not think we would have made any progress by the adoption of the conditional authorization. It would leave the whole matter in so much of a quibble or in such an uncertainty that the Court would not find anything to bite on. That is the way it looks to me, sir.

Senator KERR. Well, would there be any less justiciable issue than now exists?

Mr. SHAW. No, sir; I think not. I think it would, however, be what I called in one of the earlier hearings, a phony authorization, that is, one which Congress demonstrated it did not intend to be bound by.

Senator KERR. Why would you say it was a phony authorization if they find that the project is economically feasible, conditioned only upon Arizona's title to the water, and that they thereby authorized the project conditioned only upon her ability to sustain that position in the Supreme Court?

Now, if that were done and at the same time the law was passed giving consent for the United States to be made a party to the suit, would California have any less justiciable issue, or would she be in any wise in a poorer position by reason of the authorization I have referred to, phony or otherwise?

Mr. SHAW. I would say, in answer to what I understand to be the first part of the question, I do not think there would be any less justiciable issue existing after that process had been gone through; I do not think it would be any better.

Senator KERR. Nor do you think California would be in any more of an unfavorable position than she now is, do you, Mr. Shaw?

Mr. SHAW. It does seem to me it would be somewhat more unfavorable a situation, so far as California is concerned.

Senator KERR. I am talking about her having the right to go into the Supreme Court and the existence of a justiciable issue.

Mr. SHAW. Limiting your question that way, the answer is no, sir.

Senator KERR. You referred a while ago to a case between Arizona and California which held that the United States did have an interest in the controversy, but she was not a party to the litigation and therefore the action was dismissed.

Mr. SHAW. Pardon me, I should be more precise, I think. The holding was that the United States had such an interest in the waters of the river, rather than your expression "interest in the controversy." I do not mean to split hairs, but that was what the Court said, that it had such an interest in the waters of the river it was an indispensable party to a decision of the controversy.

Senator KERR. The United States had such an interest in something involved in the litigation that she was a necessary party to the suit?

Mr. SHAW. Yes, the subject matter, the waters of the river.

Senator KERR. Who brought that suit?

Mr. SHAW. The State of Arizona attempted to bring that suit. It did not succeed in bringing it.

Senator KERR. Who objected to the suit being heard by the Court?

Mr. SHAW. The States of California, Nevada, Utah, New Mexico, Colorado, and Wyoming, all upon the same grounds.

Senator KERR. What was California's objection?

Mr. SHAW. All of the six States in substance argued two main points: One, that there was no justiciable cause of action; two, that the United States was an indispensable party. Those points were stated in two briefs, one filed by California and Nevada, the other filed by Colorado, Wyoming, Utah, and New Mexico. But while the expression of the points was different I think the essence of them was just as I have stated to you.

Senator KERR. Is it a fact that Arizona has tried to get California into the Supreme Court three times, and California has resisted each time?

Mr. SHAW. Yes, sir; and upon very different facts than those existing today.

Senator KERR. But with reference to the same controversy?

Mr. SHAW. No, I think not, Senator.

Senator KERR. Was not the controversy about the waters?

Mr. SHAW. Let me point out to you, Senator, that in the first place the position taken by Arizona on two of these three major issues was exactly the same position that California now takes and has taken for the last 25 years. There was no dispute and no controversy on those issues at that time, and therefore since Arizona and California were agreed upon them, there was no litigation of those issues then.

Senator KERR. Did you understand my question?

Mr. SHAW. I thought I caught it.

Senator KERR. I asked you if Arizona had tried to get California into the Supreme Court with reference to the water rights on the Colorado, three different times?

Mr. SHAW. Oh, yes.

Senator KERR. And that California resisted each time?

Mr. SHAW. That is right.

Senator KERR. Now, if you want to make any further statement it is all right. I just wanted to know whether that was true.

Mr. SHAW. Yes, sir.

May I point out that at the time of those three cases Arizona had not become, or had taken any steps to become, a party to the Colorado River compact. It was not subject to the obligations, nor entitled to the privileges of a member of the compact.

Senator KERR. May I interrupt right there?

Mr. SHAW. Yes, sir.

Senator KERR. The Colorado River does run through Arizona?

Mr. SHAW. Yes, sir.

Senator KERR. And she does have an interest in the waters of the river, or it is understandable how she might think she might have an interest in those waters.

Mr. SHAW. Unquestionably, sir. At that time, however, Arizona was a free-lance, unrestricted by the limitations of the compact, and entitled to appropriate water without limit, as against the other States in the basin. That circumstance was a very important circumstance in the opposition which all of the States made to Arizona in those three cases. They did not consider that the court should undertake—particularly in the last case—to delimit the rights of the six compact States on the one hand, bound as they were by the compact, and of Arizona, which claimed certain interests in view of the Project Act and the limitation on California, but was not willing to accept the burdens of the compact.

In addition, the situation there was, as I previously stated to the committee, that Arizona did not claim at that time that she had made appropriations; she did not claim that there was an insufficiency of water in the river to satisfy her needs.

Senator KERR. She did ask for an adjudication of the rights of the water?

Mr. SHAW. She asked for an adjudication of rights in favor of herself and for a prohibitory injunction limiting the upper States and California and Nevada to given amounts of water as against Arizona.

Senator KERR. All of that was with reference to her claimed rights to water in the river?

Mr. SHAW. Yes, sir.

The situation has further changed since that time in that we have a Mexican treaty. We have now a positive conflict in claims to the water of the lower basin. The water of the lower basin is obviously, I think, in view of the testimony placed before you by the engineering witnesses, insufficient to satisfy the legitimate aspirations of all the lower basin States. There is not enough water to go around. Those circumstances were not present in the case which was started in 1935, and they radically alter the view which we think the Supreme Court would take of it.

Senator KERR. That is all.

The CHAIRMAN. Precisely how much water, in your opinion, is in controversy?

Mr. SHAW. I cannot state that with precision, Mr. Chairman.

The CHAIRMAN. Well, then, approximately how much?

Mr. SHAW. I may describe it in this way. The issue as to the measurement of the consumptive use of water—that is, whether it be the actual consumptive use or a substitute for the actual—being the depletion of the main stem of the river, that issue involves apparently 1,000,000 acre-feet. The issue with respect to reservoir losses involves apparently 900,000 acre-feet, or thereabouts. The third issue is as to who is entitled to the 1,000,000 acre-feet of III (b) water, so that in gross, the subject matter of the controversy would appear to be on the order of 2,900,000 acre-feet.

May I explain, however, that that does not mean that one State or the other would take 2,900,000 acre-feet away from the other. The effect of some of these items is to result in a division of water between them because the effect would be to alter the total amount of surplus of which each State claims a half.

The CHAIRMAN. If an acceptable division between the States of California and Arizona, of this 2,900,000 acre-feet were reached, would that settle the controversy?

Mr. SHAW. You mean acceptable to the two States?

The CHAIRMAN. To the two States.

Mr. SHAW. I assume that any division which is acceptable to them and to the other three States in the lower basin would solve the controversy.

The CHAIRMAN. Well, this is the issue; is it not?

Mr. SHAW. Yes, sir.

The CHAIRMAN. Would you care to say, since you have volunteered in response to my question, that neither State would probably expect all of this water?

Mr. SHAW. I think that is absolutely true, under any interpretation of the issues which the Court might make. It is hard to expect that either State would be entitled to all of that 2,900,000 acre-feet.

The CHAIRMAN. Let me put the question this way——

Mr. SHAW. The effect of the process, sir, is to augment or decrease the amount of surplus which is then divisible 50–50.

The CHAIRMAN. Are you then willing to state to the committee your opinion as to the amount of water of the 2,900,000 acre-feet to which California is entitled, since it is not entitled to it all?

Mr. SHAW. Under the beneficial-consumptive use question, No. 1, it is our contention that Arizona should be charged with the amount of water she actually beneficially uses and consumes on the Gila River system, over and above her depletion of the main Colorado, that being 1,000,000 acre-feet. Arizona claims on the contrary that she gets that water free, that there is no charge to her although she uses it, consumes it, makes crops with it, and makes dollars with it. If that 1,000,000 acre-feet is added to the total water suply of the lower basin the effect is that that water would then be distributed 500,000 to Arizona and 500,000 to California.

Senator DOWNEY. In other words, it would add that much to the surplus?

Mr. SHAW. Yes, sir. The total water supply being increased, the surplus increases.

The CHAIRMAN. I want your total figure.

Mr. SHAW. No. 2, the issue as to the III (b) water; that is 1,000,000 acre-feet which Arizona claims the exclusive right to use. California denies that. That issue may be decided in one of several ways, as the Secretary of the Interior indicated with relation to the whole problem in his report. There might be a division of 500,000 equally to the two States; there might be a division of different fractions. Probably—and I am not making a stipulation here but just sort of a guess——

The CHAIRMAN. Certainly.

Mr. SHAW. Probably that might be divided 50–50.

As to the third issue, the 900,000 acre-feet of reservoir losses, the question there is whether California is to take her 4,400,000 acre-feet of III (a) water net of reservoir losses, or not. If the Arizona theory is established the 4,400,000 acre-feet of III (a) water shrinks to about 3,900,000, I believe. If the opposite theory is sustained that figure of aproximately a half million acre-feet is charged to Arizona, or to Arizona and other States.

The CHAIRMAN. Then California would take——

Mr. SHAW. Would take net 4,400,000 acre-feet.

The CHAIRMAN. That would mean, then, if California were taking net 4,400,000 acre-feet and 500,000 acre-feet out of each of these other issues, that California would have a total of 5,400,000 acre-feet?

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Mr. SHAW. We would have 5,400,000 acre-feet, which is approximately the 5,362,000 acre-feet for which we have contracts.

The CHAIRMAN. So that the controversy here is whether or not California may take—forgetting for a moment this reservoir loss—in addition to the amount of water fixed in the limitation act, 1,000,000 acre-feet?

Mr. SHAW. No, sir. Pardon me for being so positive about that.

The CHAIRMAN. You may be positive. In fact, we want you to be positive.

Mr. SHAW. The limitation act provision is not 4,400,000 acre-feet.

The CHAIRMAN. What is it?

Mr. SHAW. It is 4,400,000 acre-feet of III (a) water, measured by diversions less returns to the river for use in California, plus not more than one-half of the excess or surplus waters unapportioned by the compact. I am trying to indicate that in our view the correct decision of this controversy would, within the terms of the limitation act, permit California to use the contracted water, not in excess of the limitation, but within it, sir.

The CHAIRMAN. Then your contention is that the California Limitation Act does not limit California to 4,400,000 but limits it to that plus sufficient water to enable it to fill all of these contracts?

Mr. SHAW. That is the net effect. The exact provision is:

4,400,000 acre-feet of the water apportioned by paragraph (a) of article III of the Colorado River Compact, plus not more than one-half of the excess and surplus waters unapportioned by the compact.

The CHAIRMAN. I understand, but I am trying to get the figure on this. That is why I asked a question which would elicit a response as to the net effect.

Mr. SHAW. Yes, sir.

The CHAIRMAN. Was I correct, then, in the statement?

Mr. SHAW. The answer to the statement is almost as the chairman stated it. The proposition is not simply that we are entitled under the compact to enough water to fill these contracts. Our statement is that under the limitation we are entitled to the 4,400,000 acre-feet of III (a) water plus half of the unapportioned excess and surplus. That happens to work out to a figure which is somewhat in excess of the contract figures.

May I point out that this is not our opinion alone, but the State of Arizona took the same position in the 1930 case and gave the figures, which added up to something like five million and five or six hundred thousand.

The CHAIRMAN. Mr. Shaw, now you are arguing. Let us postpone the argument. I want to get the facts. I want to get from you, if I may, your statement as to the total amount if water which, in your opinion, California is entitled to. I understood you to say first that it was 4,400,000 acre-feet, the figure in the limitation act, plus certain other amounts of water which would be the total of the amount of water necessary to fill the contracts?

Mr. SHAW. That was the result; yes, sir.

The CHAIRMAN. Then a moment later you said, "a little bit more than that." Which is it, a little bit more or that exact amount?

Mr. SHAW. The total of our rights and claims happens to be slightly in excess of the contract amounts. No one on earth can determine

with precise, hair-line accuracy what the total is because of the variation in the flow of the river from cycle to cycle or from generation to generation. As it has been developed here in the evidence, there may or may not be a trend of the flow of the Colorado River downward, considered on a long-term basis. It might conceivably, on the average, go upward.

I do not consider it possible to say to the acre-foot how much California is entitled to for that reason.

The CHAIRMAN. Of course you are not making a stipulation and I am not thinking that you are making a stipulation. I am trying to get the net effect of your position. Can you state it to me in acre-feet, 4,400,000 plus how much?

Mr. SHAW. Plus not less than 1,000,000, making a total of 5,400,000.

The CHAIRMAN. That is the figure I propounded a little while ago.

Mr. SHAW. Yes, sir.

The CHAIRMAN. Were there any contingencies in these contracts?

Mr. SHAW. Oh, yes. The contracts all read, as do all the contracts in the lower basin, with this contingency: "Subject to availability for use in California" or Nevada or Arizona, as the case may be. That expression is followed by the words to be read together, "Subject to availability under the terms of the Colorado River compact, the Boulder Canyon Project Act," and so on.

The CHAIRMAN. It is my understanding that California does not in any event claim more than this amount?

Mr. SHAW. Does not in any event claim more than the limitation act permits. California in all respects honors and expects to abide by the limitation act.

The CHAIRMAN. You are just contending for an interpretation of the limitation act which will enable you to assert and retain the 5,400,000, approximately?

Mr. SHAW. Yes, sir.

The CHAIRMAN. Regardless of what happens elsewhere? That, of course, follows.

Mr. SHAW. Obviously.

The CHAIRMAN. Is there any possibility that California would be satisfied with less?

Mr. SHAW. I do not know how to answer that question, Senator. I do know that throughout the years debates have occurred on this subject between the States and propositions and counterpropositions without end have been made. California has pinned down from time to time to this or that proposition. I cannot tell you the answer to that question, sir.

I doubt whether as a matter of opinion California could voluntarily concede any part of the 5,362,000 acre-feet and expect her representatives to go home.

The CHAIRMAN. We would invite you to Wyoming, sir, and think we would gain by your coming.

Senator DOWNEY. You do not mean the congressional representatives, you mean they would go home to stay, do you not?

Mr. SHAW. I was thinking of the negotiators. I have participated in those negotiations and I know how seriously and how genuinely they were considered by both States and by all the States.

The CHAIRMAN. I want to call your attention to this fact which is independent of all argument here on either side. It is easy to talk

about submitting this controversy to the Supreme Court. When that statement is heard on the radio or appears in the press the average reader or listener gets the idea that the controversy is to be settled by those nine judges who sit up there. But as practical men we know that the judges will not have any more time to devote to these issues, indeed, they will not have nearly as much time as the members of this committee have already devoted to the problem and that the issue will be referred in the Supreme Court to some master, the identity of whom nobody now in California, Arizona, or Nevada can predict, is that not right?

Mr. SHAW. I do not think so, Senator. I do not look at this situation as being one that calls for the appointment of a master at all. I believe the issues can be framed and they should be framed by cooperative work among the States, so as to present the legal issues which arise from certain facts. I believe that being so it will never go to a master. It will be decided by the Supreme Court just like the last three cases were.

The CHAIRMAN. If the States can make this cooperative effort of which you speak to submit the issues, why can they not make a cooperative effort now to settle the issues by dividing the water?

Mr. SHAW. The answer is, as I have just intimated, Senator, that for any one of the States to concede away, that is to give up, projects for which they have been committed for years and years, is a practical and political impossibility. For them, on the other hand, to take the decision of the Supreme Court when it is rendered and abide by it is something which any of us would concede is a proper and necessary thing to do.

In other words, we can take an adverse decision from the Supreme Court and abide by it while we could not voluntarily concede that that decision was right or that the result was right by agreement. It is a little bit like a man giving up his wife and children by agreement.

The CHAIRMAN. It is acknowledged that California is not now using this water?

Mr. SHAW. That is correct.

The CHAIRMAN. It is using, as I recall it, about 2,500,000 acre-feet, is it not?

Mr. SHAW. No, about 3,300,000 or 4,400,000.

The CHAIRMAN. Well, it is in the record. I understand, however, that you claim to have works already constructed which would utilize this extra water?

Mr. SHAW. Oh yes. The main works are already in existence. During the years to come there will be some distribution works added but mainly the works are finished and in operation.

The CHAIRMAN. If there were any disposition upon the part of Arizona to discuss this issue by cooperative conference and agreement, would there be a disposition on the part of California to cooperate?

Mr. SHAW. Yes, sir. As I stated toward the conclusion of this prepared statement California has never closed the door to the negotiation of the matter. If anyone can develop or point out any system of arrangement between the States which could be acceptable to the States of the lower basin, California would be very much interested. We have not found the formula, Senator.

At the risk of repetition I would say that during the year 1940 we had a series of half a dozen conferences lasting for days and weeks at a time. I believe there was a genuine, sincere effort, a desire, a will on the part of all the States to get together and get something done. When they got down to the arithmetic of the situation, however, it just became as plain as could be that there was not enough water to satisfy the needs.

That means, simply, are you going to give up your needs? Are you going to give up the projects you have built hopes on? One State has invested hundreds of millions of dollars. Are you going to surrender the water for these projects voluntarily?

The unhappy conclusion was arived at in those 1940 conferences that with the best will in the world we could not expect our legislatures to accept a bargain which meant giving up San Diego's right to water or central Arizona's right to water.

The CHAIRMAN. As you put it a few moments ago, a man cannot be expected to give up his wife and children. That is the position of California?

Mr. SHAW. Yes, that is what I mean.

The CHAIRMAN. I suppose the position of Arizona would be that a man cannot be expected to give up his wife and children and also bury himself?

Mr. SHAW. I hope that would be their position. It should be.

Senator ECTON. Mr. Chairman, may I ask the chairman a couple of questions? [Laughter.]

Those questions will be very legitimate.

The CHAIRMAN. I am sure any question the Senator would ask would be legitimate.

Senator ECTON. I just want to know if I am straight on this. Is it your understanding that California is limited by the compact to 4,400,000 acre-feet, plus one-half of the surplus?

The CHAIRMAN. I will say this——

Senator MCFARLAND. By the Boulder Canyon Project Act and the Self-Limitation Act.

The CHAIRMAN. I am not going to express any judgment about the issues involved.

Senator ECTON. What I mean is, is that what Mr. Shaw said?

The CHAIRMAN. The 4,400,000 is a figure taken out of the California Limitation Act. In order to bring about the enactment of the Boulder Canyon Project Act the State of California, through its legislature, adopted this limitation act in which that figure was stated.

Senator ECTON. Yes, I understand that.

The CHAIRMAN. Since that time the controversies have arisen over the interpretation of various clauses in the Colorado River compact. After the passage of that act the State of California entered into certain contracts with the Secretary of the Interior, contracts which contained contingencies or statements of contingencies, these contracts totalling for eventual use, if the water were available, the amounts stated by Mr. Shaw, approximately 5,400,000 acre-feet.

Senator ECTON. I understood Mr. Shaw to say that California was claiming 4,400,000 acre-feet plus one-half of the surplus left in the Colorado River. Is that right, Mr. Shaw?

Mr. SHAW. Yes, sir. May I read the text? It is just a few words. The limitation is to "4,400,000 acre-feet of the waters apportioned

to the lower basin States by paragraph (a) of article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact."

That is the language of the Project Act and of the California Limitation Act.

Senator ECTON. Then is that what Arizona claims, so many acre-feet plus one-half of the remaining surplus in the Colorado River?

Senator MCFARLAND. Arizona, Mr. Chairman and members of the committee, claims the 2,800,000 acre-feet of water mentioned in the next paragraph, which the Congress approved in advance for us. That is the 2,800,000 acre-feet of water less some rights which we recognize in Utah and New Mexico. We also claim the right to the 1,000,000 acre-feet of III (b) water because that is apportioned water under the compact, and California by her Self-Limitation Act limits herself to 4,400,000 acre-feet of water and one-half of the surplus of unapportioned water.

By the next paragraph of this Boulder Canyon Project Act the interpretation of Congress is very clearly shown as to what they meant. Even though California would never agree to that tri-State compact, the act shows what Congress intended by requiring California to so limit herself. California had to accept that interpretation; and she was perfectly willing to accept it at that time and did accept it in perpetuity.

Mr. SHAW. We will accept it now with Arizona's interpretations as of that time.

Senator MCFARLAND. Now, Mr. Chairman, Arizona did not place any interpretation on it at that time. That is just an argument by Mr. Shaw which he knows is not true. The view of Senator Hayden is perfectly plain as to what was done when the Boulder Canyon Project Act was passed.

Senator ECTON. I thought maybe, Mr. Chairman, all we had to determine was what the surplus was, then give 50 percent to California and the other 50 percent to Arizona.

Senator MCFARLAND. I do not believe the upper basin States would consent to that. We recognize the right of the upper basin States to an interest in the surplus waters.

Senator KERR. Does not the compact set forth that all of the States are to meet at a certain time and if they find a surplus to then work out an apportionment of it?

Senator MCFARLAND. That is correct.

The CHAIRMAN. I just want to make one additional remark. This comes out of my experience as a practicing lawyer before I entered the Senate. That seems to be a long time ago now. The worst trouble I ever had, Senator Ecton—and I will address my comment to you—in the practice of law was to get my clients to settle their controversies. Frequently they would be almost ready to fire their lawyers, but I always knew if I could persuade them to settle their controversies they would be much better off.

Senator ECTON. I am sure they would get more water and it would be much cheaper.

The CHAIRMAN. Off the record.

(Discussion off the record.)

Senator MCFARLAND. Mr. Chairman, may I clear up the record on one or two things. I am not going to ask any questions because I

think these matters have been gone over. I would like to state this in order further to answer Senator Ecton's position, and in order that our position may be made crystal clear.

First, I want the record to show that S. 433, which was the predecessor of S. 1175 was introduced on January 29, 1947, a date prior to the time Mr. Shaw mentioned as the date of the writing of this letter from Governor Warren to Governor Osborn, who was then practically on his deathbed.

I want also to state that the proper time—and I think we can do it better by our own evidence in the way of rebuttal—we will show that irrespective of claims, threats, or contracts, the Supreme Court has held there must be an actual damage before there can be a justiciable issue upon which a decision can be rendered—that is, an actual damage or an actual threat of damage, not just mere spoken words. The damage or threat of damage must be constituted by the means to take the water out of the Colorado River before the Supreme Court would hold there was a justiciable issue.

We are convinced of that view partly by the fact that we have three times tried to get into the Supreme Court, and also by some of the things the Supreme Court has said to us in at least one of those cases, which is cited as a precedent in other cases.

We will show by the different precedents, which will be a matter of argument that I do not have time to make now, that the Supreme Court will not take jurisdiction of abstract propositions of law, and that the Court has so held after the declaratory judgment act was passed; and that the former rule in this respect remains the same.

There is one other point I would like to clear up. I see no reason for arguing with the witness about the matter further. That is that there were actual uses in the case of *Nebraska* v. *Colorado and Wyoming*, known as the North Platte case. I know of no better authority than Mr. Brietenstein, one of the participating attorneys who, after citing the case and reading from it, stated on page 202 of the hearings on Senate Joint Resolution 145, at the bottom of the page:

> The important thing is that in that North Platte case the Court, while I disagree with its conclusion of fact, nevertheless found there was an injury and a threat of injury because of the Kendrick project, and there was an injury because of the out-of-priority diversions.

Then I asked him this question:

> May I ask a question? Was the Kendrick project an authorized project?
>
> Mr. BREITENSTEIN. Yes; it was an authorized project, and the main portions of it were constructed while the litigation was going on.
>
> An interesting thing there is the report of the master and the decision of the Court on the basis that the conditions during the drought period of the thirties would continue to prevail; that there would never be any water for the Kendrick project.
>
> Within the same month that the United States Supreme Court announced its decision on that basis the storage of water in the reservoirs in the Pathfinder area was more than adequate to fill Pathfinder, and there is now, I understand, to the credit of the Kendrick project over 400,000 acre-feet of water.
>
> Senator MCFARLAND. I hope it does not take a Supreme Court decision to make it rain in the West now. We need it before that time.
>
> Mr. BREITENSTEIN. We say that the facts involved in this matter now before the committee do not show a situation which will bring the differences which exist here within the rule as laid down by the Supreme Court.
>
> First, there is no threat here at all. The only project which I have heard mentioned is that of the central Arizona. That project is not an authorized project.

It is up to Congress as to whether or not it ever will be an authorized project. But until it is it cannot be said that that project constitutes a threat.

Here I intended to bring out what I have just stated to Senator McFarland: That in the North Platte case the Kendrick project was an authorized project at the time the suit was brought by Nebraska; a difference which, to me, is very material.

Now, Mr. Chairman, I understand the witness does not agree with Mr. Breitenstein and, I take it, not even with the Supreme Court. But those are matters which we can argue later. I just wanted to make it plain that the witness has not shown any means by which Arizona can divert this water, as there is no actual or authorized project, and until there is a means there can be no actual injury.

The fact is, as so ably brought out by the chairman, that California is not now using up to the 4,400,000 acre-feet which is the maximum of her permissible use of apportioned water. So there could not under any circumstances be a justiciable issue. Litigation at this time would only mean that the authorization of Arizona's project would be further delayed.

It is true that we have tried to settle this matter with California for years and years. We have talked settlement to them. This is the position that I take, so far as I am concerned: The only way we could bring this to issue before any court and make it a justiciable issue is to authorize this project. If we do that and a suit is filed, as pointed out by Senator Kerr, the Department of Justice would undoubtedly intervene in the litigation, as it did in the Nebraska versus Colorado and Wyoming case.

The CHAIRMAN. It is now almost 20 minutes after 12. The committee will not sit this afternoon. I think there would be no advantage in attempting to put Mr. Ely on now.

Off the record.

(Discussion off the record.)

Mr. SHAW. Solely to clarify the record, Mr. Chairman, insofar as a threat of injury is necessary to consitute a justiciable controversy, we agree with Senator McFarland that overt acts are necessary to develop a threat. A threat does not exist simply in the mind. We consider that the conduct of Arizona and its advocates in the last few years have been adequate to develop and constitute evidence of a threat by overt acts.

That is all I have in mind.

Senator MCFARLAND. Mr. Chairman, I do not want to further argue that. The Supreme Court has held there was not an authorized project in another case and would not take jurisdiction.

I would like to point out another matter to Senator Ecton that I intended to point out in stating our position. That is, that after years and years of attempting to try to settle this issue and after the governors of the States were designated as arbiters and returned their decision, California would not accept it.

Mr. SHAW. And Arizona would not accept it.

Senator MCFARLAND. Oh, yes. We have even agreed to accept less than that.

Mr. SHAW. Another witness will furnish the facts on that.

Senator MCFARLAND. All right. That will be a basis for the decision. If you will accept the recommendation of the governors there, I will say to you right now we can settle this in 10 minutes. If Cali-

fornia will accept that, that will be the basis for agreement. If you will accept the decision of the board of governors, we will bring this to a close right now. Will you do it?

Mr. SHAW. The Senator may be Arizona, but I am not California.

Senator DOWNEY. Speaking as one of two representatives of the Upper House I want to say that my mind is tolerantly and sympathetically open to any discussion of any possible compromise and any proposals by any of the Senators here would be gratefully received and sympathetically acted upon. I have no knowledge of the matters about which the gentleman is now speaking, so I cannot express any opinion.

The CHAIRMAN. I think this would be a very excellent note on which to bring this hearing to a close.

Senator MCFARLAND. I have not finished my statement to Senator Ecton.

When they passed the Boulder Canyon Project Act, Congress, in effect, forced Arizona to accept even 200,000 acre-feet of water less than was recommended by the Board of Governors. The limitation required by the Project Act and adopted by California was a binding contract upon the State of California, as pointed out in the Boulder Canyon Project Act, for the benefit of Arizona and the other States. Congress forced it on us. We had no choice. We are in here trying to get what Congress said we were rightfully entitled to.

If we should take anything less we would not have anything at all, so you can see where we are.

The CHAIRMAN. The committee will stand in recess, for the purposes of this hearing, until 10:30 on Monday morning. It will stand in recess until 10 o'clock for executive purposes.

(Whereupon, at 12:25 p. m., the hearing was adjourned until 10:30 o'clock, Monday, April 11, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

MONDAY, APRIL 11, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 11 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Anderson, Cordon, Ecton, Malone, and Watkins.

The CHAIRMAN. The hearing will be in order.

Senator DOWNEY. Mr. Chairman, Mr. Matthew will be our first witness. If you will come forward and testify, please, Mr. Matthew.

STATEMENT OF RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA

Senator DOWNEY. Mr. Matthew, you have testified before in this hearing?

Mr. MATTHEW. Yes, sir.

Senator DOWNEY. And you have prepared a written statement?

Mr. MATTHEW. Yes, sir, I have.

Senator DOWNEY. This statement chiefly concerns the engineering features of the central Arizona project?

Mr. MATTHEW. Yes, sir.

Senator DOWNEY. Mr. Chairman, subject to the desires of the committee, again I might suggest that if Mr. Matthew is allowed to read his statement through without interruption and then have questions later, I think we will make progress. It is merely a suggestion and not anything more than that.

The CHAIRMAN. If that is agreeable to the committee, that will be the procedure. The committee members, of course, will have the right to ask any questions they desire, certainly at the conclusion.

You may proceed, Mr. Matthew.

Mr. MATTHEW. Mr. Chairman and members of the committee: My name is Raymond Matthew. I am chief engineer of the Colorado River Board of California. I appear here on behalf of the Colorado River Board of California, which is a State agency created by act of the legislature in 1937. The Board is charged with the responsibility for protecting the interests of California in the waters of the Colorado River. The Board is composed of six members appointed by the Governor, each representing one of the public agencies having

established rights to the use of water or power from the Colorado River.

The California agencies represented on the Colorado River Board of California have rights to Colorado River water which are based in large part upon appropriations that are among the earliest on the river, supplemented by contracts executed with the Secretary of Interior from 1930 to 1934 under the provisions of the Boulder Canyon Project Act. Based upon these established rights, California agencies have made investments and commitments in excess of $500,000,000 for works and facilities authorized by or intimately connected with the Boulder Canyon project. The main works for the diversion, conveyance, and use of Colorado River water, in the aggregate amount of 5,362,000 acre-feet annually, have been constructed and are in operation.

The plans for the Boulder Canyon project and related developments were initiated over 30 years ago and have been consummated chiefly as the result of years of endeavor and the underwriting and financing of construction costs by California interests. It should be noted that Arizona opposed the Boulder Canyon project from the outset, but nevertheless has received large benefits therefrom and now seeks to receive additional benefits therefrom, without cost to Arizona.

In view of these developments, California agencies have expected and still expect to obtain the full amount of Colorado River water to which rights have been established by appropriation and use or by contract under the terms of the Boulder Canyon Project Act, and through the full use of the works and facilities which have been constructed and placed in operation for the purpose. Upon the integrity of these rights and full utilization of the works provided depend the irrigation of about a million acres of land in the Palo Verde, Imperial, and Coachella Valleys, over half of which are now irrigated, and the furnishing of domestic and industrial water supplies for the metropolitan areas of the coastal plain region of southern California from Los Angeles to San Diego and vicinity, with a present population of over 4,000,000.

At this point I would like to divert from this statement, in view of some of the things that have been discussed before the committee, to make this statement:

If California ever had any idea that Arizona actually had a just right to the amount of Colorado River water it now claims, or that the amount of water contracted for with the Secretary of the Interior by California agencies under the Project Act was not within the legal rights of California, the bill containing the limitation provision would not have been accepted by California representatives in Congress; the California Limitation Act would not have been accepted; the water contracts with the Secretary of the Interior would not have been executed; the metropolitan water district aqueduct would not have been built, and the investment of $550,000,000 would not have been made.

No responsible individual or agency in California has ever taken any action toward or had any thought or intention of taking and using any Colorado River water to which Arizona or any other State is justly or legally entitled. The claims and plans of California for use of Colorado River water are less, rather than greater, than was antici-

pated about 1920. No project or use is now contemplated that was not contemplated in the early twenties. In fact, plans for some projects which were contemplated about 1920, such as the 240,000-acre Chuckwalla Desert project have been written off, because it has become evident that the water available to California is not sufficient to supply them. California interests recognize that they are limited to the water supply available under the California Limitation Act and the secretarial contracts, and they have no intention of exceeding those limits.

I would like to call the attention of the members of the committee, Mr. Chairman, to the map on the wall which shows the several developments in California using Colorado River water. Starting from the top and going down, there is, first, the metropolitan aqueduct, diverting at Parker Dam. Construction of Parker Dam and the aqueduct were started in 1934, completed in 1941. It was financed entirely by a bond issue of the metropolitan water district of southern California and the aqueduct was constructed by the district. The aqueduct carries water into the metropolitan area of southern California, and is now serving cities and public agencies extending all the way from the northern end of Los Angeles County down to San Diego. It has a secretarial contract for 1,212,000 acre-feet annually of diversion at Parker Dam.

The next development downstream is the Palo Verde irrigation district. The water appropriation for that project was made in the seventies and the project has steadily gone forward since that time. It anticipates the irrigation of about 100,000 acres of land in the Palo Verde Valley and adjacent mesa. Slightly over half that area is now irrigated. It has its own diversion. It has diverted water by gravity from the start of the project.

Coming on downstream we have part of the Yuma project in California which originally diverted water from Laguna Dam and now is served chiefly from the Imperial Dam and the All-American Canal. About 25,000 acres in that project ultimately will be served.

The All-American Canal project was authorized by the Boulder Canyon Project Act in 1928; construction started in 1934. Water was put through the canal to serve the Imperial Valley starting in 1941. It has a capacity of 10,000 second-feet which is based upon the original water appropriations made in the nineties contemplating the irrigation of about a million acres of land in the Imperial Valley.

When the All-American Canal was investigated in about 1918 by a Federal board, the plans recommended for the project were based upon that same capacity, substantially 10,000 second-feet. It is now completely built, including the Coachella branch, extending to the Coachella Valley where about 100,000 acres will be irrigated.

The Colorado River Board of California is vitally concerned in the project sought to be authorized by S. 75 or the proposed central Arizona project as reported upon by the Secretary of the Interior because the diversion and use of water proposed thereby would, if consummated, threaten seriously to invade the established rights and interests of California in and to the use of Colorado River water, and seriously to impair the economy of half of the State of California, measured in terms of present as well as reasonably prospective population. The entire State of California shares in this concern. Accordingly, the Colorado River Board, as the responsible State agency, ap-

pears in opposition to the passage of S. 75 and to the authorization of the proposed central Arizona project as reported upon by the Secretary of the Interior. This opposition is concurred in by Gov. Earl Warren in the views and recommendations of the State of California on the proposed project, which were submitted to the Secretary of the Interior on Decmber 29, 1948, and which have been transmitted by the Secretary of the Interior to the Congress and therefore are within the official purview of this committee. A copy of these comments is hereby submitted to the committee with the request that said comments be incorporated in and be made a part of the printed hearings on S. 75. Mr. Chairman, I have copies of the official comments of the State of California for the committee.

The CHAIRMAN. They will be received.

(The document referred to above is filed with the committee.)

COMMENTS ON S. 75

Mr. MATTHEW. The bill S. 75 before this committee seeks to authorize the construction of works and facilities upon which no engineering report has been made by the Secretary of the Interior. The proposed authorization, insofar as works and facilities are concerned, is in general terms and of such indefinite scope as to preclude the possibility of preparing an estimate of what the cost and economic and financial aspects thereof would be. The project described in the engineering report submitted by the Secretary September 16, 1948, differs materially from the project proposed in S. 75.

For example, section 1 of S. 75 contains the following generalities:

Beginning page 2, line 18:

(3) Such other canals, canal improvements, laterals, pumping plants, and drainage works as may be required to effectuate the purposes of this act;

Page 3, line 2:

(5) Such appurtenant dams and incidental works, including interconnecting lines to effectuate coordination with other Federal projects, flood-protection works, desilting dams, or works above Bridge Canyon. * * *

Page 3, line 7.

* * * such dams on the Gila River and its tributaries in Arizona as may be necessary in the opinion of the Secretary for the successful operation of the undertaking herein authorized.

As contrasted with the project reported upon by the Secretary of the Interior, which would comprise definitely described units for the most part, the description of the works sought to be authorized by S. 75 is so general and indefinite in scope in the particulars cited that its approval would constitute a "blank check" authorization involving an obligation on the Federal Treasury of indeterminate magnitude, covering as many dams, power plants, and transmission lines as the Secretary might be of a mind to build.

Furthermore, the bill seeks to authorize (p. 2, line 12):

a system of main conduits and canals, including a *tunnel* and main canal from the reservoir about the dam at Bridge Canyon. [Emphasis supplied.]

In other words, this bill proposes to authorize the construction of a tunnel extending from Bridge Canyon Reservoir which, according to previous preliminary reports of the Bureau of Reclamation, would be some 80 miles in length. That is continuous. It is true that the bill

provides that the construction of this tunnel would be deferred until Congress determines that economic conditions would justify its construction; and in lieu thereof would authorize the immediate construction of a pumping system to divert Colorado River water at a point near Parker Dam several miles below Bridge Canyon Dam. The report of the Secretary of the Interior (Project Planning Report No. 3, 8b. 4–2, December 1947) and the cost estimates and financial analyses of the proposed project as presented in that report include the pumping plan only and make no provision for the additional cost that would be entailed in the construction of the 80-mile tunnel which the bill would authorize. However, the bill, if approved as written, would place an obligation upon the United tSates Treasury for the additional cost of the tunnel.

The cost and financial aspects of the proposed project sought to be authorized in the bill, even excluding the generalities previously referred to herein, would be entirely different from those presented for the project as planned and presented in the Secretary's report. It is estimated that the subsequent additional construction of the 80-mile tunnel and connecting facilities would increase the total cost of the project from $738,408,000 as estimated in the Secretary's report to $1,287,142,000, both based upon July 1947 prices.

As far as known no financial analyses have been made by the Bureau of Reclamation of the proposed project with the inclusion of the diversion tunnel and aqueduct from the Bridge Canyon Reservoir, as proposed to be authorized in the bill. Incidentally, the proposed future substitution of a gravity tunnel diversion for the pumping plan proposed to be initially constructed, under the provisions of the bill, would involve the abandonment of pumping plants and facilities and a portion of the initially constructed canal with an aggregate cost estimated by the Bureau at nearly $43,000,000, with little, if any, possibility of salvage credit.

The bill S. 75, instead of providing for the authorization of a project on which an engineering report has been made by the Secretary of the Interior setting forth definite estimates of anticipated cost and plans for repayment, proposes to give "blank check" authorization to a project embracing works and facilities generally described but of indefinite scope and cost. The bill merely provides (sec. 3) that the estimated cost shall be determined by the Secretary together with allocations of the cost to the several purposes served including nonreimbursable and reimbursable costs; and finally that—

> before any construction work is done or contracted for, the Secretary shall first determine that costs allocated to power, municipal water supply, irrigation, or other miscellaneous purposes as herein provided shall probably be returned to the United States: *Provided*, That the repayment period for costs so allocated shall be such *reasonable period of years*, not to exceed the *useful life of the project*, as may be determined by the Secretary. [Emphasis supplied.]

The expressions underlined in the foregoing quoted language of the bill are entirely foreign to the principles and standards of repayment as provided by existing reclamation law. The question naturally arises as to what would be considered a "reasonable period of years" and the "useful life of the project." It is within the power of the Congress to determine and authorize the terms of repayment of any reclamation project, which may differ from the general provisions of existing law. However, it has been the policy of Congress to set a definite period of

repayment in any case. This bill would turn this over to the discretion of the Secretary of the Interior.

Furthermore, it is desired to contrast the foregoing quoted language in section 3 of the bill and the comparable provisions of the Boulder Canyon Project Act (sec. 4, par. (b)) which read as follows:

> Before any money is appropriated for the construction of said dam or power plant, or any construction work done or contracted for, the Secretary of the Interior shall make provision for revenues by contract, in accordance with the provisions of this act, adequate in his judgment to insure payment of all expenses of operation and maintenance of said works incurred by the United States and the repayment, within 50 years from the date of the completion of said works, of all amounts advanced to the fund under subdivision (b) of section 2 for such works, together with interest thereon made reimbursable under this act.
>
> Before any money is appropriated for the construction of said main canal and appurtenant structures to connect the Laguna Dam with the Imperial and Coachella Valleys in California or any construction work is done upon said canal or contracted for, the Secretary of the Interior shall make provision for revenues, by contract or otherwise, adequate in his judgment to insure payment of all expenses of construction, operation, and maintenance of said main canal and appurtenant structures in the manner provided in the reclamation law.

The business-like procedure provided under the Boulder Canyon Project Act has been successfully carried out. It is wholly abandoned with respect to the proposed central Arizona project, which would become a major beneficiary of the Boulder Canyon project.

Aside from the questionable merits of the proposed central Arizona project as reported to the Congress by the Secretary of the Interior, it is submitted that in view of the fact that the bill S. 75 seeks to authorize a system of works and facilities of indefinite scope that does not conform to the project reported upon by the Secretary and because of the "blank check" character of the authorization sought, which if approved would place an unlimited financial obligation upon the United States Treasury, the bill in the form pending before the committee should be disapproved.

COMMENTS ON PROPOSED CENTRAL ARIZONA PROJECT

Regardless of the general character of the authorization sought to be provided by S. 75, it is assumed that the basic proposal before this committee for consideration is the authorization of the so-called central Arizona project as defined and reported upon by the Bureau of Reclamation in Project Planning Report No. 3, 8b.4–2, dated December 1947, which report, after being referred to the affected States and interested Federal departments for comment, was transmitted to the Congress by letter dated September 16, 1948, from the Secretary of the Interior.

The Secretary's letter of September 16, 1948, contains the following statement and recommendation:

> Assurance of a water supply is an important element of the plan yet to be resolved. The showing in the report of the availability of a substantial quantity of Colorado River water for diversion to central Arizona for irrigation and other purposes is based upon the assumption that the claims of the State of Arizona to this water are valid. It should be noted, however, as the regional director and the Commissioner of Reclamation have pointed out, that the State of California has challenged the validity of Arizona's claim. If the contentions of the State of Arizona are correct, there is an ample water supply for this project. If the contentions of California are correct, there will be no dependable water supply available from the Colorado River for this diversion. While the

necessary water supply is physically available at the present time in the Colorado River, the importance of the questions raised by the divergent views and claims of the states is apparent. The Bureau of Reclamation and the Department of Interior cannot authoritatively resolve this conflict. It can be resolved only by agreement among the States, by court action, or by an agency having jurisdiction. The report is therefore transmitted to the Congress for its information and such action as it deems appropriate under these circumstances. I feel confident that, in considering the project, the Congress should and will give this conflict the full consideration it deserves. The submission of this report is not intended in any way to prejudice full consideration and determination of this controversial matter.

In view of the urgent need for power from Bridge Canyon Dam and for irrigation and domestic and industrial water supplies in central Arizona, I recommend that if the claims of Arizona are correct to a degree which will provide the necessary water supply, the project be authorized for construction in accordance with the recommendations of the Commissioner of Reclamation.

In accordance with the usual procedure, the report of the Bureau of Reclamation on the central Arizona project was transmitted on May 27, 1948, to the Bureau of the Budget for review. The views of the Bureau of the Budget were transmitted to the Secretary of the Interior by letter dated February 4, 1949. The conclusions of the Bureau of the Budget are quoted from that letter as follows:

From an examination of the report, of the comments of the affected States, and of the remarks of other interested Federal agencies, it is apparent that there are a number of important questions and unresolved issues connected with the proposed central Arizona project. The provision of adequate water supply, if found to be available, is admittedly a high cost venture which is justified in the report essentially on the basis of an urgent need to eliminate the threat of a serious disruption of the area's economy. Even so, the life of certain major parts of the project is appreciably less than the recommended 78-year pay-out period. The work could be authorized only with a modification of existing law or as an exception thereto. Furthermore, there is no assurance that there will exist the "extremely important element" of a substantial quantity of Colorado River water available for diversion to central Arizona for irrigation and other purposes.

The foregoing summary and the project report have been reviewed by the President. He has instructed me to advise you that authorization of the improvement is not in accord with his program at this time and that he again recommends that measures be taken to bring about prompt settlement of the water rights controversy.

The foregoing quoted views of the Director of the Bureau of the Budget seem to be clear and unequivocal to the effect that the proposed project should not be authorized at this time and that measures should be taken to bring about a prompt settlement of the water rights controversy. However, it appears that subsequently certain Members of the Congress raised a question as to the interpretation to be placed upon the last clause of the last sentence with reference to settlement of the water-rights controversy. In response to this inquiry, the Director of the Bureau of the Budget wrote the chairman of this committee, the Honorable Joseph C. O'Mahoney, on February 11, 1949, stating in part as follows:

In order that there may be no misunderstanding of the President's position, I shall be grateful if you will advise the members of your committee that the President has not at any time indicated that suit in the Supreme Court is the only method of resolving the water-rights controversy which is acceptable to him. On the contrary, the letters addressed to the Congress last year, as indicated above, stated specifically that enactment of the resolution authorizing suit would be acceptable to the President, "if the Congress feels that it is necessary to take such action in order to compose differences among the States with reference to the waters of the Colorado River."

The project report and materials relating to the positions of the several States affected are now before your committee for consideration. If the Congress, as

a matter of national policy, makes a determination that there is a water supply available for the central Arizona project, the President will consider all factors involved in any legislation to authorize the project and will inform the Congress of his views respecting the specific provisions of this legislation.

Mr. Chairman, the next part of my formal statement takes up a brief discussion of the settlement of the water-rights controversy. That will be gone into in much greater detail by Mr. James H. Howard of the legal counsel. To save the time of the committee, I will just pass over that. It will be a part of the record, I assume.

The CHAIRMAN. You mean you would like to have that material which you are skipping, included in the record nevertheless?

Mr. MATTHEW. Yes, sir.

The CHAIRMAN. Without objection, it is so ordered.

(The material referred to above is as follows:)

SETTLEMENT OF WATER-RIGHTS CONTROVERSY

As stated by the Secretary of the Interior in his letter of September 16, 1948, as previously quoted, in discussing the water-rights controversy between Arizona and California:

The Bureau of Reclamation and the Department of the Interior cannot authoritatively resolve this conflict. It can be resolved only by agreement among the States, by Court action, or by an agency having jurisdiction.

The expression "agency having jurisdiction" is not explained in the Secretary's letter. In the letter of the Commissioner of Reclamation dated January 26, 1948, transmitting the report on the proposed project to the Secretary of the Interior, the expression used is "an agency having *proper* jurisdiction." [Emphasis supplied.] The Secretary of the Interior informed Senator William F. Knowland, by letter of April 30, 1948, that the Commissioner of Reclamation in using the expression referred to "had in mind the possibility that the dispute might somehow be resolved by the Congress itself or might become the subject of arbitration."

It is the position of the Colorado River Board that such an interstate dispute can be resolved by one of only three methods: (1) Negotiation, (2) arbitration, or (3) litigation. The precedent and procedure are well-established in the Western States, if not throughout the Nation, that in cases of dispute between two or more States over the rights to water on an interstate stream such dispute should if possible be settled by negotiation leading to an agreement or compact. If an agreement cannot be reached, it has been the usual practice to submit the issues for judicial determination and settlement by the Supreme Court. Arbitration offers an alternate procedure to litigation, but difficulties are involved in setting up a proper tribunal whose findings would be equally as acceptable as a decree of the United States Supreme Court.

However, it is submitted that the suggestion that has been made to the effect that the Congress or a committee thereof can resolve an interstate water controversy such as exists between Arizona and California is untenable. The issues between Arizona and California are substantial and complex, involving matters of legal interpretation which cannot be authoritatively decided by the Congress. Therefore, unless an agreement can be reached by negotiation between the States or possibly by arbitration, the only agency having proper jurisdiction

and capable of making an authoritative determination of the legal issues involved is the United States Supreme Court. Although the Congress could, if it should so decide, authorize the proposed central Arizona project, such authorization could not and would not settle the water-rights controversy.

On March 3, 1947, Gov. Earl Warren, of California, addressed letters to Gov. Sidney P. Osborn, of Arizona, and Gov. Vail N. Pittman, of Nevada, requesting their cooperation in an early settlement of the water-rights controversy and suggesting consideration of the three procedures in order of preference, namely, (1) Negotiation, (2) arbitration, and (3) litigation. Governor Osborn replied on March 12, 1947, stating in effect that the issues had already been determined by the Colorado River compact, the Boulder Canyon Project Act and contracts with the Secretary of the Interior thereunder, and California Limitation Act, all in accordance with Arizona's contentions; and indicated that in his opinion there was nothing further to negotiate, arbitrate, or litigate. Governor Pittman, of Nevada, replied that he would be glad to cooperate in reaching a settlement but that, in his opinion, litigation offered the only promising solution.

It is well known that sincere efforts have been made between representatives of the lower-basin States over the past 25 years or more to reach an agreement on the respective rights of those States to Colorado River water, particularly of California and Arizona. These efforts have failed thus far. Furthermore, it appears that an acceptable settlement would be difficult to reach by arbitration due to the fact that the differences in the contentions of California and Arizona are too great. Therefore, since it now appears that litigation before the United States Supreme Court offers the only solution that would authoritatively resolve the controversy, it is proposed by California that necessary legislation be enacted by the Congress which would permit the issues to be litigated before the United States Supreme Court. For this purpose, joint resolutions have been introduced in both the Senate and the House of Representatives by all of the California and Nevada Senators and Representatives (S. J. Res. 4 and H. J. Res. 3, et al., 81st Cong.) Senate Joint Resolution 4 is now pending before this committee. The Governor of California, the State legislature, the Colorado River Board, and other administrative agencies of California are united in urging its adoption.

ENGINEERING FEASIBILITY

Mr. MATTHEW (continuing). The engineering feasibility of the proposed central Arizona project is questionable in several respects. In the first place, it lacks the first prerequisite of engineering feasibility, namely, an assured and adequate water supply. Arizona's legal right to the water supply sought to be diverted and used from the Colorado River for the proposed project, in addition to the existing and authorized projects, is yet to be determined. Furthermore, if the water requirements of existing and authorized projects together with recognized commitments in the lower basin are fully met, there would be no water physically available for the proposed project. In the second place, the water requirements of the proposed project, upon which the plans, particularly for the aqueduct system, are based are grossly overestimated, considering the stated objective of the project as

being a purely "rescue" undertaking. This is an item of equal importance to water supply as an essential element of engineering feasibility. In the third place, the entire conception of the general plan for the proposed project is of questionable soundness and justification in view of the stated primary objective of the project.

It appears that the proposed project would be feasible from an engineering standpoint as stated in the Bureau report in that it would offer no major physical obstacles in the construction of the works, provided sufficient funds were provided for the purpose. However, the plans and cost estimates are based on preliminary investigations for some of the major features, and were prepared without adequate surveys, explorations, and design plans. Hence the physical feasibility of construction has not been fully determined in all cases. Furthermore, there is no assurance at this time that all of the proposed plans of operation and indicated accomplishments could be effected.

CONCEPTION OF GENERAL PLAN

The stated primary objective of the proposed central Arizona project is to provide a supplemental water supply for 600,000 to 725,000 acres of irrigated lands situated in the Salt River and Gila River Valleys in central Arizona, to meet an existing water shortage and preserve and maintain the lands now irrigated. For this purpose, the proposed plan for the main service area contemplates development of additional water suplies from local sources by the enlargement of the Horseshoe Dam on the Verde River and the Buttes Dam on the Gila River and an aqueduct which would divert 1,200,000 acre-feet annually from the main Colorado River. Diversion from the Colorado River would furnish 90 percent of the total supplemental water supply of the project. However, the general plan in addition proposes certain developments above Hoover Dam on the Colorado River and tributaries—the Bridge Canyon, Bluff and Coconino Dams—and other units on the upper Gila River and its tributaries—the Hooker Dam, Safford Valley improvements, and the Charleston Dam on the San Pedro River—none of which have any necessary interconnection or interrelation with the other units of the project.

The Bridge Canyon Dam and power plant and the Bluff and Coconino Reservoirs are not a necessary part of the proposed central Arizona project, from the standpoint of its primary objective. These units could not and would not conserve any additional water or provide any part of the supplemental water supply proposed to be used by the project. The only justification for including these units as a part of the project is to furnish power to pump the 1,200,000 acre-feet of water proposed to be diverted from the Colorado River through the aqueduct into central Arizona. However, the Bridge Canyon power development could provide a source of power for such purpose without its being included as an integral part of the proposed project. Power could be purchased therefrom or from other available sources for project pumping just as is done in the case of the Colorado River aqueduct of the Metropolitan water district of southern California from the Hoover Dam power development.

The chief reason for inclusion of Bridge Canyon power development as a unit of the central Arizona project is to provide a source of reve-

nue to finance most of the cost of the project. It is proposed to sell power produced at Bridge Canyon at a price which would repay the entire capital cost of the project and much of the annual operation and maintenance expenses, since the irrigation water users will be incapable of paying any of the capital costs of the project properly chargeable to irrigation.

The inclusion of such a power development, merely for the purposes stated, would be a departure from past precedent and policy of reclamation development. Heretofore, power development has been incidental to the conservation, regulation, and conveyance of water for reclamation projects. The power produced in some cases may be used in part for pumping of project water, or partly or wholly sold to produce revenues which will financially aid the project. However, it is obvious that the Bridge Canyon power development is not in this category. It could be authorized and constructed, entirely independent of the water supply units of the central Arizona project. Since it is not a necessary part of the project from the standpoint of developing and supplying water for the project, there is no justification for including the Bridge Canyon power development as a unit of the proposed Central Arizona project and dedicating all of the power revenues therefrom to financing the cost of an uneconomic irrigation undertaking.

At this point may I divert from the prepared statement to quote from reports of Federal departments in regard to this particular matter.

The Federal Power Commission, in its comments filed with Secretary of the Interior on May 21, 1948, had the following to say, quoting from that report:

> The Commision staff has reviewed the Bureau's report and points out that the Bridge Canyon project and its two auxiliaries, Bluff and Coconino Reservoirs, have no essential physical relationship with the central Arizona diversion project. These reservoirs are not needed to regulate flow for the central Arizona diversion, nor would the Bridge Canyon power plant necessarily be the only source of power available for pumping from Lake Havasu into the Granite Reef aqueduct. The only relationship between the three reservoirs as a group and the diversion project appears to be the assumed financial relation in order to provide means for repayment of a large percentage of the reimbursable costs of the diversion project chargeable to irrigation.

That ends the quotation from the Federal Power Commission comments with respect to these aspects of the central Arizona project as reported by the Secretary of the Interior.

The most essential structure for the furnishing of supplemental water supply for the proposed project is a project already built and in operation, namely, Hoover Dam. The physical availability of the 1,200,000 acre-feet of water proposed to be diverted by the project from the Colorado River is wholly dependent on the conservation and regulation of Colorado River water by Hoover Dam in Lake Mead. The report proposes to obtain a water supply conserved and regulated behind Hoover Dam, at no cost to the central Arizona project. It is also proposed to use Hoover power plant and Lake Mead to firm up the output of the Bridge Canyon power plant, at no cost to the proposed project.

Another existing development which would perform a valuable function for the proposed project, at no cost thereto, is the Parker Dam, behind which the waters of Lake Havasu are stored and from

which the pumping units of the proposed project would lift water into the Granite Reef aqueduct. Although this dam was built by the Department of the Interior, it was paid for entirely by the Metropolitan Water District of Southern California.

The upper Gila and San Pedro units proposed to be included in the central Arizona project have no necessary connection with the main service area of the central Arizona project. Their function and purpose would be to take care of separate local problems and needs. The Hooker Dam and Reservoir would provide for flood control and the regulation of stream flow on the upper Gila River, for the benefit of presently irrigated lands in the vicinity of Cliff and Red Rock and in the Duncan-Virden Valley. The principal function of the Safford Valley improvements would be to conserve and utilize the existing water supply to the best advantage. The primary functions of Charleston Dam would be to provide a municipal water supply for the city of Tucson together with flood control and additional regulation of irrigation supplies in the San Pedro River Basin.

The plans for these projects, exclusive of Hooker Dam, were formulated by the Corps of Engineers of the United States Army as a result of investigations authorized by the Congress. These units, which deal with separate local problems, could be authorized and constructed independent of the works proposed for the main service area of the proposed project.

At this point, Mr. Chairman, I would like to digress to refer to comments of the Department of the Army in regard to this matter, comments which were filed on May 12, 1948, with the Secretary of the Interior, quoting as follows from that report:

> However, since the central Arizona project is composed of individual units and interrelated groups of units which are not mutually interdependent for adequate functioning, it is believed that action on certain of these units and groups need not be delayed pending settlement of legal and economic questions for the project as a whole, but that they may properly be considered on their own merits as separate units or groups of related units.
>
> The Corps of Engineers is now studying a group of related units included in the central Arizona project. These units consist of improvements in the Safford Valley, the Buttes Dam and power plant, the Charleston Dam, and the Tucson water supply aqueduct. This group is urgently needed and does not depend upon importation of Colorado River water or upon subsidization by Colorado River power. This group will be reported upon separately by this Department at a later date.

That is the end of the quotation from the Army report.

In addition to the fact that several of the units of the proposed project have no necessary interconnection with the stated primary objective of furnishing supplemental water to the main service area, it appears that the general plan has been conceived without mature consideration.

In particular, insufficient consideration has been given to the possibility of additional conservation and utilization of local water supplies to meet the needs of the main service area. It seems apparent that a less costly solution than that proposed could be found by a more careful consideration and application of local water supply conservation and use.

At this point, Mr. Chairman, may I divert to refer to comments, first, of the Federal Power Commission, and of the Department of Agriculture. First, a comment of the Federal Power Commission

on this general subject as to the conception of the plan and the adequacy of the plans:

The Commission staff believes that the Glen Canyon Reservoir project on the Colorado River upstream from the Bridge Canyon site should be initiated very soon after the Bridge Canyon Reservoir is constructed. This will be necessary to prolong the period of usefulness of the storage capacity at Bridge Canyon which would otherwise probably be entirely filled with silt in from 40 to 50 years, even with the Bluff and Coconino Reservoirs constructed with the capacities proposed in the report. Bluff and Coconina reservoirs being off the main stream, would be of no assistance in reregulating the depleted flows from the upper basin above confluence of the San Juan River to meet the 10-year average requirements under the Colorado River compact. Without major upstream storage on the main Colorado River, such as at the Glen Canyon site, as the Bridge Canyon active storage capacity is gradually reduced by silt deposits, this project and the firm power available therefrom, would become more sensitive to the upper basin depletions and withholdings of water in headwater storage, and would gradually assume the character of a run-of-river plant. The Glen Canyon Reservoir would obviate the necessity of the Bluff Reservoir, insofar as silt storage is concerned, or at least would defer the necessity of Bluff.

Senator MALONE. Could I be excused?

The CHAIRMAN. Certainly.

Senator WATKINS. I would like to be excused, if I may.

The CHAIRMAN. Certainly.

Mr. MATTHEW. One more quotation from the Department of Agriculture comments in regard to the adequacy of the plans quoting from those comments:

The contemplated reservoirs will be rendered useless by sediment within a comparatively few years if nothing is done to reduce erosion. It seems clear from the foregoing that the proposed central Arizona project must be supported by projects and activities not contemplated in the report; in particular, by upper basin reservoirs and a program of land treatment.

That is the end of the quotation from the Department of Agriculture comments.

The CHAIRMAN. Mr. Matthew, we are sorry your statement has to be interrupted at this point. The Senate is about to go into session. The calendar will be called this morning, so that we will have to defer until tomorrow morning at 10 o'clock the completion of your statement.

The committee stands in recess until 10 o'clock tomorrow morning.

(Whereupon, at 12 noon, the committee adjourned until 10 a. m. of the following day, Tuesday, April 12, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

TUESDAY, APRIL 12, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:10 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Anderson, Kerr, Ecton, Watkins, Malone.

The CHAIRMAN. The hearing will be in order.

Senator DOWNEY. Mr. Matthew, will you take the stand, please.

STATEMENT OF RAYMOND MATTHEW—Resumed

Mr. MATTHEW. Yesterday, I had reached the subject of water requirements.

WATER REQUIREMENTS

The water requirements of the proposed central Arizona project, in terms of supplemental water supply needed to maintain lands now under irrigation, are grossly overestimated by the Bureau in the report under review. This is due in part to admitted inadequancies in the data required to determine the amount of existing water shortage or deficiency but in larger part to fallacies and errors in the computations.

The requirements are estimated erroneously on the basis of gross surface water supply diversion, instead of on the proper basis of consumptive-use requirements. This error in itself results in an overestimate of 78 percent as to the water requirements in the main service area of the project comprising the Maricopa and Pinal units. The overdraft on underground water is erroneously computed as the difference between gross pumpage and estimated safe ground water yield, whereas the consumptive use draft on water pumped from underground should be used in such a computation, since it constitutes the net withdrawal from ground water. This error involves an overestimate of about 47 percent.

In estimating the supplemental water requirements for a project such as the central Arizona project, where both surface and underground water supplies are utilized, and the groundwater basin operates as a reservoir for the storage of water applied to the land in excess of

actual consumptive use and also for the storage of stream flow and rainfall, all of which is available for utilization by pumping from wells, the supplemental requirements must be determined on a consumptive-use basis. If a supplemental water supply were brought in and applied to the existing irrigated acreage in the amount as estimated by the Bureau on a gross surface diversion duty basis, it would be so excessive as to waterlog the lands and require costly works for artificial disposal thereof.

The estimates of safe ground-water yield are preliminary approximations which may be in serious error. As pointed out in reports of the United States Geological Survey, the data and studies on which these preliminary estimates are based are inadequate. Before final estimates can be made, a large amount of additional data and extensive studies will be required for one of the most important units of the project, namely, the Maricopa unit, which embraces the older established irrigation projects of the Salt River Valley and vicinity.

A break-down of the Bureau's estimates of requirements for the Maricopa unit shows that the average available irrigation water supply is more than sufficient for the present irrigated acreage; that the excess surface water supply balances the indicated net overdraft on the ground water; and that, exclusive of such amount of water that may be found needed for maintenance of salt balance, there is no water deficiency in the Maricopa unit with the existing average water supply for the acreage now irrigated. Studies show that the bulk of the shortage in present water supply, both surface and underground, for the existing irrigated acreage of the project is in the Pinal unit and that most of that indicated deficiency is on recently developed lands surrounding and adjacent to the San Carlos project, irrigated by pumping from wells.

The Bureau's estimate of supplemental requirements includes a full surface water supply for 73,500 acres of so-called idle lands which are stated to have an irrigation history, but not now irrigated for lack of water. Actually the Bureau's estimated requirement for this purpose is an arithmetical quantity, computed as the difference between the sum of the estimated requirements for ground water overdraft and supplemental surface water supply and a total irrigation demand of 1,070,000 acre-feet annually, which appears to be a preconceived requirement.

The location of such so-called idle land is not revealed in the report except in general terms. It seems probable that such area constitutes mostly, if not wholly, the usual percentage of idle or fallow lands that are customarily found in all irrigation projects, and which usually amounts to 10 to 15 percent of the gross project area. Therefore, the need for any additional new water for such so-called "idle lands" is highly questionable in view of the representation that the proposed undertaking is a "rescue project." The Bureau's estimate of the water requirement for such lands constitutes about 40 percent of the total estimated requirement.

Independent estimates of the supplemental water requirements for present irrigated lands in the Maricopa and Pinal units of the project, which constitute the main service area of the project where all of the irrigation water shortage exists, indicate that the total supplemental requirement amounts to 312,000 acre-feet annually, including an

allowance of 142,000 acre-feet outflow for maintenance of salt balance. Of this total requirement, 120,000 acre-feet annually, according to Bureau estimates, could be furnished from the development of additional local water supplies on the Verde and Gila Rivers, leaving a balance to be supplied from other sources of 192,000 acre-feet annually delivered on the project. If this requirement were supplied from the Colorado River, the gross diversion requirement would be 300,000 acre-feet annually, or only one-fourth of the 1,200,000 acre-feet annually proposed to be diverted according to the Bureau's plans for the proposed project.

The main service area, as defined by the Bureau, comprising the Maricopa and Pinal units, does not include about 50,000 acres of lands irrigated by pumping from wells in the Eloy area south of and adjacent to the Pinal unit. These adjoining lands could not be prevented from obtaining project water, inasmuch as the ground-water basin is continuous and pumps in the Eloy area would undoubtedly draw upon project water. It is estimated that this adjoining Eloy area has a deficiency in present water supply, which is entirely from underground sources, of 135,000 acre-feet annually; and that, if this deficiency were met by water diverted from the Colorado River, a total supplemental water supply of 169,000 acre-feet annually would be required, including 34,000 acre-feet for salt balance.

Based on these independent studies, the total supplemental water requirements for all of the present irrigated acreage in the central Arizona area, which according to proponents of the project aggregates 725,000 acres, is estimated at 327,000 acre-feet annually. If this supplemental supply were obtained from the Colorado River, the requirement for delivery to the project would be 409,000 acre-feet, including additional allowance for salt balance of the imported supply, and the corresponding required gross diversion would be 500,000 acre-feet annually.

Of the total 327,000 acre-feet of supplemental water needed, excluding salt-balance requirement for an imported supply, 247,000 acre-feet or three-fourths of the total requirement would be needed to meet the present deficiency in water supply on the lands irrigated by pumped water, situated in the areas adjoining the San Carlos project in the Pinal unit and the adjacent Eloy area. Most of this irrigated acreage comprises newly developed lands which, according to available information, have been placed under irrigation within the last 9 years and mostly during the last 5 years. The new irrigation development has resulted partly from the speculative opportunity for large profits from high crop prices and partly from a desire to establish rights to use of water prior to the passage of a State water code. It has occurred with full knowledge of the inadequate and limited water supply available.

Much of these newly developed lands have been purchased by the operators from the State of Arizona. A substantial part is in large holdings ranging from 1,000 to over 6,000 acres in single family ownerships. Most of these lands are in family holdings of over 160 acres. Few farm homes are seen on these new lands. From the best information available, there are not less than 150,000 to 200,000 acres of these recently developed lands under pump irrigation in central Arizona.

The studies show that most of the over-all indicated water shortage in the main service area of the proposed project is within these newly

developed lands, and not within the older established irrigation projects of the Salt and Gila River Valleys. Therefore, the main effect and purpose of the proposed project would apparently be to rescue or bail out these newly developed lands which were put under irrigation in the face of a known shortage of water supply.

Although any estimates of supplemental water requirements must be considered as approximations, in the absence of adequate basic data and more mature study than the Reclamation Bureau has given, it appears that the supplemental requirements for existing irrigated acreage in central Arizona are overestimated by the Bureau in the report under review, in an amount about three to four times greater than what would be actually needed. Furthermore, in considering the furnishing of the supplemental water required, careful consideration should be given to additional conservation and use of the available local water supplies, including the conservation of flood flows in periods of above normal run-off and the salvaging of water now consumed by natural vegetation. Preliminary studies indicate that full development and utilization of local sources of supply would take care of most of the deficiencies in the project area as defined by the Bureau, and that this could be done at a small fraction of the cost of the proposed project.

FINANCIAL ASPECTS

The capital cost of the proposed central Arizona project is estimated by the Bureau in the report presented to the Congress at $738,408,000. That is based upon July 1947, prices, Mr. Chairman. That estimate would apparently be about $100,000,000 more on the basis of October 1948 prices.

The estimate of cost is based largely upon preliminary investigations without adequate surveys, explorations and plans, with the result that the cost of the project is probably underestimated and that final cost estimates, after detailed surveys, explorations, and construction plans are made, would substantially exceed the estimates presented in the report.

Of the total estimated cost, $729,193,000 would be reimbursable and $9,215,000 nonreimbursable under existing law. Under recent proposals, the Bureau estimates possible nonreimbursable costs of over $80,000,000, including flood control, fish and wildlife, silt control, recreation, and salinity control. Of such nonreimbursable costs, the largest single item would be $37,500,000 for recreation, most of which, about $35,000,000, would be for the Bridge Canyon Dam and Reservoir. The method used in determining such large amounts of additional nonreimbursable costs appears questionable.

At this point, Mr. Chairman, I would like to refer to a comment of the Federal Power Commission on this subject, which appears in their comments under date of May 21, 1948. Quoting from that report:

> The staff is not prepared at this time to comment on the justification for the proposed allocation of $60,715,000 of the cost of Bridge Canyon, Bluff, and Coconino Reservoir to silt control, recreation, and fish and wildlife conservation. It is pointed out, however, that this cost which would be nonreimbursable and which includes about $36,000,000 allocated to recreation, amounts to more than 25 percent of the estimated cost of these reservoirs.

Capital cost of irrigation: The estimated capital cost allocated to irrigation amounts to $420,019,000 under existing reclamation law, and about $23,000,000 less with the additional nonreimbursable costs recently proposed. This capital cost of the works chargeable to irrigation under existing reclamation law would amount to $657 per acre on the gross area stated to be benefited by the proposed project; $2,754 per acre on the area of land to be "rescued" as stated in the report; and $1,858 per acre on the area that would be served with the water supply provided on a full surface irrigation supply basis. These figures would be slightly less under the assumption of the additional nonreimbursable costs as recently proposed.

Mr. Chairman, another way of looking at this capital cost of irrigation would be in this manner: The capital cost allocated to irrigation of $420,000,000, for a delivery at farm headgate averaging 636,000 acre-feet annually, would amount to about $660 per acre-foot. It is proposed to deliver 4 acre-feet at the farm headgate as the full irrigation supply, so that the capital cost per acre, for any acre given a full irrigation supply, would be $2,640 on that basis.

As compared to these capital costs per acre of irrigation, the present value of general farming land in crop within the project area is $300 an acre as a maximum and more nearly $200 an acre in long-time average value. Thus, the capital cost of the proposed project as an irrigation enterprise far exceeds the value of the land to be served or benefited; in fact, it is between 9 and 10 times the value of the land which, it is stated in the report, would be rescued.

Repayment ability: Project revenues as estimated by the Bureau would be obtained from sale of irrigation water at a price of $4.50 an acre-foot delivered at farm headgate, sale of water for municipal use at 15 cents a thousand gallons or $48.88 per acre-foot, and sale of commercial power. The analyses indicate that the revenues from sale of municipal water supply would be sufficient to cover all fixed and operating costs chargeable to that function. However, the estimated revenues from sale of water for irrigation would be insufficient on an average through a 50-year repayment period even to pay the operation and maintenance expenses chargeable to irrigation and consequently could not repay any of the capital costs chargeable to irrigation.

Analyses under existing reclamation law show that the irrigation supply proposed to be delivered at farm headgate would involve a cost for repayment of $13.20 per acre-foot, and for operation, maintenance, and replacements of $4.65 per acre-foot, a total of $17.85 an acre-foot. Thus, the total cost would be about four times the proposed charge for irrigation water.

In this respect the proposed project would be unique among irrigation enterprises is not being able to pay, from irrigation revenues, even the operation and maintenance expenses chargeable to irrigation. In fact, analyses show that irrigation revenues would be sufficient to pay only about one-half of the total operation and maintenance cost properly chargeable to irrigation, including the cost of electric power for project pumping.

At this point, I wish to call attention to one item in the preliminary reports which were made to this committee, in connection with S. 1175. The operation, maintenance, and replacement expenses chargeable to irrigation were estimated at about a million dollars more than in this

present report. There is no explanation in this report as to why that item was reduced. The cost per acre-foot for the original estimate would amount to over $6 an acre-foot, as compared to what is indicated in this present report of $4.65. That reduction was apparently made chiefly on the two aqueducts. As I say, it is not explained as to why that reduction was made. We are of the opinion that the original estimates are probably closer approximations to what the actual cost would be than the revised estimate made in the present report.

Analyses of annual costs and revenues show that the probable revenues from sale of water and power would be far from sufficient to repay reimbursable costs and meet other carrying charges under the provisions of existing reclamation law. Even under an assumed modification of additional nonreimbursable costs recently proposed, estimated by the Bureau in excess of $80,000,000, and with the interest rate on commercial power investment reduced from 3 to 2 percent, analyses show that repayment in 50 years of reimbursable costs together with other annual carrying charges would require water or power rates exceeding the market value or ability of the water and power users to pay, or a capital subsidy from the United States Treasury of nearly $400,000,000 in addition to the $80,000,000 of nonreimbursable costs and the cost of interest to the Federal Government on municipal and irrigation costs. With irrigation revenues based on $4.50 per acre-foot and a power rate sufficient to meet the fixed and operating charges assignable to commercial power, the period for repayment of irrigation costs would have to be extended to 114 years.

The cost of commercial power, based on Bureau estimates of output delivered at load centers, and covering all fixed and operating charges assignable thereto, would range from 5.17 mills per kilowatt-hour with 3 percent interest, under existing reclamation law, to 3.93 mills per kilowatt-hour under assumed modifications comprising additional nonreimbursable costs and an interest rate on commercial power investment of 2 percent.

As compared to these costs, it is proposed by the Bureau to sell commercial power produced chiefly by the Bridge Canyon Power Plant, at a price sufficient to repay not only all of the capital costs and annual carrying charges assignable thereto, but also the entire capital cost and a substantial part of the operation and maintenance costs chargeable to irrigation that cannot be met from irrigation revenues. For this purpose, the price of power is proposed at 4.82 mills per kilowatt-hour delivered at load center, predicated upon a repayment period of 78 years.

The financial analysis of the Bureau of Reclamation assumes that all net power revenues would be used to pay off the allocated capital cost of commercial power in a period of 30 to 35 years and, thereafter, applied to the repayment of the costs allocated to irrigation. This would mean that repayment of the irrigation investment would be postponed for 30 to 35 years. There is no provision in existing reclamation law that would permit of such a postponement of the repayment obligation of the water users. Furthermore, it appears that the average annual firm commercial energy that could be made available by the project for delivery at load centers would be substantially less than estimated by the Bureau. Accordingly, power revenues as

estimated by the Bureau could not be realized with the rate of 4.82 mills per kilowatt-hour and the rate required to obtain the same estimated power revenues would necessarily exceed that figure.

However, under the assumption that commercial power could and would be sold at 4.82 mills per kilowatt-hour and that the power revenues together with water revenues as estimated by the Bureau could be realized, analyses show that such revenues would be insufficient to repay the reimbursable costs in 50 years; and that the period for repayment of the cost allocated to irrigation would have to be extended to from 83 years to 93 years, corresponding respectively to interest rates on commercial power investment of 2 percent and 3 percent; that otherwise, repayment in 50 years could be effected only by corresponding capital subsidies from the Federal Treasury of $270,000,000 to $360,000,000, in addition to nonreimbursable costs of $80,571,000 and the cost of interest to the Federal Government on municipal and irrigation costs, or by a charge for irrigation water of about three to four times the rate of $4.50 per acre-foot proposed by the Bureau.

Benefit-cost relations: The report of the Bureau of Reclamation contains certain analyses comparing estimated annual benefits and annual costs of the proposed project, which indicate a ratio of benefits to cost of 1.63 to 1. This analysis is believed to be misleading, particularly as to methods used and amounts estimated for certain annual benefits.

Existing reclamation law does not provide for the authorization of a project on the basis of comparison of estimated "benefits" and costs. Federal reclamation law requires for any proposed project that a showing be made of engineering feasibility and of economic feasibility, based upon the sufficiency of revenues from all sources to meet reimbursable costs and other necessary charges and expenses. Projects previously authorized and constructed by the United States on the Colorado River system, including large developments, such as the Boulder Canyon project, have been on the basis of a showing of engineering feasibility and of economic justification on a repayment basis.

The true criterion for a showing of economic feasibility of the proposed central Arizona project is its repayment ability to meet all reimbursable costs together with other necessary charges and expenses under the provisions of existing reclamation law, from revenues that could be reasonably expected from the sale of water and power at rates within the ability of the water and power users to pay.

At this point, Mr. Chairman, I would like to place in the record the comments with respect to economic matters made by several Federal agencies. First, quoting from the report of the Department of the Army as follows:

> The legal and economic premises upon which the project as a whole is based appear to be open to serious question, particularly with respect to water rights and to the analysis of the economics of the works.

The CHAIRMAN. That is the source?

Mr. MATTHEW. The source, Mr. Chairman, is the comments of the Department of the Army to the Secretary of the Interior dated May 12, 1948.

In the report of the Department of Agriculture, dated May 5, 1948, the following appears, quoting from that report:

The first and most important question that must be asked about any proposed public work is: Will the total benefits produce equal or exceed the total costs? Our first concern then, was to find out if the central Arizona project would satisfy this requirement. Frankly, we were unable to determine from your report whether or not the benefits actually would exceed the costs. In the estimation of benefits, gross, rather than net, crop values have been used in the calculation of irrigation benefits. You will recall that in commenting upon previous reports prepared by the Bureau of Reclamation, we have pointed out that this procedure disregards the cost of producing the crops. In the present report, it is indicated that this cost of production is assumed to equal the indirect benefits accruing to the project. But, in our opinion, this is not a valid way of estimating indirect benefits. In this connection, we want to make it clear that we are not questioning the propriety of utilizing indirect benefits in justifying the project, but merely pointing out that an incorrect procedure has been used in estimating these benefits.

The actual relation of benefits to costs is still further obscured by what appears to be a failure to use the market value of power in estimating, for evaluation purposes, the cost of pumping the water supply. Market value must be used in economic evaluation because the power has alternative uses. (This does not mean, of course, that market value must be used in fixing rates to be charged for water—an operation separate and apart from economic evaluation.) Here again it is to be understood that we are pointing out a procedural error; not questioning the estimates of construction cost.

In at least the respects mentioned above, the benefits and costs used in testing the economic soundness of the project are in error. We would recommend, therefore, that further and more careful consideration be given to the economic evaluation of the proposed irrigation project. It is not possible to predict the effect that the suggested procedural changes might have on the benefit-cost ratios set out in the report.

Sound economics and common sense require: First, the consideration of possible alternatives; and, second, the choice of that alternative yielding the largest return on the investment. We presume that the Bureau of Reclamation has given consideration to various alternative solutions for the water problems of the central Arizona area. This leads us to suggest that these be briefly reviewed in the report so that the Congress and the public will be assured that optimum returns will result from the investment of the public funds required.

Finally, Mr. Chairman, a quotation from the report of the Federal Power Commission, dated May 21, 1948. Quoting from the Federal Power Commission report of May 21, 1948:

It is observed that the burden of irrigation costs on power would be considerable and that costs of commercial power would be approaching a level that cannot be classed as low-cost power in the region. This raises the question of whether subsidies for irrigation should not be looked for from sources other than power if the irrigation features of the project are adopted.

CONCLUSIONS AND RECOMMENDATIONS

Summarizing my statement, Mr. Chairman:

1. The State of California is vitally concerned in the proposed central Arizona project because the diversion and use of Colorado River water proposed thereby would, if consummated, threaten seriously to invade the established rights of California to the use of Colorado River water, upon which depend the irrigation of about a million acres of land in the Palo Verde, Imperial, and Coachella Valleys, and the furnishing of domestic and industrial water supplies for the metropolitan areas of southern California from Los Angeles to San Diego with a present population of over 4,000,000 inhabitants, and in connection with which an investment of over $500,000,000 has already

been expended or committed for works and facilities which have already been built and are in operation.

2. The general plan for the proposed central Arizona project has been conceived without mature consideration and is based upon preliminary investigations with inadequate surveys and explorations for several of the major features, and the proposed project lacks justification from both an engineering and economic standpoint.

3. The water requirements of the proposed project have been grossly overestimated by the Bureau of Reclamation in the light of what is represented to be the primary objective of furnishing supplemental water supplies that may be needed for existing irrigated lands in the Salt and Gila River Valleys in central Arizona. Studies of the available local water supplies, as compared to the requirements of presently irrigated lands in the main service area of the proposed project, indicate that the additional water supply required is only about one-third to one-fourth the amount estimated to be required by the Bureau of Reclamation; and that a large part, if not all, of the additional water supply required could be obtained by further conservation, distribution, and use of local water supplies and the maximum efficient utilization of existing ground water storage capacity, to which insufficient consideration has been given.

4. Most of the over-all indicated water shortage in the main service area of the proposed project is within newly developed lands irrigated by pumping from ground water and not within the older established irirgation projects of the Salt and Gila River Valleys; and therefore the main effect and purpose of the proposed project would apparently be to rescue these newly developed lands which were put under irrigation within recent years in the face of a known shortage of water supply.

5. The proposed project is economically unsound and without justification as an irrigation undertaking. Under existing reclamation law, the capital cost chargeable to irrigation would be $2,754 per acre on the area of land that would be "rescued" as stated in the Bureau's report and $1,858 per acre on the total area that it is stated would be served on a full supply basis. As compared to these capital costs, the present value of general farming land in crops is $300 an acre as a maximum.

6. The estimated revenues from the sale of water for irrigation would be insufficient on the average during a 50-year repayment period even to pay the operation and maintenance expenses properly chargeable to irrigation, and consequently could not repay any of the capital costs.

7. With power and water revenues as estimated by the Bureau of Reclamation, the period of repayment of the reimbursable costs would have to be extended to from 83 to 93 years, Repayment in 50 years as required by existing law could be effected only by a capital subsidy from the Federal Treasury of $270,000,000 to $360,000,000 in addition to other nonreimbursable costs of over $80,000,000 or by increasing the charge for irrigation water and commercial power in excess of the ability of the water and power users to pay. The proposed project is not economically feasible under the provisions of existing reclamation law or any reasonable modifications thereof. It seems apparent that a less costly plan than the $738,000,000 project

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proposed by the Bureau could and should be found for meeting the problems of water shortage on the existing irrigated lands in central Arizona.

8. The basic problems presented by the proposed central Arizona project involve engineering questions as to water supply and requirements and the planning of feasible and economic developments; and legal questions as to the availability of water from the Colorado River for the proposed project. The engineering questions may best be resolved by the appointment of a board of engineers of national reputation to review the proposed project and all basic engineering questions involved therein.

There is one more matter I would like to point out, Mr. Chairman, and that is that this statement I have made is a brief summary of a very detailed presentation of all these matters in the official views and recommendations of the State of California on the proposed report of the Secretary of the Interior on the central Arizona project, which, as I stated previously, has been sent to the Congress and is before your committee.

We have copies for each member of the committee of those comments, and probably you will wish to make reference thereto.

Senator DOWNEY. Mr. Chairman, it is my understanding the California comments constitute the only real attempt at an analysis of the central Arizona project.

Senator KERR. Say that again, please, Senator.

Senator DOWNEY. It is my understanding that the California comments constitute the only substantial attempt to analyze the factors involved in the central Arizona project. Whether that is true or not, we do believe that that document, which was prepared over a number of months, is of utmost value, at least from our viewpoint, and I would request that it be printed as a part of this record. It is a documented extension, and we believe the proof, of these findings made by Mr. Matthew who has just testified. We do wish to urgently recommend that it should be printed as a part of this record.

The CHAIRMAN. The Chair does not feel at liberty to make a decision on that point at this moment. It will be taken up in executive session.

Senator McFarland, any questions?

Senator MCFARLAND. Yes, I would like to ask a few questions. However, as to most of this testimony, Mr. Chairman, instead of trying to develop it by questions, I think it would save time to develop it by rebuttal. That is particularly true in regard to the amount of water supply in Arizona and also the amount of water in California that has been talked about here, and the needs of California. We will have rebuttal testimony on both of those questions.

Mr. Matthew, you are now speaking officially for the State of California?

Mr. MATTHEW. I am speaking here on behalf of the Colorado River Board of California, which is the agency of the State charged with the responsibility of protecting and preserving California's rights to the use of Colorado River water.

Senator MCFARLAND. There was some question presented here the other day by Mr. Howard as to whether your testimony represented

the position of California. The testimony you are giving now does represent the position of California, do I understand that?

Mr. MATTHEW. That is right.

Senator MCFARLAND. I notice in your analysis here, and in your testimony, you refer mostly to the existing irrigation laws. You, of course, have noted the changes which would be made in those laws by S. 75.

Mr. MATTHEW. Yes.

Senator MCFARLAND. Are you opposed to those changes in reclamation law?

Mr. MATTHEW. As proposed in S. 1175, sir?

Senator MCFARLAND. S. 75.

Mr. MATTHEW. We do not feel that those changes would be wise, no, sir.

Senator MCFARLAND. You are opposed to an extension of the repayment period on reclamation projects?

Mr. MATTHEW. No, sir, California is not opposed to reasonable extenson of the repayment period.

Senator MCFARLAND. What period would you favor?

Mr. MATTHEW. I think that depends largely on the individual project, Senator. It is a matter for consideration in individual cases, and for the Congress to decide what that repayment period might be.

Senator MCFARLAND. But you would oppose a general change in the reclamation law extending the period of repayment?

Mr. MATTHEW. We feel there should be some basic provision in regard to repayment, just as in the existing law.

Senator MCFARLAND. You have previously opposed legislation which did extend the repayment period, have you not?

Mr. MATTHEW. Only to the extent of the proposals to extend it to an indefinite period, by such expressions as "the useful life of the project" or "for a reasonable period of years."

Senator MCFARLAND. How far would you be in favor of extending the repayment period?

Mr. MATTHEW. You mean as a basic law?

Senator MCFARLAND. Yes.

Mr. MATTHEWS. Possibly another 10 years. We have progressed on that from time to time since the original act was passed. It was 10 years at the start, then increased to 15, to 20, and then to 40. Possibly another extension of 10 or 15 years would be reasonable.

Senator MCFARLAND. Anything beyond that you feel would be too long?

Mr. MATTHEW. That again, sir, I feel would be a matter for consideration of the individual project by the Congress.

Senator MCFARLAND. As to this particular project, for how many years would you be in favor of extending the period of repayment?

Mr. MATTHEW. I do not know that I could answer that question, Senator. I pointed out in our analysis here just how long it would take to pay out.

Senator MCFARLAND. I did not ask you that. I asked how long an extension you would favor.

Mr. MATTHEW. That again would be something for the Congress to decide in connection with this project.

Senator McFARLAND. You do not care to make any statement as to how long you would be willing to extend it?

Mr. MATTHEW. No, sir, I think that is the prerogative of Congress.

Senator McFARLAND. Are you opposed to subsidies using power to help develop irrigation?

Mr. MATTHEW. No, sir.

Senator McFARLAND. According to the estimates here, this power is to be sold at 4.82 mills and that rate would carry a 0.72 of a mill subsidy. Do you think that is too much of a subsidy for irrigation?

Mr. MATTHEW. Well, Senator, in answering the question as to how much that subsidy is, my estimates indicate the subsidy would be more than that, it would be almost a mill. Furthermore, the proposal here is to finance the entire cost of this project from power development that has no necessary connection with the conservation features of the project. The precedent for the use of power revenues to finance a multipurpose project, that is, the irrigation features of a multipurpose project is in case of projects where the power produced is incidental to the conservation and use of water.

Senator McFARLAND. Mr. Matthew, that was not my question. Do you think 0.72 of a mill is too much of a subsidy for a project?

Mr. MATTHEW. It depends on who is paying the subsidy, Senator.

Senator McFARLAND. Well, the power users pay for the subsidy.

Mr. MATTHEW. If it happens to be the power users in the same area using the water and they are willing to pay such a subsidy, then I would say in general that would be all right.

Senator McFARLAND. If it should be developed here that all this power can be used and paid for in Arizona, would you then say that subsidy would be all right, and that you would have no objection to it?

Mr. MATTHEW. I would say that would be for the Arizona power users to decide whether they want to do that or not.

Senator McFARLAND. Now you are evading the question, Mr. Matthew. You make one answer and then you do not follow through.

Would you say that would be agreeable to you and that that would be a reasonable amount for them to pay, providing it was all paid from within the boundaries of the State of Arizona.

Mr. MATTHEW. I would say that would not be a matter for my concern as to whether that is reasonable or not.

Senator McFARLAND. Then you would not have any objection to it, I take it?

Mr. MATTHEW. I would not have any concern with it.

Senator McFARLAND. Well, if you will not answer I cannot help it.

Now, over in the Central Valley project of California the power is sold at 5.30 of a mill and the subsidy is 0.68 of a mill. Do you think that is too much subsidy there?

Mr. MATTHEW. In the first place, Senator, I do not think your figures are correct as to how much that power is to be sold for.

Senator McFARLAND. Assuming they are correct, I cannot say as to that. They were given to me by the Division of Power, Bureau of Reclamation, at my request. I must assume that they are correct. So let us assume they are correct.

Senator DOWNEY. Mr. Chairman, I want to object to that. Those figures are grossly inaccurate. I have the exact figures in mind that

the Bureau of Reclamation has repeatedly given out, and those figures are not correct.

The CHAIRMAN. The Senator's question is a hypothetical question based upon the assumption that they are correct.

Senator DOWNEY. Well, Mr. Chairman, it is an irrational question because it is wholly incorrect. The Bureau of Reclamation proposes to sell infirm power at 1½ mills per kilowatt-hour, for project pumping 2½ mills per kilowatt-hour, and the firm power for delivery all over the Central Valley at 4.57 mills; is that not correct?

Mr. MATTHEW. I think that is correct, sir.

Senator MCFARLAND. Well, if it is not correct it can be corrected. I would like to have an answer to my question.

Mr. MATTHEW. As far as the Central Valley project of California is concerned, Senator, power is produced at Shasta Dam incidental to the conservation of water, which provides pretty nearly the entire water supply of the project. It is squarely in line with past precedent and policy whereby power is used to help finance the irrigation end of a multipurpose project. It is to be used also in the same area.

Senator MCFARLAND. I am talking about the average firm power rate. According to the figures I have, the average firm power rate for the Colorado-Big Thompson is 5.10 mills, and the subsidy there for that project is 0.89 of a mill. Do you think that is too much up there?

Mr. MATTHEW. That kind of a subsidy, under the conditions I stated that fit an individual project, Senator, does not appear out of line; no.

Senator MCFARLAND. In other words, up at Big Thompson, which is more than 0.72 mill, you think that is all right?

Mr. MATTHEW. If they could subsidize irrigation up there to the extent of 1½ cents a kilowatt-hour, and the people wanted to pay for it in the same area they were getting water, and power was incidental to the conservation of water, why, yes, I would say so. That has always been the basis.

Senator MCFARLAND. In other words, you would always oppose any subsidy from power unless the water was diverted at the dam; is that your position?

Mr. MATTHEW. I would say the power produced should be incidental to the conservation or conveyance of water for the project.

Senator MCFARLAND. You refer to the Missouri Basin. It is estimated here that average firm power would be at 5½ mills, with a subsidy of 2.47 mills for irrigation. Do you think that is too much for them?

Mr. MATTHEW. If they can do that, if the people want to pay that price for the power. But I just want to say this: You always have the conflict between the policy set-up in the flood-control act of selling power at the lowest possible cost consistent with sound business principles, and the matter of charging as high a rate as possible which the market can bear in order to support irrigation.

Senator MCFARLAND. Now, as the other benefits that are charged off and which you have noted in your testimony, do you oppose the reclamation law being extended in that manner?

Mr. MATTHEW. No, sir. I did not offer any testimony in opposition to that. I merely raised the question as one which Congress has to decide. The Federal Power Commission did likewise in their comments.

Senator McFARLAND. You stated, I believe, there was a $500,000,000 investment in California on this Colorado River project?

Mr. MATTHEW. Over $500,000,000; yes, sir.

Senator McFARLAND. Does that include the Boulder Dam and the power plant?

Mr. MATTHEW. I will tell you exactly what it includes, sir. It is made up of a large part of the construction cost of Hoover Dam and power plant, which is estimated at $125,000,000.

Senator McFARLAND. Did California put up that $125,000,000?

Mr. MATTHEW. California had to commit itself to the repayment in 50 years of all of the construction costs of Hoover Dam and power plant.

Senator McFARLAND. For which they got the best power contracts that have ever been issued for hydroelectric power; is that not true?

Mr. MATHEW. At the time the contracts were entered into, Senator, a lot of the officials were severely criticized as being far too optimistic, and there was no knowledge at that time that the power could actually be used.

Senator McFARLAND. I presume your answer is "Yes." Or do you just want it to stand as evasive?

Mr. MATTHEW. I gave you a direct answer. I think I did.

Senator McFARLAND. I do not understand those kinds of answers, but we will just pass it. I do not think anyone else would call it a direct answer.

Can any water be used on the West Mesa lands from works already constructed, or would it take additional works?

Mr. MATTHEW. On the West Mesa lands of the Imperial Valley?

Senator McFARLAND. Yes.

Mr. MATTHEW. That would take the construction of additional works.

Senator McFARLAND. And neither the West Mesa nor the East Mesa lands are being irrigated at this time?

Mr. MATTHEW. No, sir, not to any extent.

Senator McFARLAND. What assistance did California give in the investigations of the Boulder Canyon project?

Mr. MATTHEW. What assistance?

Senator McFARLAND. Yes; did you contribute any money to the investigations of the Boulder Canyon project?

Mr. MATTHEW. I cannot answer that question, Senator, without looking up the facts. I do know the California agencies expended thousands of dollars of their own funds in seeking to have the plans formulated in the first place, and in carrying on to get the project authorized, which took a period of about 10 years.

Senator McFARLAND. But they did not contribute anything toward the investigations as to engineering, and so on?

Mr. MATTHEW. As to whether they contributed funds to the Federal Government, I am not able to answer on that.

Senator McFARLAND. I am informed they did not.

Senator WATKINS. May I ask a question there?

Were the investigation costs spent by the United States on that project finally charged back against the project as having to be repaid under this guaranty?

Senator McFARLAND. I cannot answer that question, Senator.

Senator WATKINS. Usually they are on most of these projects; the investigation costs are charged back against the project.

Senator DOWNEY. Mr. Chairman, if I may answer that question, they were charged back.

Senator ANDERSON. They were?

Senator DOWNEY. Yes, they were.

Senator MCFARLAND. Does anyone from the Reclamation Service have the answer to that? I think it would be well to get that answer.

Senator WATKINS. I would like to know, because on most of the Utah projects the final investigation costs are always a part of what we finally have to pay.

Mr. MATTHEW. I imagine they were, Senator, but I cannot answer you authoritatively without checking it up.

Senator WATKINS. I think the State also contributes originally about half. In the first investigation 50 percent is contributed by the State.

Mr. MATTHEW. That is correct. On many a preliminary investigation made by the Bureau, it is the practice to ask for 50 percent contribution toward the cost of the investigation.

Senator MCFARLAND. Was that true for the Boulder Canyon project? Did California contribute 50 percent of the cost of the investigations?

Mr. MATTHEW. Pardon me, Senator, I have already answered that. I cannot now give you that information.

Senator ANDERSON. Let us see which State it would be, Nevada, Arizona, or what?

Senator MCFARLAND. Arizona did contribute 50 percent on these investigations for this project.

Senator WATKINS. You mean the central Arizona project?

Senator MCFARLAND. Yes. Go ahead and ask your question, Senator.

Senator ANDERSON. I didn't want to break in. I just wondered what State contributed 50 percent of the original investigations that led to the construction of Hoover Dam, if any.

Mr. MATTHEW. I am sorry, Senator, but I will have to look up the record on that. I am sure it is available and can be obtained.

Senator ANDERSON. May it be inserted in the record at this point when you find it?

Senator DOWNEY. Mr. Chairman, we have other witnesses here who went through that and I think can authoritatively answer that question to clear up the point.

Ths CHAIRMAN. If there is any person in the room from the Bureau of Reclamation or from any other agency who can state that authoritatively, it would be an appropriate thing to do.

Mr. ELY. Mr. Chairman, I am Mr. Northcutt Ely. Prior to the Boulder Canyon Project Act the investigations of the project that were carried on by the Bureau of Reclamation were financed in large part by the contributions made by public agencies of the State of California under the Kincaid Act, and under other legislation.

The CHAIRMAN. Do you know how much?

Mr. ELY. I do not have the figure, but will supply it for the record, sir.

Senator ANDERSON. That is contrary to my understanding.

Mr. DEBLER. Mr. Chairman, these project investigations were started in 1920. Arizona put up a very material part of those costs. I am not sure that it was the entire 50 percent, but it was the only State that contributed any funds, and they did contribute very materially.

The CHAIRMAN. How was the contribution made?

Mr. DEBLER. In money by the State of Arizona to the Bureau of Reclamation.

Senator WATKINS. That is a matter of record, is it not?

Senator MCFARLAND. Yes, the Bureau of Reclamation can furnish that information.

The CHAIRMAN. Will you have that done, please?

Mr. BENNETT. Yes, sir.

(The information is as follows:)

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington 25, D. C., April 14, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate.

MY DEAR SENATOR O'MAHONEY: Representatives of the Bureau of Reclamation who were present at the hearings before your committee on Senate Joint Resolution 4 and Senate 75 on April 12 tell me that inquiry was made about the amount of money expended on investigations for the Boulder Canyon project. I understand that the questions raised concern particularly the investigation costs related to Hoover Dam, the amounts contributed for such investigations by local interests, and the inclusion of investigation costs in the capital cost of the project.

The Bureau expended for Boulder Canyon project investigations (exclusive of All-American Canal investigations) $506,734.88, of which $141,000 was contributed funds, and $365,734.88 was expended from appropriations from the reclamation fund.

The reclamation fund has been reimbursed from appropriations made to carry out the provisions of the Boulder Canyon Act of December 21, 1928 (U. S. C. Supp. III, title 33, ch. 15A) in the amount of $365,734.88. This amount is included in the cost of the Boulder Canyon project and repayable by the power contractors.

The following is the list of contributed funds:

Imperial irrigation district	$70,000
Coachella Valley County district	6,000
Palo Verde levee district	5,000
City of Los Angeles, Calif	55,000
City of Pasadena, Calif	5,000
Total	$141,000

Sincerely yours,

KENNETH MARKWELL, *Assistant Commissioner.*

Senator MCFARLAND. There are just one or two other questions, Mr. Chairman, then I will leave the remainder for rebuttal. I think we can save a lot of time that way.

Mr. Matthew, you talked about Arizona receiving the benefit of storage without cost. As a matter of fact, the Boulder Canyon Project Act provides that they will have to pay for this water, does it not?

Mr. MATTHEW. It does do that, Senator, but curiously enough the estimated cost of the central Arizona project in this report contains no charge for water stored in Lake Mead.

Senator MCFARLAND. It does contain an item of charge for water, does it not?

Mr. MATTHEW. No, sir.

Senator McFARLAND. I think if you will look at the report you will see that it does.

Mr. MATTHEW. Not for storage and delivery of water from Lake Mead.

Senator McFARLAND. It may not be broken down, but there is a charge for water.

Now, let me ask you this question: Does the Imperial Valley pay anything for the storage of water for irrigation?

Mr. MATTHEW. The Imperial irrigation district is expressly excluded from paying in the Boulder Canyon Project Act, because of the fact that the stored water furnished Imperial Valley from Lake Mead replaces the natural flow which they had appropriative rights to.

Senator McFARLAND. But the natural flow, as has been brought out here by the testimony, was frequently insufficient, was it not?

Mr. MATTHEW. It certainly was, on account of increased upstream diversions. That is what precipitated the original ideas of a constructive solution to the matter.

Senator McFARLAND. But the fact remains they are not paying anything for their storage at this time.

Are the Hoover Dam contractors losing any money by their contracts?

Mr. MATTHEW. Not at the present time, so far as I know.

Senator McFARLAND. Would the Hoover Dam power contractors lose any money on the proposed coordination of the Colorado River power plants?

Mr. MATTHEW. Yes, they would, very definitely.

Senator McFARLAND. How?

Mr. MATTHEW. Well, the proposal of the Bureau to integrate and support Bridge Canyon with Hoover Dam power and Lake Mead, would amount to quite a serious invasion and disruption of the present power contractors' privileges, which they have a property right in.

Senator McFARLAND. In what way?

Mr. MATTHEW. By calling upon Hoover power plant and Lake Mead to supply 600,000 to 700,000 kilowatts of stand-by capacity to take care of the deficiency in output of the Bridge Canyon power plant in dry years. That amounts to about $80,000,000 in steam-electric plant capacity cost.

Senator McFARLAND. Would there be any advantages to the Hoover Dam power contractors to have the Bridge Canyon Dam built?

Mr. MATTHEW. The only indicated advantage, Senator, in the upstream developments is an assumed reduction in flood-control reservation of 3,000,000 acre-feet in Lake Mead. That theoretically results in the possibility of a higher level in Lake Mead which with the same amount of water is capable of producing more kilowatt-hours.

Senator McFARLAND. Would there be any silt advantages in having these dams proposed in this project? Would there be any silt advantages to Lake Mead?

Mr. MATTHEW. Yes; there would be.

Senator McFARLAND. Are any charges made against Boulder Canyon project for those advantages, in the report?

Mr. MATTHEW. There has not been any arrangement discussed up to this time that I know of.

Senator McFARLAND. No charges are made in the report against it?

Mr. MATTHEW. No, sir; not at this time.

Senator McFARLAND. So that they would get that for nothing, as far as the report is concerned, would they not?

Mr. MATTHEW. What report?

Senator McFARLAND. This project report.

Mr. MATTHEW. I do not know whether they would or not. But bear this in mind, Senator, those silt benefits that would accrue are charged off as nonreimbursable costs to the National Government, so that is nonreimbursable in any case and whatever benefits there are to Lake Mead would be in the same nonreimbursable category.

Senator McFARLAND. Would you favor the building of Bridge Canyon Dam if it were just to be built independent of the central Arizona project?

Mr. MATTHEW. In answer to your question, Senator, we feel the Bridge Canyon power development, if it were properly set up with adequate upstream storage built at the same time in order to equate the flow and result in a firm power output—that a desirable power development is potentially possible there on the lower Colorado River.

Senator McFARLAND. Do you think there is a sale for that power?

Mr. MATTHEW. I think there would be a sale for the power if it were developed on a reasonable financial basis.

Senator McFARLAND. How much do you think you would be able to sell it for?

Mr. MATTHEW. That would be a matter to determine whenever it becomes available, Senator.

Senator McFARLAND. Well, there was quite a demand for the Davis power which was slightly under 5 mills, was there not?

Mr. MATTHEW. I believe all of the States made application for Davis power; yes.

Senator McFARLAND. That is all, Mr. Chairman.

Senator DOWNEY. Mr. Chairman, I had a few questions I wanted to ask but I do not want to take precedence over any of the Senators who want to ask questions.

The CHAIRMAN. Are there any questions by the other members present?

Senator ANDERSON. Mr. Chairman, I feel that the best way we can get at the testimony that has been given is by direct rebuttal from Arizona.

Senator McFARLAND. We will do that.

Senator ANDERSON. There are a lot of things here which it does not do us much good to ask about. They are either true or they are not. The assumptions are either correct assumptions or they are not.

What I was going to suggest was that we might give a couple hours tomorrow for reply by Arizona and then Thursday give them an hour apiece to sum up and close the hearings on this bill.

Senator DOWNEY. Mr. Chairman, the viewpoint of the Senator from California is that that is not possible. We have an engineer from California who has made a serious study of the possibility of utilizing these underground reservoirs in the Gila and Salt River Valleys, for the purpose of securing additional water. Mr. Matthew has merely indicated that without stating the data upon which he relies.

In addition to that we have one of the best power engineers from California who will be here to discuss the conditions and difficulties

of the power situation there. I do think, Senator Anderson, they are both questions of great magnitude.

I thoroughly agree with the Senator, it would be a very fine thing to allow other engineers to immediately succeed in order to discuss the statements made by Mr. Matthew. We want to support by additional data some of the statements he has made.

The CHAIRMAN. The original plan was to have California present four engineering witnesses on the central Arizona project. Mr. Matthew is the first. He has now completed his statement. Who would be the succeeding witness?

Senator DOWNEY. It would be either Mr. Conkling or Mr. Peterson. Mr. Peterson appears on the power issue.

The CHAIRMAN. Is either one of them here now?

Senator DOWNEY. Yes.

Mr. MATTHEW. They will both be here tomorrow.

The CHAIRMAN. Are either one of them here at this moment?

Senator DOWNEY. Mr. Chairman, before we put on another witness I wanted to amplify some points here.

The CHAIRMAN. Yes; I understand that.

Senator DOWNEY. Mr. Conkling is here. You will adjourn before 12 o'clock in this matter?

The CHAIRMAN. Yes.

Senator DOWNEY. I do think it might give us greater unity if we concluded with Mr. Matthew this morning and then continued with Mr. Conkling tomorrow.

The CHAIRMAN. May I ask Mr. Matthew a question with respect to his statement on the first page of his prepared testimony, the last sentence:

> The main works for the diversion, conveyance and use of Colorado River water, in the aggregate amount of 5,362,000 acre-feet annually, have been constructed and are in operation.

Do I correctly interpret that as meaning that only the main works have been constructed and that other works remain to be constructed to use this full amount?

Mr. MATTHEW. Yes, Senator, there will be some additional facilities by way of distribution lines and some increase, in certain sections, of the metropolitan aqueduct.

The CHAIRMAN. Elsewhere in your testimony you spoke of the amount of money which had been committed for the construction of these California works. Can you tell us how much has been committed and how much has actually been expended to date? You may furnish that for the record if you do not have it now.

Mr. MATTHEW. I cannot give you the figure offhand but I can furnish it and will be glad to do it.

(The following was later furnished for the record:)

The information requested, in terms of expenditures made to date which California agencies have made or are obligated to repay, and exclusive of commitments for additional works that will be needed, is as follows:

Hoover Dam and power plant	$143,149,940
Parker Dam and metropolitan aqueduct	205,838,196
All-American Canal	53,035,159
San Diego aqueduct	20,500,000
Power transmission lines	56,000,000
Total	478,523,295

The CHAIRMAN. May I ask you this additional question: We have here the Colorado River Basin [indicating] which includes the States of, beginning on the north, Wyoming, Colorado, Utah, Nevada, New Mexico, Arizona, and California. Do you regard this as a sort of unit divided into the two basins?

Mr. MATTHEW. By "this" you mean what?

The CHAIRMAN. The Colorado River compact makes a unit of the Colorado River system, does it not?

Mr. MATTHEW. Oh, surely.

The CHAIRMAN. Do you feel that the water supply of this entire area may properly be conserved, stored, and developed for the development of the resources of the basin?

Mr. MATTHEW. Certainly, we are very much in favor of that.

The CHAIRMAN. You do recognize the fact that multiple-purpose projects are necessary to bring about that development?

Mr. MATTHEW. That is correct.

The CHAIRMAN. And that multiple-purpose projects involve necessarily, by the allocation of certain amounts to various purposes such as flood-control, recreation, et cetera, subsidies for irrigation?

Mr. MATTHEW. That is right.

The CHAIRMAN. Have you in mind any specific measure by which to determine the amount of subsidy for irrigation?

Mr. MATTHEW. No, sir. I think, Senator, it depends on the situation you meet in any individual project.

The CHAIRMAN. Of course, we all recognize that when the Reclamation Service was established way back in the beginning of the century, the concept was almost exclusively the application of water to arid land and the repayment of the amounts expended by the settlers upon the land. Then with the development of lands easily irrigable it became impossible to require the irrigated land to repay the costs of the works that would necessarily be built to store and distribute the water.

Mr. MATTHEW. Yes; that is true.

The CHAIRMAN. Would it be a reasonable conclusion in your mind that the measure of utilization of this water should be not the ability of the land to repay, but the ability of the area served to bring about the development of its natural resources which would include mineral resources, as well as agricultural resources, as a result of the construction of these works? Would that be a reasonable assumption?

Mr. MATTHEW. I think each individual State might very well pool their resources and develop their water resources just as far as they can, depending on how much they need the water, whether they need new agricultural lands, what the need for the products of the irrigated lands would be, and so forth.

The CHAIRMAN. Have they not already pooled these resources in this compact, the water resources? Have the individual States not already done that? Was that not the purpose of the compact?

Mr. MATTHEW. Well, the water resources are apportioned, of course.

The CHAIRMAN. Yes, that is right. That was part of the compact, certainly.

Mr. MATTHEW. I do not know whether you would call it a pooling, or not. I think the Colorado River Basin States are combined in the objective of full development of the water resources of the Colorado River Basin. Certainly California favors that.

The CHAIRMAN. And California favors every development that can be made?

Mr. MATTHEW. That can be reasonably made, certainly.

The CHAIRMAN. Then what is your definition of "reasonably made"? Of course, that phrase is the whole issue. In other words, to what extent should these developments be subsidized and should we not, in measuring the amount of subsidy, take into consideration the resultant development of new sources of wealth outside of agricultural production?

Mr. MATTHEW. I think that is generally true.

The CHAIRMAN. Senator Malone pointed out yesterday that in the State of Nevada it may be quite possible to bring in an additional number of people, about 150,000, developing the resources in that area. That would be adding to the wealth of Nevada and of the basin. That is perfectly reasonable, is it not?

Mr. MATTHEW. I think that is true. I think if you get very far away from a sound business basis for these developments it may result in a disservice to western reclamation, rather than a service.

The CHAIRMAN. It depends upon what resources you can develop, Mr. Matthew.

Mr. MATTHEW. Yes, that is very true. In other words, if the revenues from oil in some of these other States could be used for water development——

The CHAIRMAN. What I fear is that somebody might draw the conclusion from this measure of reasonableness which you cite upon a business basis, that only those States which have the population and the wealth to pay for the development should be entitled to use the waters of the Colorado River system, and that the other States which do not have the population and do not have the present wealth but which do have the natural resources which can be developed by a distribution of the water upon the land and the development of power, would have to go without. You do not mean that, of course?

Mr. MATTHEW. No. I think as a general thing—and of course this is something that Congress would have to say. I do not mean to put my views in but since you have asked, and to answer your general question, it seems to me the amount of subsidization for irrigation and multipurpose projects is going to depend upon the need, as compared to cost, which has to be weighed at the time a particular project comes up. The time may come when we will need food so badly that it might become a complete Federal subsidy. I do not think that point has been reached yet, or that we have anywhere near reached that point.

Senator KERR. You would want to make legislation that would enable you to escape it rather than to wait until you faced it before attempting to get the legislation, would you not?

Mr. MATTHEW. I think Congress would be well able to handle it at any time.

Senator KERR. But you would endorse that principle?

Mr. MATTHEW. That we should now adopt——

Senator KERR. That we should move to meet those emergencies ahead of the time when they are acutely present with us, instead of waiting until then to make preparations to meet them?

Mr. MATTHEW. Yes, I think that would be wise.

Senator DOWNEY. Mr. Chairman, if I might make this statement as Senator from California. I am sure it would be the desire of

California and the California power users to pay a higher rate than would otherwise be necessary for their power—within their ability to pay—to help accomplish any reasonable development for any of the sister States. I am sure we would go completely out.

I say any "reasonable" development. I cannot conceive that the power users in California could be sold upon the idea of buying power at a sufficient rate to enable the irrigation of lands worth two or three hundred dollars an acre, when the cost would be $1,500 or $2,500 an acre. I am stating my answer directly and not in generalities. I just cannot conceive of that and I cannot conceive that the people of this Nation would want that, either.

Now, Mr. Matthew, may I ask you this question: Apparently the interest component on the power investment, or the profits on the power—however you may want to express it—will be utilized under this plan for a long and indefinite period to help subsidize the irrigation features of the central Arizona project. That is correct, is it not?

Mr. MATTHEW. Yes. The Bureau in their analysis used the interest component for that purpose.

Senator DOWNEY. And is it not also true that a full one-third of the output of power from the contemplated dam would be given to Arizona to use in pumping the water up 987 feet from the Colorado River to the necessary level?

Mr. MATTHEW. That is true as to the entire capital cost of power for project pumping and a part of the operation and maintenance cost.

Senator DOWNEY. So that Arizona under this plan would have a complete subsidy equal to one-third of the power development, plus the profits or interest differential on the balance?

Mr. MATTHEW. That is right.

Senator ANDERSON. Does he mean it would be given free?

Senator DOWNEY. Yes; I think that is a correct statement of it.

Mr. MATTHEW. Senator, the entire capital cost of project power, that is, the energy used for project pumping is going to be repaid by commercial power revenues, according to the plan as proposed by the Bureau.

Senator ANDERSON. Let me see if I can get at it from a different basis so that I can understand it. In calculating what it costs to lift that water up out of the Colorado River some 900 feet, will they take power from the dam and make no accounting for it or will the water users pay for it anyway?

Mr. MATTHEW. The water users will not pay for it but the power users will.

Senator ANDERSON. You mean other power users?

Mr. MATTHEWS. Yes, commercial power users.

Senator ANDERSON. Then it is being given free to lift or pump that water?

Mr. MATTHEW. Yes, sir, that is right, that is the subsidy.

Senator MCFARLAND. If I may interrupt, one-third of the cost of the dam, that is approximately one-third, is charged to irrigation, is it not? That is where the cost comes in, it goes to irrigation.

Mr. MATTHEW. All of the capital costs of irrigation, all of the capital costs of producing power to lift water in the aqueducts are to be paid by the commercial power users.

Senator ANDERSON. Let me try it again. As I understand it, you have a generating plant at this Bridge Canyon Dam site?

Mr. MATTHEW. Yes, sir.

Senator ANDERSON. That has nothing to do with the water pumped onto this land except that the power will be moved down here to help pump it?

Mr. MATTHEW. That is right.

Senator ANDERSON. That power moved down there to help pump it; who pays for that?

Mr. MATTHEW. The commercial power users.

Senator ANDERSON. You mean he pays a rate high enough up here so that this can be furnished free?

Mr. MATTHEW. That is right.

Senator DOWNEY. As a matter of fact, just speaking in magnitudes and estimating, Mr. Matthew, the actual pumping of that water 987 feet will cost somewhere in the neighborhood of $9, $10, or $11 an acre-foot, that is, if you figure the cost of your power at what it could be commercially sold, say 5 mills?

Mr. MATTHEW. The commercial value of that power is at least 4½ mills, that is, the actual cost of producing it would be 4½ mills. They are going to use an average of about 1,300,000,000 kilowatt-hours. That would be over $5,000,000, if my decimal point is right, so the cost would be somewhere in the neighborhod of $4 or $5 an acre-foot for the energy.

Senator ANDERSON. Annually?

Mr. MATTHEW. Yes.

Senator MCFARLAND. I have a question when you have completed your questions.

Senator DOWNEY. Is it not true that in order to make Bridge Canyon usable for power output it would be necessary in the very near future, after it is erected, to erect either Glen Canyon Dam or some other dam upstream to prevent silting into Bridge Canyon Dam?

Mr. MATTHEW. That is right. Bridge Canyon, even with Coconino and Bluff Reservoirs will silt up in about 40 years. It will completely silt up in 50 years and the power output of the project will be reduced accordingly. That whole thing will be developed in much more detail by Mr. Peterson who is to appear before the committee.

The result is that even over and above the situation at the start, Bridge Canyon power is not firm power. It gets down to a monthly output in such year as 1934, according to the Bureau's own estimates, which is insufficient even to take care of the pumping demand. In the long run as we proceed the output would be very seriously reduced.

Senator DOWNEY. Is it not contemplated under the plans of the Bureau of Reclamation and other interested parties that Glen Canyon Dam shall be built in order to prevent the silting up of Bridge Canyon?

Mr. MATTHEW. The Bureau of Reclamation has studies under way, they have been exploring the Glen Canyon Dam site and it is contemplated in part for such a purpose.

Senator DOWNEY. And does the Bureau of Reclamation through its computation of costs give any consideration to the cost of erecting this upper dam that would prevent the silting of the lower dam?

Mr. MATTHEW. No, sir; there is nothing in the cost estimate to provide for the cost of construction of Glen Canyon Dam.

Senator DOWNEY. Is it not true that the Glen Canyon Dam would cost something in the neighborhood of $150,000,000 at present prices?

Mr. MATTHEW. It would probably cost much more than that, Senator. The dam and power plant would probably cost in the neighborhood of $400,000,000.

Senator DOWNEY. You include the power facilities and I was just speaking of the dam, Mr. Matthew. Is there any consideration at all given to the methods by which that dam should be erected, how it should be financed and how its power should be divided?

Mr. MATTHEW. No, sir; nothing in this report.

Senator DOWNEY. Is that dam located in the upper or lower basin?

Mr. MATTHEW. It is located in the upper basin, sir.

Senator DOWNEY. Under present conditions, without the building of steam plants or the use of the power at Boulder, would the power at Bridge Canyon have any substantial value? Would it be firm enough to have any substantial value?

Mr. MATTHEW. The firm output as an independent unit would only be in the neighborhood of 2,000,000,000, or maybe 2,500,000,000 kilowatt-hours.

Senator DOWNEY. As against what average amount that could be used if it were firmed up?

Mr. MATTHEW. Estimated at about 4,000,000,000 to 4,500,000,000 kilowatt-hours.

Senator DOWNEY. And would not the firming up of that be a substantial cost running into the tens of millions?

Mr. MATTHEW. Yes, sir; the firming up of that power, if it was firmed up with steam power, would cost $80,000,000 or $100,000,000 in capital cost.

Senator DOWNEY. And if it were firmed up by the power from Hoover Dam would that necessitate difficulty and expense for the people who accommodated themselves to that firming up?

Mr. MATTHEW. Yes, sir. Mr. Peterson will explain to the committee just how this proposal of the Bureau invades these Hoover Dam power contracts. In fact, on the hearings on S. 1175 Bureau witnesses admitted the contracts would have to be changed.

Senator DOWNEY. Mr. Matthew, you spoke about one particular area of 75,000 acres in the central Arizona project which the Bureau of Reclamation said was now wholly idle and would have to receive a full water supply.

Mr. MATTHEW. That is right.

Senator DOWNEY. Has the Bureau of Reclamation produced any data or any maps showing what that 75,000 acres is?

Mr. MATTHEW. No; they have not.

Senator DOWNEY. Have the California representatives been able to determine what it is?

Mr. MATTHEW. No, sir.

Senator DOWNEY. It is your suggestion that that 75,000 acres is only the usual amount that lies idle from year to year in an irrigation project of this kind and of this magnitude?

Mr. MATTHEW. That is correct.

Senator DOWNEY. And that as a matter of fact if you have 100 percent acreage you may only need 85 or 90 percent of the water supply because you can count upon 5, 10, or 15 percent of the land lying fallow, or for other reasons being idle?

Mr. MATTHEW. That is right. That is the experience of western irrigation all through its history.

Senator DOWNEY. And is it your opinion that before we can deal wisely with this problem we will have to find out just exactly what that 75,000 acres is that they have referred to, that is, identify it?

Mr. MATTHEW. Yes, sir.

Senator DOWNEY. Did you not state that that 75,000 acres took 40 percent of the water, according to Bureau figures, that would be brought in from the Colorado River?

Mr. MATTHEW. Yes. It is proposed in the report to furnish that acreage with a full surface irrigation supply which would take 40 percent, or more, of the water to be diverted from the Colorado River.

Senator DOWNEY. It is true, is it not, Mr. Matthew, that in your presence I asked Bureau representatives for identification of that 75,000 acres and they were unable to give any identification?

Mr. MATTHEW. That is correct.

Senator DOWNEY. Mr. Matthew, you stated that, according to the Bureau statement—and please correct me if I am wrong—if this central Arizona project should not go in it would cause a return to the desert or lack of irrigation of approximately 150,000 acres.

Mr. MATTHEW. Yes. That was estimated by the Bureau in the report and so stated.

Senator DOWNEY. You have stated the maximum value for most of this land would be $300 an acre?

Mr. MATTHEW. That is correct.

Senator DOWNEY. My mathematical computation is that 150,000 acres at $300 an acre is worth $45,000,000.

Mr. MATTHEW. That is right.

Senator DOWNEY. In other words, if our assumptions are correct, for $45,000,000 it would be possible to purchase the amount of land that the Bureau of Reclamation is proposing to prevent being returned to the desert, as a cost of many hundreds of million of dollars?

Mr. MATTHEW. About 9 or 10 times the value of the land.

Senator DOWNEY. Mr. Chairman, I think that is all I have now.

The CHAIRMAN. Any other questions?

Senator MALONE. Mr. Chairman, I think we all want to be on the floor at 12 o'clock, but I might have time for one question.

I was interested in the Chairman's questions about the feasibility, and all. Of course the theory of division between the States gets away from the theory of appropriation, to a certain extent. That is the theory of the compact, I think. That has been done between the upper and lower basins and it has not been divided by compact between the States of the upper basin, but not between the States of the lower basin.

I was interested in your questioning along the line of pooling the resources as being a compact method. It is my opinion, Mr. Chairman, that it is the exact opposite.

The CHAIRMAN. The suggestion of pooling was made by the witness.

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Senator MALONE. I suggest it is not pooling when you divide it by compact. I beg your pardon because I had not heard that part of the testimony. But far from pooling the resources, a use by Utah, New Mexico, or Nevada may come much sooner than a use by California, those States being at a higher elevation. Our interest is in safeguarding the amount of water that we can use so that regardless of the time of feasibility it is based on ultimate feasibility. Feasibility changes.

I was also interested in the chairman's questions along the line that what was feasible 30 years ago is entirely out of order now because of demand and various other factors. About all anyone can do is to figure present feasibility and project it into the future as long as feasible.

Do we meet tomorrow, Mr. Chairman?

The CHAIRMAN. Yes, indeed.

Senator MALONE. I think I will have a short statement of about 5 minutes to make, which we might regard as a preliminary statement.

The CHAIRMAN. Very well.

Senator MCFARLAND. Mr. Chairman, there was just one thing I wanted to say. I do not want to take the time of the committee to ask questions; but the project report does not show that just 150,000 acres less land will be irrigated if the project is not developed; it shows that 230,000 acres less land will be irrigated if the project is not developed. I believe the record should be clear on that point.

The report also shows that the proper proportionate part of the proposed cost of the dam and its maintenance for irrigation are charged to irrigation. That will be developed by our witnesses when they have an opportunity to testify. I did not want those statements to go unchallenged here.

That is all I have at this time, Mr. Chairman.

The CHAIRMAN. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 11:50 a. m., the hearing was adjourned to 10 o'clock a. m. of the following day, Wednesday, April 13, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

WEDNESDAY, APRIL 13, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney, Downey, McFarland, Anderson, Kerr, and Malone.

The CHAIRMAN. The committee will be in session.

We shall, without objection, interrupt the presentation by California to permit Senator Malone to make a brief statement.

Senator MALONE. Mr. Chairman, I thought it proper at this time to make a brief statement for the record, as I have already indicated that Nevada would have a statement to make at the proper time. This is a very preliminary statement. I have urged Mr. A. M. Smith, the State engineer of Nevada, to come here when the hearings are resumed. Mr. Smith, the present State engineer, was one of my deputies when I was State engineer. I resigned in 1935, and Mr. Smith took over. He had since attended, I think, all of the hearings of the lower basin conference on water division, and I attended all of them before that time for 8½ years, so that we have a pretty good picture of the whole thing.

This morning I want to make a part of the record the report of the engineering committee appointed by the Colorado River Conference at Salt Lake City on March 1, 1935. That is the date of the report to that conference. The members of that committee in 1935 were Edward Hyatt, the State engineer of California; M. G. Hinderlider, State engineer of Colorado, and myself. I was State engineer of Nevada at that time. The three State engineers were charged with making this preliminary report for the conference.

Mr. Edward Hyatt is still State engineer of California and Mr. Hinderlider is State engineer of Colorado. All of the work done in their respective States has been under their general supervision. They have been advisers to the Colorado River Commission, even when they were not members.

I will not go into an analysis of the report because it was made 13 or 14 years ago and considerable information has become available since that time. I think in general it conforms very closely to estimates of water supply which were the best estimates of the period. Of course, much information has been made available since.

There is a great deal of difference in the conception of irrigated areas, that is, as to expense, costs and returns now as compared to 1935. Therefore, the situation has changed materially.

In this report, in addition to assuming a certain amount of water for the upper basin in accordance with the compact, reservoir development on the lower basin, which is now almost complete, includes the Boulder—now known as Hoover Dam—and Davis Dam, which will be completed next year, and which dam backs the water up to the Hoover Dam, plus the Parker Dam below Davis. That practically completes the development of the lower river.

Now, we assumed at that time Mexico would be allocated a maximum of 750,000 acre-feet of water annually, simply because everyone who is familiar with the river knew that was even more than they had ever beneficially used. Since that time, of course, the State Department and the Senate of the United States have seen fit to give them twice that amount of water, a million and a half acre-feet of water, which materially altered the calculations with regard to the Colorado River, and for use in the lower basin.

In this preliminary statement we have considered Utah and New Mexico, but not adequately, I am sure, since adequate data were not available at the time. Without going into detail at all, the report shows the total use by Nevada was estimated at 900,000 acre-feet. As I have previously said in these hearings, apparently the fight or the arguments between Arizona and California has dominated all meetings. They are the two largest water users. Nevertheless, the amount of water that Nevada can use beneficially for domestic uses, industrial uses, and irrigation uses, plus Utah and New Mexico, who are in the same category, and are relatively just as important to those States as the larger amount of water used by the other two States.

I want to emphasize again—and I will make a more complete statement later toward the close of the hearings; and at that time I will ask that my statement made last year before this committee be made a part of the record. We will wait until the proper time to do that—but I want to emphasize again for the benefit of those members of the committee who have not taken an active part in the Colorado River work over the period 1922–49, a long stretch of time, those who have not been active with regard to the work on that river and who also may be new members of this committee, that no agreement, no compact has ever been signed between the five lower-basin States that the water set out in the Boulder Canyon Project Act is entirely ineffective on account of the fact that no State has ever signed the division made there. And even if they had, it would be of doubtful legality because two of the low-basin States were left out entirely. Of course, they could have come in later, but it is now impossible to consider and discuss the lower basin water supply except when you take into consideration the five lower-basin States.

I ask that this statement of the engineers, dated March 1, 1935, be made a part of the record at this point.

The CHAIRMAN. So ordered.

PRELIMINARY REPORT OF THE ENGINEERING COMMITTEE APPOINTED BY COLORADO RIVER CONFERENCE IN SALT LAKE CITY, UTAH, MARCH 1, 1935

A study of the water ultimately available in the lower basin of the Colorado River including all tributaries, based on the report of E. B. Debler, December 1934; analysis of commitments thereon; and an assumed distribution thereof.

ASSUMPTIONS

1. Consumptive use of 7,500,000 acre-feet annually in the upper basin as apportioned by the Colorado River compact.
2. Complete reservoir development in lower basin as set forth in the Debler report.
3. That Mexico will be allocated 750,000 acre-feet annually.

I. Ultimate usable water supply

	Acre-feet
1. Net supply for use from main stream below Boulder Dam	8,370,000
2. Net supply for use from Gila River	2,259,000
3. Net supply available for lower basin use above Boulder Dam	240,000
4. Waste crossing international boundary and usable in Mexico	200,000
Total	11,069,000

NOTE.—Items (1) and (2) are exclusive of waste into Mexico.

II. Present commitments on lower basin supply (including total Gila River vested rights and contracts)

1. Arizona:	
Total of Gila River	2,259,000
Vested in Colorado River below Boulder Dam	600,000
2. California contracts	5,362,000
3. Present lower basin uses above Boulder Dam in Arizona, Nevada, New Mexico, and Utah	90,000
Total	8,311,000

III. Assumed distribution

Additional assumptions:	
(*a*) Use in Arizona, Nevada, New Mexico, and Utah above Boulder Dam of	240,000
(*b*) Total use by Nevada	900,000
(*c*) Allocation to Mexico	750,000

DISTRIBUTION

1. Arizona:		
(*a*) Gila River	2,259,000	
(*b*) Rights below Boulder Dam	600,000	
(*c*) Total above Boulder Dam	30,000	
(*d*) Remaining water in main stream	[1] 988,000	
		3,877,000
2. California contracts		5,362,000
3. Nevada:		
(*a*) above Boulder Dam	30,000	
(*b*) balance of proposed contract	870,000	
		900,000
4. New Mexico above Boulder Dam		30,000
5. Utah above Boulder Dam		150,000
6. Republic of Mexico		750,000
Total		11,069,000

AVAILABLE TO ARIZONA FROM MAIN STREAM OF COLORADO RIVER

Present uses from Colorado River below Boulder Dam	600,000
Assumed ultimate uses above Boulder Dam	30,000
Remaining water below Boulder Dam	988,000
Total	1,618,000

[1] Total available quantity for use in lower basin less allocations, contracts, and assumed distributions.

REMARKS

1. It is herein understood that water used or to be used above Boulder Dam as above listed is assumed to come from tributaries of the main stream of the Colorado River. The Nevada contract for water deliveries proposed to the Secretary of the Interior for 900,000 acre-feet, includes both present and proposed uses.

2. It is assumed that the water used by New Mexico from the Gila River is included in the Gila River commitments.

3. It is also assumed that Utah will use 150,000 acre-feet of the 240,000 acre-feet of the lower-basin water to be used above Boulder Dam, as determined by the Debler report. If as indicated by Utah, that State may require a total of 300,000 acre-feet, the additional amount must be deducted from the net supply listed as available for use below Boulder Dam.

4. It is not necessarily assumed that all members of the Commission agree in all particulars to the accuracy of the Debler report, but this report is a preliminary analysis of the water supply available for use in the lower basin, based on that document.

EDWARD HYATT.
M. G. HINDERLIDER.
GEO. W. MALONE.

SALT LAKE CITY, UTAH, *March 1, 1935.*

Senator MALONE. I do not want it understood that the 900,000 acre-feet is the limit of what Nevada is claiming at this time, because I am having our State engineer come here with reports available since 1935.

I asked the State engineer to review the reports. Before I left the State engineer's office I made a report covering 8½ years' work and data secured on the Colorado River. That report has become somewhat of a standard document in Nevada, like Senate Document No. 186, my report which the Seventieth Congress, second session, has published and which became a standard document on the entire Colorado River Basin States.

At that time we made an industrial survey with a 250-mile radius around the dam. I directed the survey from the State engineer's office in Nevada. The Bureau of Mines of the States of California, Arizona, New Mexico, and Utah assisted me with the help of my own director of the Nevada State Bureau of Mines, who at that time was John Fulton, and who was also the head of the Makay School of Mines at the University of Nevada. It is an industrial survey which has stood up and which has been very helpful. The purpose of it was to show how the power and water from Hoover Dam could be utilized.

I have a wire from Mr. A. M. Smith, State engineer, that I request permission to read into the record. This wire is in response to my inquiry on the amount of water needed:

CARSON CITY, NEV.

Hon. GEORGE W. MALONE,
United States Senator from Nevada:

Approximately 150,000 acres of land in southern Nevada irrigable from Colorado River by pumping lift not over 800 feet. Information in report of Colorado River Commission of Nevada, 1927–35 prepared from data assembled by you—meaning me—when Nevada State engineer as to areas may be a little conservative. See pages 119, 120, 121. This report does not include 60,000 acres west of Searchlight, mostly first-class land which can be irrigated by 1,500- to 2,000-feet lift from Davis Reservoir. Rapidly increasing population and future outlook will no doubt justify inclusion of areas along river that were omitted from early estimates. Bureau of Reclamation estimated cost of reclaiming 15,000 acres in Las Vegas Valley would be under $400 per acre with operation, maintenance, and amortization 40 years at $33 per year per acre. See John N. Kerr,

Bureau report, dated February 1936. Any of this land seems better economical investment than Arizona land at $2,000 or more per acre for supplemental irrigation only, Nevada water duty in this area is about 5 acre-feet per acre. If Arizona project is to be ratified the entire Colorado River downstream water set-up should be revamped in order to give Nevada more water on a comparable basis.

My preliminary statement as of now is in line with my former request for the Bureau of Reclamation report, and I again request that the chairman of this committee write an official letter to the Commissioner of the Bureau of Reclamation and request the information from that Bureau on the acreage which could be irrigated in Nevada, New Mexico, and Utah under the approximately same conditions as to cost per acre and lift, as contemplated under the Arizona project.

The population of the Hoover (Boulder) Dam area in southern Nevada has doubled at least four times in the 21 years since the Boulder Dam Project Act was passed.

There is every reason to suppose that with the complete utilization of the more than 200,000 horsepower to which Nevada is entitled from Hoover (Boulder) and Davis Dam, and the irrigation of approximately 150,000 acres of land in that area together with the almost unlimited recreation facilities, the population could easily reach 150,000 in the forseeable future.

The demand for domestic irrigation and domestic purposes could run well over 1,000,000 acre-feet annually, instead of the 300,000 acre-feet formerly accepted as due the State of Nevada by California and Arizona.

GEORGE W. MALONE.

Mr. Chairman, that completes my preliminary statement.

The CHAIRMAN. Such a letter will be written.

The CHAIRMAN. Senator Malone, are you ready to make your statement on S. 75?

Senator MALONE. Yes, sir.

(S. 75 is as follows:)

[S. 75, 81st Cong., 1st sess.]

A BILL Authorizing the construction, operation, and maintenance of a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of controlling floods, improving navigation, and regulating the flow of the Colorado River, providing for storage and for the delivery of the stored waters to provide essential supplementary supply of water to irrigated lands, for municipal and domestic uses, and for the irrigation of public and other lands within the United States, and for the generation, use, and sale of electrical energy as a means of making the project herein authorized a self-supporting and financially solvent undertaking, and other beneficial purposes, the Secretary of the Interior, hereinafter referred to as the Secretary, subject to the terms of the Colorado River compact and the water delivery contract between the United States and the State of Arizona, executed February 9, 1944, is hereby authorized to construct, operate, and maintain (1) a dam and incidental works in the main stream of the Colorado River at Bridge Canyon, which dam shall be constructed to an elevation of not less than one thousand eight hundred and seventy-seven feet above sea level; (2) a related system of main conduits and canals, including a tunnel and main canal from the reservoir above the dam at Bridge Canyon to the Salt River above Granite Reef Dam, a canal from the Salt River to the Gila River above the town of Florence, Arizona, and thence a canal to Picacho Reservoir, and thence a canal to the Santa Cruz River flood plain; (3) such other canals, canal improvements, laterals, pumping plants, and drainage works as may be required to effectuate the purposes of this Act; (4) complete plants, transmission lines, and incidental structures suitable for the fullest economic development of electrical energy generated from water at the works constructed hereunder for use in the operation thereof and for sale in accordance with Federal reclamation laws (Act of June 17, 1902, 32 Stat. 388, and acts amendatory

thereof or supplementary thereto); and (5) such appurtenant dams and incidental works, including interconnecting lines to effectuate coordination with other Federal projects, flood-protection works, desilting dams, or works above Bridge Canyon and a dam on the Gila River in New Mexico and such dams on the Gila River and its tributaries in Arizona as may be necessary in the opinion of the Secretary for the successful operation of the undertaking herein authorized and to effect exchanges of water to insure an adequate supplemental supply to lands presently or heretofore irrigated from the Gila River including and below Cliff Valley in New Mexico and from the tributaries of the Gila River by supplying water from the main stream of the Colorado River to lower lands now receiving water from the Gila River or its tributaries, thus releasing Gila River and tributary water for use and exchange on other lands served by the Gila River and tributaries and other exchanges of water which may be agreed upon by the users affected: *Provided, however*, That construction of the tunnel and that portion of the canal hereinabove described from the reservoir above the dam at Bridge Canyon to a junction with the aqueduct hereinafter authorized shall be deferred until Congress by making appropriation expressly therefore has determined that economic conditions justify its construction, and in order to provide a means of diversion of water from the Colorado River to the main canal pending the construction of said tunnel and said portion of the canal and for use thereafter as supplemental and stand-by works the Secretary is authorized to construct, maintain, and operate from appropriations authorized by this Act an aqueduct from Lake Havasu to and connecting with the main canal in the vicinity of Cunningham Wash, and pumping plants to raise water from Lake Havasu to such elevation as may be required to provide gravity flow of such water to the main canal.

SEC. 2. The Secretary shall have the authority to acquire, by purchase, exchange, condemnation, or otherwise, all lands, rights-of-way, and other property necessary for said purposes: *Provided*, That, anything herein contained to the contrary notwithstanding, the Secretary shall not have the authority to condemn established water rights or the water to the use of which such rights are established, or works used or necessary for the storage and delivery of such water to the use of which rights are established, or the right to substitute or exchange water without the consent of the holders of rights or those entitled to the beneficial use of such waters as may be involved in the proposed exchange.

SEC. 3. The estimated cost of the construction of the said works shall be determined by the Secretary. The Secretary shall also determine (a) the parts of said estimated cost that can be properly allocated to flood control, silt control, navigation, river regulation, recreation, fish and wildlife conservation, general salinity control, respectively, and any other purposes served by the project which may hereafter be made nonreimbursable by law, the sums so allocated, together with the expenses of operation and maintenance attributed by him to such purposes, to be nonreimbursable, and (b) (1) the part of the estimated cost which can properly be allocated to irrigation and probably be returned to the United States in net revenues from the delivery of water for irrigation purposes; (2) the part of the estimated cost which can properly be allocated to irrigation and probably be returned to the United States by revenues derived from sources other than the delivery of water for irrigation purposes; (3) the part of the estimated cost which can properly be allocated to power and probably be returned to the United States in net power revenues; and (4) the part of the estimated cost which can properly be allocated to municipal water supply or other miscellaneous purpose; and probably be returned to the United States.

Before any construction work is done or contracted for the Secretary shall first determine that costs allocated to power, municipal water supply, irrigation, or other miscellaneous purposes as herein provided will probably be returned to the United States: *Provided*, That the repayment period for costs so allocated shall be such reasonable period of years, not to exceed the useful life of the project, as may be determined by the Secretary.

SEC. 4. Electric energy developed at any of the generating plants herein authorized shall be used first for the operation of pumping plants and other facilities herein authorized, and for replacement purposes, and the remainder thereof sold or exchanged to effectuate the purposes of this Act. In the production, sale, exchange, and distribution of electric energy generated by any of the works herein authorized in excess of that required for the operation of said pumping plants and other facilities, the Secretary shall be governed by the Federal reclamation laws.

The Secretary is authorized to supply water for municipal and domestic purposes in accordance with the provisions of said laws.

SEC. 5. Contracts for the delivery of water for irrigation purposes shall provide for the delivery of such water at an identical price per acre-foot at the several points of delivery of water from the main canals and conduits herein authorized, and from such other points of delivery as the Secretary may designate. Such contracts shall be made with the State of Arizona or the State of New Mexico, or with persons, firms, public or private corporations, irrigation or other districts, municipal or other political subdivisions thereof, in accordance with the reclamation law. No person shall have or be entitled to have the use for any purpose of any water delivered hereunder except by contract made as herein stated.

SEC. 6. The works provided for by the first section of this Act shall be used: First, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of present perfected water rights; and third, for power. The title to all works herein authorized shall forever remain in the United States and the United States shall until otherwise provided by law control, manage, and operate the same: *Provided*, That the Secretary may in his discretion enter into arrangements for the operation or use of a unit or units of said works with the States of Arizona or New Mexico or any irrigation district, reclamation project, or other subdivision or agency thereof.

SEC. 7. The rights of the United States in and to the waters of the Colorado River and its tributaries for the use of which the works herein authorized are incidental, convenient, or necessary as well as the rights of those claiming under the United States shall be subject to and controlled by the Colorado River compact.

SEC. 8. The United States in constructing, managing, and operating the works herein authorized, including the appropriation, delivery, and use of water for the generation of power, irrigation, or other uses, and all users of water thus delivered and all users and appropriators of water stored by said reservoirs or carried by said canals, including all permittees, licensees, and contractees of the United States, or any of its agencies, shall observe and be subject to and controlled, anything to the contrary herein notwithstanding, by the terms of the Colorado River compact and the water delivery contract between the United States and the State of Arizona dated February 9, 1944, and by the laws of the State of Arizona or the State of New Mexico governing water rights wherever the same may be applicable.

SEC. 9. Nothing herein shall be construed as modifying or affecting any of the provisions of the treaty between the United States of America and the United Mexican States signed at Washington, District of Columbia, February 3, 1944, relating to the utilization of the waters of the Colorado River and other rivers as amended and supplemented by the protocol dated November 14, 1944, and the understanding recited in the Senate resolution of April 18, 1945, advising and consenting to ratification thereof.

SEC. 10. This Act shall be deemed a supplement to the reclamation law, which said reclamation law shall govern the construction, operation, and management of the works herein authorized except as otherwise herein provided.

SEC. 11. Nothing herein shall be construed as interfering with such rights as the State of Arizona or any other State now has either to the waters within its borders or to adopt such policies and enact such laws as it may deem necessary with respect to the appropriation, control, and use of waters within its borders, except as modified by the Colorado River compact or any other interstate agreement.

SEC. 12. There are hereby authorized to be appropriated out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary to carry out the provisions of this Act.

Senator MALONE. Mr. Chairman, I have here a letter from the Honorable Vail Pittman, Governor of the State of Nevada; Alan Bible, attorney general for Nevada; and Alfred Merritt Smith, State engineer for Nevada, which I will submit for the record; and also an additional telegram from Alfred Merritt Smith, Nevada State engineer and secretary of the Colorado River Commission of Nevada.

Now, to consolidate the statement on April 13, when I made a preliminary statement for the record, I will simply ask that the letter signed by Vail Pittman, Governor of Nevada; Alan Bible, attorney

general of Nevada; and Alfred Merritt Smith, which was addressed to the Honorable John R. Murdock, chairman of the Irrigation and Reclamation Subcommittee of the Committee on Public Lands of the House of Representatives, be inserted in the record following my preliminary statement of April 13. This, Mr. Chairman, is apropos of the official position taken by the Honorable Vail Pittman, Governor of the State of Nevada, Alan Bible, attorney general, and Alfred Merritt Smith, State engineer of Nevada, on the bill for the Arizona project, S. 75.

Now, Mr. Chairman, I will ask at this point that the telegram received from Alfred Merritt Smith, State engineer of Nevada and secretary of the Colorado River Commission of that State, be inserted immediately following the letter just described. That telegram describes in some detail the acreage available for irrigation, together with the water duty, the domestic needs and an estimate of the future needs, and adding up and giving a rough estimate of the total of the water needs for industry, irrigation, and various other uses.

Now, Mr. Chairman, in order to save the time of the committee, it will be remembered, last year Senator Millikin was chairman of a subcommittee of this committee that heard this matter at some length, and at that time I made a rather complete and comprehensive statement on this subject which, upon review, I think I could improve but very little, and I ask that that statement be made a part of this record. It was confined principally to the definition, and contributed to a better understanding of the upper basin States and the lower basin States, what those terms meant; the upper division and the lower division, and the present status of the conferences up to date of the lower-basin States in trying to arrive at a division of the water.

The only change in the whole statement I should now like to make is that no lower-basin State or upper-basin State had any definite amount of water allocated to it. The upper-basin States have a definite amount of water allocated to them under the compact, and that is also true of the lower-basin States as a group; but the States in and of themselves had no rights to any definite amount of water, simply because there had been no agreement in the upper-basin States or lower-basin States, as between themselves, and, furthermore, very definitely the lower-basin States included five States and not three, and there had never been any detailed conservation made available as to the possibility of use of the water in except two of the States, Arizona and California, and, of course, they are the major users of the water, and unfortunately the fact had developed and had gone to the public that it was simply a quarrel between Arizona and California. That made a very bad situation, because over the years the two had been in a good many bad fights and each had its violent supporters of its position, regardless of any merits of the case, which most of us are trying to keep away from.

Now, to complete that statement, since the statement was made on August 5, 1948, the upper-basin States have signed a compact and have definitely divided the water between the upper-basin States, and to that extent the statement will be changed.

I think there is no other change. There is a very complete record that quotes not only from the record back over the years since 1927,

when I originally entered the fight as State engineer and secretary of the Colorado River Commission, which is the job Alfred Merritt Smith now holds, whose telegram I have included in the record.

(The letter and telegram referred to are as follows:)

MAY 12, 1949.

Hon. JOHN R. MURDOCK,
Chairman, Irrigation and Reclamation,
Subcommittee of the Public Lands Committee.

STATEMENT OF VAIL PITTMAN, GOVERNOR OF NEVADA; ALAN BIBLE, ATTORNEY GENERAL OF NEVADA; ALFRED MERRITT SMITH, STATE ENGINEER OF THE STATE OF NEVADA

The House Committee on Public Lands now has under consideration a bill identical to S. 75, to authorize the construction of a project to deliver 1,200,000 acre-feet of water per year into the Salt River Valley of central Arizona from the Colorado River for supplemental irrigation use. Two alternate plans have been surveyed and studied by the Bureau of Reclamation. Both plans require a dam at Bridge Canyon. The first plan calls for a gravity diversion above the dam through some 77 miles of tunnel conduit into natural water courses. The second plan could divert water at Parker Dam by pumping through an elevation of about 1,000 feet to a canal which will convey the water to the Phoenix area. The second plan is preferred as of somewhat lower cost. Power for pumping at Parker would be 1,393,000,000 kilowatt-hours per year. The Bureau estimates a cost of $730,000,000 to the Government. The project appears incapable of repayment of capital costs.

The capital cost of supplying irrigation water to this project will be about $1,500 per acre, to which will be added operation and maintenance. No new lands are to be reclaimed. The water is to be used for supplemental irrigation of existing cultivated lands and does not provide for new population or new farms which is the principal object of the reclamation law.

The project calls for the construction of the Bridge Canyon Dam to supply power for pumping. Bridge alone seems unwise as it can store only 3,720,000 acre-feet, and if unprotected will fill up with silt in 40 years. Glen Canyon Dam above Bridge should be built at the same time for both storage and silt control as it will have 8,600,000 acre-feet capacity, but has low power head. Glen is necessary to protect the firm power output of Bridge. The Arizona project will require one-third of the power from Bridge and probably should be charged with one-third the cost of Glen, for safe continuous operation, which would place it still further in the realm of fantastic planning.

Nevada was allocated 300,000 acre-feet of water per year from the Colorado, but the diversion of downstream water has not been fixed by interstate compact. For 15 years Nevada has spent time and money in trying to effect an agreement on the terms of the tri-State compact without avail. The downstream water situation is in chaos, yet the requirements of California and Arizona are urgent and imperative and should be served without delay. A prompt determination of respective rights is necessary; and the ambiguous wording of the Boulder Canyon Project Act should be cleared up. All negotiations have been futile, and it is our opinion that a solution can be effected by lawsuit and with the aid of the Supreme Court. It is our opinion that prior to a determination of available water, the high cost of the detailed studies of this project should not have been incurred and no project should be authorized by Congress below Lee Ferry on the Colorado. We are of the belief based upon observation and study, that there is not enough water in the Colorado to satisfy this colossal project and at the same time serve the established existing irrigated lands and authorized projects in Arizona and California.

Furthermore, it seems to us that the computations for the project should have been based upon the present reclamation law. As set up it contemplates changes in the law which are purely speculative.

The Boulder Canyon Project Act authorized Arizona, California, and Nevada to compact upon an estimated 7,500,000 acre-feet apportioned on the basis of 300,000 acre-feet to Nevada, 2,800,000 acre-feet to Arizona, 4,400,000 to California. Arizona and California and Nevada were also given the right to increase their

use 1,000,000 per annum under article III, section (b) of the compact. This has been referred to as "b" water.

During the preliminary negotiations in 1935, Nevada requested 900,000 acre-feet as her share, but upon representations made by the Bureau of Reclamation that less than 300,000 acre-feet could be beneficially used Nevada did not press her claim. Rapid increases in population and development in southern Nevada since 1935 show that Nevada can beneficially use 900,000 acre-feet, and can reclaim and irrigate at least 130,000 acres of new land and in addition will require at least 105,000 acre-feet for industrial, suburban, and domestic uses by the year 1960. Reclamation of this new land can be made at one-sixth of the cost per acre calculated for supplemental irrigation only on the Arizona project.

The adamant stand of Arizona to accept no interpretation of existing documents excepting her own, and her emphatic refusal to arbitrate, negotiate, or submit to a Supreme Court analysis and adjudication and the determined fight by that State in Congress to prevent such a procedure would close the door to a satisfactory solution by preferred methods. California and Nevada, equally firm in support of their rights, have nevertheless been and are now willing to submit the matter to the courts.

With these facts in mind we urge that the bill to authorize the Arizona project be unfavorably considered by your committee and that support be given to the legislation to submit the Colorado River controversy to the Supreme Court.

Respectfully submitted.

VAIL PITTMAN,
Governor of Nevada.
ALAN BIBLE,
Attorney General for Nevada.
ALFRED MERRITT SMITH,
State Engineer for Nevada.

CARSON CITY, NEV., *May 11, 1949.*

Senator GEORGE MALONE,
Senate Office Building, Washington, D. C.:

Incomplete list irrigable lands as follows: Las Vegas area, 15,000 acres; Mormon Mesa and Littlefield areas, 30,000 acres, mainly in Tps. 13 S. R. 68 E., and 13 S. 69 E. and 14 S. 68 E. and 14 S. 69 E.; Davis Dam area, 50,000 acres mainly in T. 30 S., R. 65 and 66 E. and 31 S. 35 and 66 E.; and 32 S. 65 and 66 E. and 33 S. 65 and 66 E.; Meadow Valley, Wash., 7,000 acres mainly in T. 14 S. R. 66 E.; Dry Lake area, 20,000 acres mainly in Tps. 23, 24, and 25 S. R. 62 and 63 and 64 E.; Moapa Valley, 4,000 acres, scattered areas east of Lake Mead, 4,000 acres; total lands, 130,000 acres minimum water duty 6 acre-feet equals 780,000 acre-feet for irrigation to which add probable additional uses by year 1960 Las Vegas and Henderson industrial, 50,000; milltary installations, 5,000; Las Vegas including suburban and area to south to State line domestic uses, 50,000; grand total water, 885,000 acre-feet. Surveys would change these areas somewhat but would probably show more irrigable land. Present population of area 40,000. Population by 1960 estimated 100,000.

ALFRED MERRITT SMITH,
Nevada State Engineer and Secretary,
Colorado River Commission of Nevada.

Senator MALONE. Mr. Smith worked for me for a couple of years prior to the time I resigned and he took over the job, and thereafter the two of us have had intimate contact with all of the meetings and discussions beginning back in 1927, up to the present time.

So, I will ask, Mr. Chairman, that this statement be included as part of my statement, to follow the telegram just submitted, the telegram received from Mr. Smith.

The CHAIRMAN. It is so ordered.

(The statement referred to is as follows:)

THE COLORADO RIVER BASIN—STATUS OF WATER DIVISION AND COMPACTS IN THE SEVEN STATES OF THE COLORADO RIVER BASIN

(Excerpts from the Congressional Record in the Senate of the United States. Statement of Hon. George W. Malone of Nevada, August 5, 1948)

[Congressional Record, p. 9983]

STATEMENT ON THE CURRENT STATUS OF WATER DIVISION AND COMPACTS IN THE SEVEN STATES OF THE COLORADO RIVER BASIN, INCLUDING A DEFINITION OF THE TERMS LOWER AND UPPER BASINS, LOWER AND UPPER DIVISIONS, COLORADO RIVER COMPACT, AND THE BOULDER DAM PROJECT ACT IN SUPPORT OF SENATE JOINT RESOLUTION NO. 145, INTRODUCED TO FACILITATE THE CONTINUED DEVELOPMENT AND BENEFICIAL USE OF THE WATER AND POWER OF THE COLORADO RIVER SYSTEM

Mr. MALONE. Mr. President, in view of the pending legislation for the continued development of the Colorado River Basin States through the development and beneficial use of the waters of that great river system, and my extreme interest in such continued development dating back to the introduction of the Swing-Johnson bill later—1928—to become the Boulder Dam Project Act, I am prompted to request unanimous consent to insert in the Record at this point my statement made before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs. The statement was made in connection with Senate Joint Resolution No. 145, which was introduced to facilitate such development.

There being no objection, the statement was ordered to be printed in the Record, as follows:

STATEMENT OF THE HONORABLE GEORGE W. MALONE, UNITED STATES SENATOR FROM THE STATE OF NEVADA, ON COLORADO RIVER DEVELOPMENT, SENATE JOINT RESOLUTION NO. 145.

Senator MALONE. Mr. Chairman, I will make my statement brief since I am chairman of the Subcommittee on Flood Control, Rivers and Harbors, Dams, and Electric Power of the Public Works Committee and must return to that meeting.

Mr. Chairman, I intend to show, in support of Senate Joint Resolution 145 in which I joined, that no State of the seven States in the Colorado River Basin, including my own State of Nevada, has a definite allocation of water under the existing conditions.

COLORADO RIVER COMPACT

The Colorado River compact divides the water of the Colorado River system between the upper and lower basins. This compact was approved by six of the States of the basin in accordance with the provisions of the Boulder Dam Project Act before the construction of a dam could be started. I will present the evidence upon which I concluded that an agreement between the lower basin States on the division of the water allocated to that basin is impossible. Therefore, the only logical remaining method would be through a court of competent jurisdiction.

The statement made by Senator Hayden, of Arizona, is a very fair outline of all of the history of the project that he has reviewed. I have not read the brief by Senator McFarland, but I assume it outlines all of those things which were done by the commissions and the Members of the Congress of the United States during the hectic days of 1927 to 1928 when the Bouder Dam project was finally passed and marked the first major development on the Colorado River system.

Many of the things, however, that we would probably each recall are subject to interpretation. Each State, at the time I first attended the Commission meetings early in 1927, had its own water and power set-up, including their own engineers, and it soon became apparent that there was no way of getting anything done except to go along with the compact and amend the then Swing-Johnson bill to treat the interested States fairly in the division of the water and power benefits from the project. I, therefore, as secretary of the Colorado River Commission for Nevada, directed all of my efforts, with the power of the State of Nevada behind me, to that end.

AGREEMENTS

Mr. Chairman, it will be found as you delve into this matter that not only is it impossible to make new agreements, but the old agreements already made, including the interpretation of the original Colorado River Compact will be questioned and, no doubt, submitted to the court many times in the future for interpretation.

At that time I was State engineer of Nevada, engineer member of the Public Service Commission, and secretary of the Colorado River Commission. We found immediately that the original bill did not provide any benefits from the project for the States of Arizona and Nevada where the project was located, that it was simply a power development and water storage on the Colorado River for the sole benefit of California.

Mr. Chairman, it his been evident to me since the first water meeting I attended in Los Angeles, Calif., early in 1927, before I became a member of the Nevada-Colorado River Commission, that the lower basin States would never agree upon a division of the waters of the Colorado River.

The reason was perfectly obvious; there was more land than water, and that the limit of any State's development is the limit of that State's water supply.

I do not want to see any State injured through any action of the Federal Government, and certainly not by any action of mine. Therefore, since an agreement is very unlikely, an adjudication by a court of competent authority seemed the only way.

ORIGINAL CONFERENCES

I want to mention in particular some men that were in this fight from the beginning. One was in your own State, Mr. Chairman—Mr. Delph Carpenter. Mr. Carpenter wrote the Colorado River compact I was informed on the best of evidence at Santa Fe, N. Mex., in 1922, with Herbert Hoover as chairman of the Seven Basin States Organization. It was the first real organized attempt to develop the Colorado River through a division of the water through a compact signed by a representative of each State on November 24, 1922.

I have often chided Delph Carpenter about the compact, that no one could understand it, therefore he was probably going to get it adopted. I personally felt that as long as no State was discriminated against in the matter of water division and the benefits from the power development, which was the purpose of the nine amendments that I offered at that time, that we would get the first step in the development of the river. Then the rest would be growing pains; and I think, Mr. Chairman, that that is exactly where we are now. We anticipated these growing pains, and the next step must be taken just as carefully as the first step, which was the development at Boulder Dam, now known as Hoover Dam. Each step must be just as carefully worked out so that no State will be injured without its day in court.

In the beginning, the men on the committee included Senators McNary, of Oregon, Thomas, of Idaho, Johnson and Shortridge, of California, and Kendrick, of Wyoming, as well as Pittman and Oddie, from my own State of Nevada; Dill, of Washington, and Henry Ashurst, of Arizona, were on the then Irrigation and Reclamation Committee of the Senate (now the Committee on Interior and Insular Affairs). These men wanted to start the development of the Colorado River. Over in the House was Leatherwood, of Utah, Arentz, of Nevada, Morrow, of New Mexico, Lewis Douglas, of Arizona, and White, of Idaho. They are all men who have gone on other jobs or have since died, but they did do this initial job and, Mr. Chairman, it was a good job. Senator Hayden is the only Member of the United States Senate who was a member of this body and this committee on January 20, 1928, when I first appeared before it on behalf of the Boulder Dam development.

SENATE DOCUMENT NO. 186, SEVENTIETH CONGRESS, SECOND SESSION, COLORADO RIVER DEVELOPMENT

There is one thing that I would like to clear up for the benefit of the committee, and I am sure that everyone knows it, if they would review the Colorado River compact. There are five States in the lower basin—not three—and, by the way, this Senate document to which I refer was prepared by me in 1927. It was then printed as a Senate document in 1928. It is called Senate Document No. 186, Seventieth Congress, second session. It is still used as a reference work by many of the commissions. I did not prepare it alone. The State engineers

of the other six States in the basin assisted me in the work through acting as consultants, as well as the Bureau of Reclamation engineers.

Senator MILLIKIN. What is this document now that you are talking about, Senator?

Senator MALONE. Colorado River Development, Senate Document No. 186, Seventieth Congress, second session. On page 31 of that document, you will find the definition of the upper and lower divisions and of the upper and lower basins. Much has been said about upper and lower basins and I think an explanation would be helpful. The Colorado River Basin is a seven-State affair, and the term "upper division" means the States of Colorado, New Mexico, Utah, and Wyoming. The "lower division" means the States of Arizona, California, and Nevada. Lees Ferry is the dividing point between the divisions.

"The term 'upper basin' "—and this is where a misunderstanding exists—"means those parts of the States of Arizona, Colorado, and New Mexico, and Utah and Wyoming"—you see, Utah and New Mexico come into the upper basin—"within and from which waters naturally drain into the Colorado River system above Lees Ferry."

BASINS AND DIVISIONS

The first is an arbitrary division and the next is a drainage division. The lower basin then, instead of only meaning just the States of Arizona, California, and Nevada, means those parts of the States of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River system below Lees Ferry. So, there are five States interested in the division of the waters of the lower basin, instead of only three States, which further complicates this situation and, as a matter of fact, the advance consent given by the United States Senate in the Boulder Dam project for a water-division treaty could not be binding upon all of the States of the lower basin even if it had been agreed upon and ratified by the States of Arizona, California, and Nevada, since Utah and New Mexico were excluded.

International water obligations

We are all familiar with the compact. It is provided that out of that upper basin States, the 7,500,000 acre-feet and the lower basin States 7,500,000 acre-feet, and the additional 1,000,000 acre-feet come the international water obligations. They were determined by treaty as coming out of the waters of both basins equally, after certain surplus water allocated to the lower basin may be exhausted.

To pass the Swing-Johnson bill at that time it was necessary to have a six-State ratification paragraph put in it, because, as Carl Hayden has just said, Arizona did not until much later ratify the seven-State compact. There has never been, I want specifically to point out, a lower-basin agreement in accordance with the approval (advance) of the Water Division, in the Boulder Dam Project Act, found on page 9 of this Senate document. There was an advance approval by the United States Senate for the States of Arizona, California, and Nevada to enter into an agreement dividing the 7,500,000 acre-feet annually apportioned to the upper basin—paragraph (a) of article III of the Colorado River compact, plus certain surplus water, but the States never agreed so the provision remained ineffective.

THE ADVANCE APPROVAL—INTERSTATE COMPACT—NEVER RATIFIED

"There shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial conumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico, but if, as provided in paragraph (c) of article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to

Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada."

I will call the chairman's attention to the fact that New Mexico and Utah are left out of this provision, and there never was such a compact entered into even by the States of Arizona, California, and Nevada; so naturally the provision in the act is null and void, since no action was ever taken by such States.

I will not read the remainder of the agreement but simply cite it for reference. I do not think it is necessary to put anything further in the record on that subject, since it has never been ratified, and is not effective.

I want to call attention further that the two basins are in the same situation, that is to say, while the water is divided between the upper and lower basins by the compact, and also the upper and lower divisions, that there has never been any division or allocation of the water between the lower basin States which include five States, and as between the upper basin States,[1] which include four States, and until such a division is made by the consent of the States concerned, then it is my conclusion that no State, including my own State of Nevada, could say that it really had any specific amount of water.

On page 36 of this document, under an explanation by Delph E. Carpenter, of Colorado, appears a review of the Colorado River compact. Delph Carpenter was well and favorably known among the old-timers, and perhaps not by the more recent participants because he has been practically paralyzed for the last 15 years. However, he was one of the most brilliant men that I ever had the opportunity of knowing. In his explanation or review of the Colorado River compact, he says that provision was made that all future controversy between two or more States of each group are specifically reserved for separate consideration and adjustment by separate commissions or by direct legislation, whenever such questions may arise, if they ever do. Also, appropriations of water are covered.

COLORADO RIVER COMPACT AND APPROPRIATIONS

The West is very careful about anything that affects appropriations of water. Present perfected appropriations of water are not disturbed, but such rights take their water from the apportionment to the basin in which they are located. In other words, if California or Arizona and Nevada claimed that they had used water and it was theirs by appropriation, it would come out of the lower basin water and the upper basin States would not be affected.

On page 38 there is provision for future apportionment of water. In the "Disposition of the waters of the Colorado River under the Colorado River compact," by Delph E. Carpenter, as found on page 38 of the same document, we have this provision; it is a very learned explanation of the entire document, but sufficient for this testimony I cite a paragraph on the first page:

"The Colorado River compact allocates 16,000,000 acre-feet to uses in the United States and sufficient for the international burden, whatever it may be, and then sets apart the unallocated surplus for future apportionment by the States after 40 years."

The 16,000,000 acre-feet adds up to seven and one-half million allocated to the upper basin, the four upper basin States, and seven and one-half million to the lower basin States, the five States that I mentioned, and not the three, and then 1,000,000 acre-feet in addition to the lower basin if it is available. If there is additional water, it would be called unallocated surplus and would not be under the compact apportioned until after 40 years.

"In other words, the compact specifically allocates 16,000,000 acre-feet plus the international burden, as designated burdens upon the whole supply of the river and then dedicates the unallocated surplus to future apportionment between all seven of the States. Of the 16,000,000 aggregate 7,500,000 plus 1,000,000

[1] The upper basin States—Wyoming, Utah, Colorado, and New Mexico—did agree upon the division of the upper basin water allotted between them and the United States Senate has ratified the agreement (1949). The status of the lower basin, however, has not been changed.

acre-feet per annum (beneficial consumptive use) is permanently allocated to the lower basin. These permanent allocations include all water necessary to supply all present appropriations, wherever the same may be and whether from the main stream or from the Green, the Gila, or any other tributary."

Now, Mr. Chairman, that is not my language. It is the language of the man who wrote the compact and whom I consider one of the most brilliant attorneys in the United States, certainly on water matters. That is his explanation of the compact, which he himself wrote and which the representatives of the seven States of the basin signed at that time, and which was later to become a highly controversial matter. Finally, the Boulder Dam Project Act was passed based on the approval of the six States of the basin, as already outlined.

DELPH E. CARPENTER—COLORADO

Total water available in the entire basin for apportionment, out of which would come this unallocated surplus and the water for any international treaty, is estimated in the beginning on page 38 on the "Disposition of the waters of the Colorado under the Colorado River compact," by Delph E. Carpenter, the water is supplied, reading from his explanation:

"The river is supplied by its tributaries from the Green to the Gila. Without tributaries there would be no river.

"The water supply of the river consists of all water which of nature and undisturbed by works of man would pass Yuma, the point below the last tributary. It is impossible to tell the exact amount of this total supply in any year, owing to interference by diversions, but it has been estimated at from 20,000,000 to 24,000,000 acre-feet average.

"This aggregate natural water supply may be divided into (1) that part entering the river above Lees Ferry and contributed by those streams which drain the upper basin; and (2) that part entering the stream between Lees Ferry and Yuma and contributed by streams which drain the lower basin."

You see, he again emphasizes that basins mean drainage, and drainage above Lees Ferry is the upper basin and the lower basin means that area draining to the river below Lees Ferry. Divisions mean an arbitrary division of the four States above Lees Ferry and the three States below Lees Ferry.

Any subsidiary compact of the lower basin would be, according to Mr. Carpenter, "the water available to the lower basin, water there originating and Lees Ferry delivery, is to be used in the lower basin to care for the lower-basin allocation. 8,500,000 acre-feet, and the entire international burden, unless there is a deficiency for international supply, in which case the waters allocated to each basin are to be called upon to the extent of one-half of the deficiency."

Mr. Carpenter says:

"The States of the lower basin should enter into a subsidiary compact making (1) local allocation of the aggregate 8,500,000 acre-feet (out of the whole river supply) allocated to the lower basin by the compact; (2) provision for supplying the entire international burden, if, when and for the amount by treaty determined; and (3) disposition of the unallocated surplus pending and subject to future allocation between the seven States. They should also make provision for temporary use of allocated water escaping from the upper basin, without prejudice to the rights of the upper basin."

That is the five lower-basin States.

INDUSTRIAL ENCYCLOPEDIA—11 WESTERN STATES

Mr. Chairman, in order to save the time of the committee, I also prepared—and it seems I have a habit of preparing reports for reference over the past 20 years—what is called an Industrial Encyclopedia of the 11 Western States. That was edited and published in 1944; the data included in it, however, is up to 1943. I would like, in order to make available the included reference work on the Colorado River, to make a part of the record beginning in 1922, "November 24, Colorado River compact, executed at Santa Fe, N. Mex., Herbert C. Hoover, then Secretary of Commerce, acted as chairman of the Seven Colorado River Basin States Conference." It enumerates from that date the Colorado River development events up until 1944.

Senator MILLIKIN. Will you make clear to the reporter exactly what you want put in there, and it will be put in.

Senator MALONE. Yes; I will.

(It is as follows:)

"1922: November 24, Colorado River compact, executed at Santa Fe, N. Mex.; Herbert C. Hoover, then Secretary of Commerce, acted as chairman of the Seven Colorado River Basin States Conference.

"1923: C. H. Birdseye and the United States Geological Survey party survey canyons.

"1924: Weymouth report rendered in eight manuscript volumes.

"1924: Second Boulder Dam bill (Swing-Johnson) introduced in Congress.

"1924: Cosby report on Colorado River issued.

"1925: The State of Nevada, by legislative act, March 18, 1925, approved the Colorado River six-State compact.

"1925–26: December 21, third Swing-Johnson bill introduced in Congress, H. R. 6251. Identical bill, S. 1868, was introduced by Senator Johnson in the Senate about this date. H. R. 6251 was replaced February 27, 1926. These two bills are referred to as the third Swing-Johnson bill.

"1927: Special advisers made report to the Secretary of the Interior.

"1927: Conference of lower division States—Arizona, California, and Nevada—at Los Angeles attended by the Colorado River commissions of the three States (new Nevada Colorado River Commission).

"1927: Conference of Governors on Colorado River.

"1928: Fourth Boulder Dam bill—Boulder Canyon Project Act (Swing-Johnson bill) introduced in both Houses of Congress.

"1928: January 20, George W. Malone report and testimony before the Irrigation and Reclamation Committee of the United States Senate, title of the report, 'Boulder Canyon Lower Colorado River Power and Water Set-up.' Nevada Colorado River Commission. The report and the testimony recommended that nine amendments be made to the then pending Swing-Johnson bill.

"1928: Senate Document No. 186, Colorado River Development, December 11, Seventieth Congress, second session, by George W. Malone, State engineer of Nevada.

"1928: The fourth Swing-Johnson bill was passed by the Senate December 14, by the House December 18, including eight of the nine amendments proposed by the Nevada Colorado River Commission, and approved and signed by President Coolidge, December 21.

"1929: The State of Utah signed the Colorado River Compact.

"1929: President Hoover issued proclamation declaring six-State ratification of Colorado River Compact in effect and declaring Boulder Canyon Project Act effective this date, June 25, 1929.

"1929: July 5, 1929, Nevada submitted bid for all of the power to be produced from Boulder Dam, together with a use curve showing ultimate use for 483,000 horsepower for mining, agriculture, and electrochemical products to support the State's request for a withdrawal provision for power to use in the State. The withdrawal provision was later inserted in the power contracts and the bid was withdrawn.

"1929–30: Biennial report—State engineer of Nevada—covering developments to date including legislation and amendments to the original Swing-Johnson bill.

"1930: Contract signed by Secretary Wilbur with Metropolitan Water District of Southern California for delivery of water April 24. Contract signed by Secretary Wilbur with Metropolitan Water District of Southern California for electrical energy April 26, amended May 31, providing withdrawal of power by Arizona and Nevada to extent of 36 percent, in accordance with the amendments to the Swing-Johnson bill proposed by the Colorado River Commission of Nevada.

"1930: Contract signed by Secretary Wilbur with city of Los Angeles and Southern California Edison Co. for electrical energy April 26, amended May 28, and Department of Water and Power of City of Los Angeles, made party to contract in addition to city of Los Angeles, providing for the withdrawal of power for use within the States of Arizona and Nevada in accordance with amendments to the Swing-Johnson bill finally known as the Boulder Canyon Project Act.

"1930: Second deficiency appropriation bill appropriating $10,660,000 to start Boulder Dam work passed by House and Senate July 3.

"1930: July 7, 1930, the Secretary of the Interior, Ray Lyman Wilbur, issued an official order to Dr. Elwood Mead, Commissioner of Reclamation, to 'start work on Boulder Dam today.'

"1930: Secretary Wilbur drives first spike starting railroad and construction of Boulder Dam at Las Vegas, Nev., September 17, and issues order that dam be called Hoover Dam.

"1931: $15,000,000 appropriated by Congress for construction of dam.

"1931: Bureau of Reclamation opens bids for construction of Boulder Dam and powerhouse March 4 and awards contract to Six Companies, Inc., which starts work March 11.

"1932: $23,000,000 appropriated for continuing construction of dam.

"1932: The engineers divert the river, November 14.

"1933: $46,000,000 appropriated for construction of dam.

"1933: Secretary of Interior Harold L. Ickes announced that the name of the dam would again be Boulder Dam. Start concrete pouring in dam. Diversion tunnels, coffer dams, excavation for the dam completed.

"1934: Penstock tunnels completed; installation of 30-foot diameter outlet pipes started.

"1935: January—Conference of the seven States of the basin, Wyoming, Colorado, New Mexico, Utah, Nevada, Arizona, and California. The conference was held at Phoenix, Ariz., on a further division of water from the Colorado River. Arizona has never signed the Seven-State Compact and now wants to secure a contract for water.

"1935: Complete pouring concrete in dam February and start storing water.

"1935: February—Report of the Colorado River Commission of Nevada; 'Including a study of proposed uses of power and water from Boulder Dam,' 1927 to 1935.

"1935: Boulder Dam starts to impound water in Lake Mead February 1.

"1935: Last concrete placed in dam May 29.

"1935: President Franklin D. Roosevelt dedicates the dam September 30.

"1936: First generator goes into full operation October 22.

"1936: Second generator goes into operation November 14.

"1936: Third generator goes into operation December 28.

"1937: Two more generators go into operation March 18 and August 16.

"1938: Storage reaches 24,000,000 acre-feet and Lake Mead stretches 115 miles upstream.

"1938: Two more generators go into operation June 26 and August 31; total 7.

"1939: Storage reaches 25,000,000 acre-feet, more than 8,000 billion gallons.

"1939: Two more generators, June 19 and September 12; total 9. Installed capacity reaches 700,000 kilowatts, making Boulder's hydroelectric power plant the largest in the world.

"1940: Boulder Canyon Adjustment Act, providing for the acceptance of $300,000 annually to each of the States of Arizona and Nevade in lieu of the 37½ percent provided for in the Boulder Canyon Project Act, and eliminating the periodical readjustment of the sale price of power.

"1940: Three more generators ordered.

"1940: All-American canal placed in operation.

"1940: Metropolitan water district's Colorado River aqueduct successfully tested.

"1941: One additional generator began operating in October.

"1942: Two more generators began operating in August and December.

"1942: Basic Magnesium, largest magnesium plant in the world, began taking power from Boulder Dam and water from Lake Mead.

"1943: Rated capacity of power plant of 952,300 kilowatts operated at overload in June to produce more than 1,000,000 kilowatts.

"1943: Basic Magnesium takes more than 100,000,000 kilowatt-hours in June.

"1943: Industrial service report—11 Western States, August, by the Industrial West Foundation, George W. Malone, managing director.

"1944: Additional generator scheduled for operation in October."

Senator MALONE. To make clear my next point and to show the highly controversial nature of the Boulder Dam legislation as introduced under the Swing-Johnson bill as early as 1923, and finally passed and called the Boulder Dam Project Act late in 1928, as explained by Senator Hayden, I would like to make a part of the record excerpts from the 1929–30 biennial report of the State engineer of Nevada. This simply shows the recommendations that were made for amendments to the pending Swing-Johnson bill and those accepted at the time, and has a direct bearing on the next point I am about to make, ending on page 87 and beginning on page 86.

Senator MILLIKIN. Again, you will make that clear to the reporter?

Senator MALONE. Yes.

(It is as follows:)

"The Boulder Dam Project Act as finally passed, including the power contracts, provides revenue for Arizona and Nevada in lieu of taxes and power to use for the development of the States. According to the Secretary of the Interior

the revenue derived will amount to over $700,000 to each State annually after the completion of the project, and each State can withdraw, if, as, and when wanted, up to 117,000 firm horsepower of the electrical energy for use in the State, paying cost at the switchboard when so withdrawn. It is thought that the use of this power will increase the taxable wealth of the State several millions of dollars.

"When the State (George W. Malone, State engineer and Colorado River Commissioner) administration took over the work of the Colorado River Commission early in 1927 the then pending Swing-Johnson bill, proposing to construct the Boulder Dam on the Colorado River, did not provide any revenue for the States of Arizona and Nevada, nor power from the project to develop those States, but did provide that the All-American Canal in Imperial Valley, costing $38,500,000 should be paid for by revenue from the power from the project in addition to the dam and power plant. Provision was later made for the lands benefited to underwrite the cost of the project. (One of the amendments to the Swing-Johnson bill—later the Bouder Dam Project Act—offered by George W. Malone.

"By unanimous action of the Commission, early in 1927 it was agreed to make a thorough study of the Colorado River set-up, employing such assistance as found advisable, to determine the exact position the State should take relative to the pending legislation for the development of that river, so that our position would be found to be fair to all concerned and supported by the facts.

"SAN FRANCISCO POWER CONFERENCE—GEORGE W. MALONE, CHAIRMAN

"Accordingly a conference was called for the three lower basin States, Arizona, California, and Nevada, in San Francisco, November 19 to December 16, 1927, at which time the power angle of the undertaking was thoroughly reviewed and a report subsequently issued for Nevada (by the State engineer of Nevada, chairman of the conference) definitely determining the effect of such development and making certain definite (nine) recommendations for the protection of our State and to aid the legislation by gaining the support, insofar as possible, of the upper basin States. The State engineer acted as chairman of that conference.

"The conference, in addition to the members of the Colorado River Commission of the three lower States, included such outstanding power experts as H. W. Crozier, consulting electrical engineer, employed by our Commission; E. S. Scattergood, chief engineer of the Los Angeles Bureau of Power and Light, and L. S. Ready, former engineer for the California Railroad Commission, employed by Los Angeles; Charles Cragin, chief engineer of the Salt River project, Arizona, and B. F. Jacobsen, consulting engineer of Los Angeles, employed by Arizona.

"From the results of this conference a report was made, January 1, 1928, by the Nevada Colorado River Commission, known as the Boulder Canyon lower Colorado River power and water set-up, and from the conclusions drawn from this report nine definite recommendations were made, all calculated to distribute the benefits from the project among the interested States in an equitable manner.

"NINE RECOMMENDATIONS TO THE THEN PENDING SWING-JOHNSON BILL

"On January 20, 1928, the State engineer of Nevada (George W. Malone) appeared before the United States Senate Committee on Reclamation and Irrigation and presented a statement made up from this report, including the nine recommendations, viz:

"1. That Nevada and Arizona should benefit from the proposed development, at least to the extent that she would benefit if developed by private capital, second only to Government payments and any reasonable reserve.

"2. That the power be not sold as low as the repayments to the Government will permit, but should be sold at a competitive figure comparable with the cost of power available elsewhere for these markets.

"3. That arrangements be made for the sale of the power so that fair offers may be had, and that legitimate bidders be not handicapped.

"4. That suitable readjustment periods be arranged for the power charges per kilowatt-hour and also for the proper charges for other service rendered.

"5. That proper charges be made for other service rendered flood control, silt control, irrigation-water storage, and domestic-water storage.

"6. That the States shall have the right to withdraw, upon proper notice, certain blocks of power to be used within their own States.

"7. That a board be arranged for, from the three lower States, to assist the Secretary of the Interior, or any agency supervising the sale of the power and other service rendered, in an advisory capacity to fix the proper charges per kilowatt-hour for power and proper charges for other service rendered.

"8. That an attempt be made to equalize in some manner among the three States the benefits of reclamation financing.

"9. That after the Government advancement is entirely repaid the benefits from this development accrue to the States.

"The State engineer was then cross-examined at length by members of the Senate committee, which testimony appears in full in the hearings before the Committee on Irrigation and Reclamation, United States Senate, Seventieth Congress, first session, on S. 728 and S. 1274. (January 20, 1928.)

"Senate Document No. 186 (70th Cong., 1st sess.), Colorado River Development, containing 200 pages and 67 maps and illustrations, was prepared by the Nevada State engineer to make available to our Senators and Congressmen complete information for use in the congressional fight. This report was subsequently printed by the Government as a Senate document and was widely distributed as the official document on the Colorado River development.

"EIGHT RECOMMENDATIONS ACCEPTED

"When the Swing-Johnson bill was finally reported out of the Senate committee, and including the amendments on the floor of the Senate, eight of the nine recommendations were included in the legislation as finally passed and called the Boulder Dam Project Act, and, together with the power contracts made by the Secretary of the Interior in conformance with the act, as amended, provide:

"1. That 37½ percent of all the money the project makes above the payments due the Government each year after construction is finished is to be paid to Arizona and Nevada. The Secretary of the Interior has announced that those payments will amount to over $700,000 per year to each of the States. (Would at this time—1948—have amounted to more than $1,500,000 annually to each State if the 1940 Adjustment Act had not been passed.)

"2. That the power be sold at a competitive price.

"3. That the Federal Water Power Act be made a part of the act insofar as determining between conflicting bidders is concerned, so that any agency may bid for the power (priority to States and municipalities).

"4. That there shall be a readjustment of the charges for power after the first 15 years from the date of signing the contracts and every 10 years thereafter, either up or down, as the competitive price may indicate.

"5. That a charge be made for domestic water in Los Angeles and other southern California cities. (No charge was included in the original act.)

"6. That the States shall have the right to withdraw, upon certain notice, 18 percent or 117,000 firm horsepower each for use in the States (now approximately 140,000 kilowatts). This power can be withdrawn and turned back when not needed and withdrawn again as often as necessary by giving such notice and paying the cost at the switchboard when used.

"7. That an advisory board to assist the Secretary in the construction, management, and operation of the project, consisting of one duly authorized Commissioner from each of the seven States, may act in an advisory capacity with the Secretary of the Interior. (George W. Malone was appointed by the Secretary for the State of Nevada.)

"8. That the All-American Canal, costing $38,500,000, shall be underwritten by the lands benefited and not be paid for by the power from the dam. (This increases the revenue of the States, and investigations shall be made by the Government in Arizona, Nevada, and the upper basin States to determine feasible irrigation projects for development.)

"Recommendation No. 9, providing for turning the project over to the States when the cost to the Government has been repaid was not included in the act. It was said that while that policy had been adopted in the case of irrigation districts it would be 50 years before the Government would be repaid, and during that time a general policy toward this type of project would be adopted.

"In connection with the Nevada amendments, we quote, in part, from a dispatch from Washington over Universal Service, which appeared in the Los Angeles Examiner of September 19, 1930, viz:

"'The outstanding features of these amendments were the provision for revenue for Arizona and Nevada from the project in lieu of taxes after its completion, and the privilege of withdrawing power at cost at the switchboard

for use in those States when needed. The original Swing-Johnson bill did not provide either revenue or power for the States of Arizona and Nevada, wherein the project is located, and this fact formed the basis for objection to the project.

"'At a hearing of the United States Senate Committee on Reclamation and Irrigation held in Washington, January 20, 1928, George W. Malone, secretary of the Nevada Colorado River Commission, made nine recommendations for changes in the bill as offered, all those recommendations being calculated to distribute the benefits of the project among the interested States.

"'Eight of these recommendations were included in the Boulder Dam Project Act as finally passed and, as a result, Arizona and Nevada each will receive, according to the Secretary of the Interior, a revenue of over $700,000 annually after the project is completed. In addition, through these amendments, Arizona and Nevada will be allowed to withdraw such amounts of power as they may need within their States up to 117,000 firm horsepower, paying cost at the switchboard for its use.'"

BOULDER DAM ADJUSTMENT ACT, 1940

Senator MALONE. Before I make my next point, and the last one, there was what was called the Boulder Canyon Adjustment Act of 1940, with which I think the Chairman is familiar, since it was agreed to by the seven States. To save the time of the committee, I would like to have the explanation of that amendment, which it really was, an amendment to the Boulder Dam Project Act, called the Boulder Canyon Adjustment Act of 1940, incorporated in the record, beginning with the heading "Precedent" on page 88, and ending on page 90, as marked.

Senator MILLIKIN. Do you want the tables in there?

Senator MALONE. No, Mr. Chairman; they simply outline the payment over the years. They would not be a part of it.

(It is as follows:)

"PRECEDENT

"The precedent for the 'revenue in lieu of taxes' from a Federal power development within a State was founded in the long-adopted principle in the revenue from the sale of public lands, and form the oil and gas leases located on the public lands, providing for 37½ percent of such revenue to be paid directly to the State in which such lands are located, on the theory that where such lands are held by the Federal Government the State cannot levy taxes but is entitled to a proportion of any income in lieu thereof. The Boulder Canyon Project Act, in section 4, paragraph (b) of the original act, provided for 37½ percent to be paid to the States of Arizona and Nevada wherein the project is located.

"In order to insure adequate provision for the States it was further provided in section 5, paragraph (a) of the act that 'contracts made pursuant to subdivision (a) of this section shall be made with a view of obtaining reasonable returns and shall contain provisions whereby at the end of 15 years from the date of their execution and every 10 years thereafter, there shall be readjustment of the contract, upon the demand of either party thereto, either upward or downward as to price, as the Secretary of the Interior may find to be justified by competitive conditions at distributing points or competitive centers.'

"The above provisions of the original act, approved December 21, 1928, provided the foundation for the Boulder Canyon Adjustment Act of 1940, which was negotiated by the seven Colorado River Basin States and approved by the States of Arizona and Nevada, paying $300,000 annually to each of the States of Arizona and Nevada in lieu of the 37½ percent provided for in the original act.

"KILOWATT-HOURS—COST—REVENUE

"Table No. 10 prepared annually by the Bureau of Reclamation in determining the rates to be charged for power from the Boulder Canyon project for the ensuing year applies to the fiscal year 1943–44 and shows at a glance the expected number of kilowatt-hours of firm and secondary energy for sale from 1943 to 1987, inclusive, and the actual sales for the years 1937–42. (Table No. 10 p. 88 of section VIII–A—Power Section of the Industrial Encyclopedia, published in 1944.)

"It shows the price per kilowatt-hour (1.190 mills for firm and 0.357 for secondary power) necessary for both firm and secondary energy to provide the annual operation and maintenance, amortization payments to the Government, and

the $300,000 to each of the States of Arizona and Nevada agreed upon through the Boulder Canyon Adjustment Act.

"REVENUE TO NEVADA AND ARIZONA—ORIGINAL ACT

"At the original price per kilowatt-hour agreed upon in contracts for the power under the original Boulder Canyon Project Act passed in 1928, 1.63 mills for firm power and 0.50 for secondary, the return for the fiscal year 1943–44 would have been increased by approximately $2,000,000, 37½ percent of which—or approximately $800,000—would have been added to the $600,000 annual payments to the States of Arizona and Nevada, agreed to under the Boulder Canyon Adjustment Act, making a total to the two States of $1,400,000, or $700,000 each.

"The 1.63 mills per kilowatt-hour for firm power established in the original contracts was based on the availability of oil at that time to the 'distributing points or competitive centers' at $0.75 to $0.80 per barrel. The price of such oil is now quoted (1944) at $1.10 per barrel, which would indicate an upward adjustment of the price per kilowatt-hour in 1945 at the end of the 10-year period under the original Boulder Canyon Project Act. However, since the Adjustment Act has been accepted, no such additional revenue can now be secured. (The price of oil is now approximately $2 per barrel.)

TABLE 11.—*Comparative revenue to the States of Arizona and Nevada under the original and under the adjusted Boulder Canyon Project Act*

Price per barrel of oil	$0.80	$1.10	$1.35
Assumption kilowatt-hours per barrel	500	500	500
Annual revenue to Arizona and Nevada under 1928 Boulder Canyon Project Act and power contracts	$1,400,000	$2,345,000	$3,133,000
Annual revenue to Arizona and Nevada under 1940 Adjustment Act [1]	$600,000	$600,000	$600,000

[1] $600,000 annual payments in lieu of taxes accepted by the States of Arizona and Nevada in place of the more than $3,000,000 annual revenue provided under the original Boulder Canyon Project Act.

Source: Bureau of Reclamation.

"ADJUSTMENT ACT

"The principal items of the Boulder Canyon Project Act pertaining to the generation and sale of electric power have been, to a large extent, revised under the Boulder Canyon Project Adjustment Act of 1940.

"One of the principal revisions of the Boulder Dam Project Act under the 'Boulder Canyon Project Adjustment Act of 1940' referred to above was the acceptance by the States of Arizona and Nevada of a definite annual payment of $300,000 each, in place of the 18¾ percent as provided under the Boulder Canyon Project Act passed in December 1928, which, according to the Bureau of Reclamation would have paid to the two States over the 50-year period $62,468,000, or an average of $624,680 to each State annually. This lesser amount was accepted presumably on the theory that the oil and gas used to generate the power 'at distributing points or competitive centers' would cost less in 1945, the date of the first 'readjustment of the contract,' than when the contract was first made.

"The Boulder Canyon Readjustment Act authorized and directed the Secretary of the Interior to promulgate 'charges on the basis of computation thereof for energy generated at Boulder Dam,' during the period from June 1937 to May 31, 1987. This, in addition to other net revenues, was to be adequate for the following purposes:

"1. To meet the cost of operation and maintenance and replacement.

"2. To provide $500,000 annually for additional development of the Colorado River.

"3. To provide $300,000 annually each for Arizona and Nevada.

"4. To repay the Treasury with interest at 3 percent loans for the construction of the project, exclusive of the $25,000,000 allocation to flood-control payment which is to be deferred until the end of the 50-year period subject to such action as Congress might then determine.

"The cost of generating equipment is to be repaid with interest at 3 percent within 50 years from the installation date. On May 29, 1941, the rate for firm power was reduced from 1.63 mills to 1.163 mills, and the rate for secondary power was reduced from 0.5 mill to 0.34 mill.

"These rates are subject to adjustment from time to time as conditions warrant.

"Another item of importance in the Adjustment Act is provision whereby the Government may arrange for an exchange of power to the Metropolitan Water District from the Parker and Davis Dams in place of the Boulder Dam power allotted it. This provision makes possible an over-all efficient operation of the plant in Black Canyon and the nearby downstream plants. The city of Los Angeles and the Southern California Edison Co. are established as United States operating agents for the Boulder power plant.

"ELECTRIC ENERGY ALLOCATION

"The basic firm energy has been allocated as follows: 17.6259 percent each to Arizona and Nevada; 35.2517 percent to the Metropolitan Water District of Southern California for pumping water through its Colorado River aqueduct; 17.5554 percent to the city of Los Angeles; a total of 4.0095 percent to Burbank, Glendale, and Pasadena; 7.0503 percent to the Southern California Edison Co.; and 0.8813 percent to the California Electric Power Co. Energy allocated to, but not used, by Arizona and Nevada, and subject to withdrawal by them upon giving proper notice, has for the present been assigned to other users as follows: 55 percent to the city of Los Angeles; 40 percent to the Southern California Edison Co.; and 5 percent to the California Electric Power Co. The California Pacific Utilities Co. of California has contracted for a maximum of 20,000,000 kilowatt- hours per year and the Citizns Utility Co., of Kingman, Ariz., has contracted for a maximum of 50,000,000 kilowatt-hours per year of the present unused portion of the Metropolitan Water District's power allotment. These contracts run until 1954, at which time the Metropolitan Water District may need its full allotment.

"HISTORICAL

"Boulder Dam, officially named Hoover Dam by the then Secretary of the Interior Ray Lyman Wilbur, and changed back to Boulder Dam again by Secretary of the Interior Harold L. Ickes when he took office in 1933 (and changed again to the Hoover Dam by Congress last year) was the first of the federally financed, large, multiple-purpose projects to be authorized by Congress and constructed by the Government in the 11 Western States, and the only one in the entire United States on which the cost was completely underwritten before construction was begun.

"The Boulder Canyon Project Act was passed by the United States Senate on December 14, 1928, by the House on December 18, and signed by President Calvin Coolidge on December 21, and made effective through proclamation by Herbert Hoover in June 1929. It, together with the contracts for the use of the power provided for in the act, definitely set the precedent for a State in which a project is located to receive a cash benefit in lieu of taxes, and for withdrawal of power to be used within the State when and if needed, even though such power might be used elsewhere in the meantime.

"The above review traces the history of the Colorado River and its development in some detail, together with its effect upon that growth of the Southwest and the 11 Western States, from the date of the discovery of the region by Francisco de Ullao in 1539 to the use of Boulder Dam by the Basic Magnesium Co. of more than 100,000,000 kilowatt-hours from the completed Boulder Dam in June of 1943."

Senator MALONE. One of these amendments—and I will not try to explain all of them because they are a matter of history and ready reference—but they all were directed toward the division of the power and the revenue features of Boulder Dam, now known as Hoover Dam, between Arizona, California, and Nevada. The dam is located between Arizona and Nevada, and the contracts were largely made for the sale of power in California. There was no development at all near the dam then available in either Arizona or Nevada.

In lieu of a direct sale of power to the States of Arizona and Nevada—the two States were given a withdrawal privilege to secure 36 percent of such power if, as, and when needed.

Mr. Chairman, we were laboring and sweating blood over the construction of Boulder (Hoover) Dam, just like they are doing now on the water division. It was important to each of the States to start the river development just as it is now very important to each of the States that a division of the water be made. If a division by compact is impossible, then the only recourse is to a judicial body. That is the reason that I joined in the resolution, Senate Joint Resolution 145.

ALL-AMERICAN CANAL NOT PAID FOR BY POWER FROM DAM

In the original Swing-Johnson bill was included the All-American Canal. For 5 years, every time Boulder Dam project was mentioned, the All-American Canal was a part of it. I came into the picture new and fresh in early 1927, and was chairman of the Lower Basin States Power Conference for several months. We met 40 days in San Francisco at one time and debated the entire problem in a very friendly conference, but no actual agreement came out of it. You will understand that there were just too many claims.

That All-American Canal always bothered me. I prepared amendments to the bill which were offered by Senators Pittman, Oddie, and others, both in committee, and on the floor of the Senate. In the debate in the committee, Senator Johnson was in his prime at that time, and everyone admits that, whether they agreed with Senator Johnson or not, he was a fighter. He said to me in cross examination, "We would be glad to give Nevada and Arizona money in lieu of taxes if there were such an amount of money available, but there is no such amount."

I said, "Senator," which is all a matter of evidence at that time, I think January 20, 1928, "what about the All-American Canal?" It has no more to do with the Boulder Dam project than any other reclamation project. Why pay for it out of Boulder Dam power? In our State when we want a reclamation project, we borrow the money from the Government, build the project, and repay the Government over a period of years." That is exactly what the committee did. They took the All-American Canal out of the picture, which left the $37,500,000; then I went on to explain that there would be no ditches to clean in Imperial Valley once the river cleared up and washed the silt out of the river so that the $500,000 a year expended in cleaning the ditches would be unnecessary, and that will be available money.

Then, $1,000,000 per year was being expended in rebuilding levees along the lower Colorado, because with 150,000 second-feet flow the valley (Imperial) was endangered, but with the Boulder Dam storage project holding the flow to 40,000 second-feet the 1,500,000 or at least a large part of such expenditure would be saved. So, as a result, they gave us, Arizona and Nevada, 37.5 percent of all of the money the project made above the payments due the Government each year when amortization payments should start. The Secretary of the Interior announced that these payments amount to $700,000 per year to each State.

REVENUE IN LIEU OF TAXES COMPROMISE

In the Adjustment Act, Arizona and Nevada accepted $300,000 a year in lieu of the $700,000 per year to each State and then went on to make other adjustments to which all seven States agreed. The revenue payments being based upon the cost of oil for steam power, the payments to each State would have been more than one and one-half million per year at this time if the original act had not been amended. I recommended that such an attempt be made to equalize in some manner among the three States, the benefits of reclamation and financing. What they actually did, was to require the All-American Canal costing $38,000,000 to be underwritten by the lands benefited in Imperial Valley. I note that this Readjustment Act also increased the revenue of the upper basin States, and provided that an investigation shall be made by the Government in Arizona and Nevada and the upper basin States to determine feasible agricultural projects for development. No projects have ever been paid for out of power or are being paid for out of power due to that amendment which I suggested to the then Senate Reclamation and Irrigation Committee on January 20, 1927.

NO SPECIFIC RIGHT TO WATER WITHOUT AGREEMENT

In conclusion, Mr. Chairman, I simply want to say that I am very desirous of seeing fair play, not only for California and Arizona but for my own State of Nevada. The 300,000 acre-feet of water that we are supposed to have allocated to our State was always simply taken for granted since it was not very much water, and therefore, no one ever paid it much attention, but we do not at this time have any water allocated to the State of Nevada through agreement by the lower basin States and neither does California or Arizona under the compact; and since there has been no agreement between the lower basin States, either under the provisions of the Boulder Dam Project Act or otherwise, which I want to emphasize again includes two States that have not been mentioned. New

Mexico and Utah, then it is wide open, except for the appropriations that are mentioned by Delph Carpenter, original appropriations already put to use, which would come out of the basin where the State is located.

I want to say again that all of these men that were in the fight—and I remember them all kindly. Delph is paralyzed and only his wife can understand him when he tries to talk; Mr. Scattergood, one of the finest engineers that I ever saw, and Bill Matthews, an attorney for Los Angeles, who is kindly remembered, and many others that I am unable at the moment to name—all contributed their share as they went through. They were fighting for their State but ready to concede something here and there to make the compact work, and to start the river development.

Senator MILLIKIN. I want to get this very clear. Does not Nevada claim the right to 300,000 acre-feet of water?

Senator MALONE. We do claim it but it has never been a part of any agreement. There have been conferences over a long period of time. I must have attended 30 or 40 such conferences during the 8½ years I was State engineer of Nevada, and Colorado River Commissioner. I should say, one such conference was held for several weeks in your city of Denver; but no agreement was ever reached.

Senator MILLIKIN. Let me pursue the matter a little further. Does not Nevada at this time claim the right to 300,000 acre-feet?

Senator MALONE. A claim is all it is. There is no right, and nothing could ever be attached as a right, because there has been no agreement between the States.

Senator MILLIKIN. As of this time, Nevada has no fixed right of any kind to water out of Colorado River?

Senator MALONE. No; and no other State has. Therefore, this matter is very complicated, and it is a matter then of interpretation of the compact, and even Delph Carpenter's learned discussion would have no bearing except to enlighten some of us in our conferences and in our discussions with each other, as to what the author of the compact had in mind, which might or might not affect the court's interpretation.

Senator MILLIKIN. May I ask this, Senator: You raised a very interesting angle in this business. Do your views coincide with those of the senior Senator from Nevada?

Senator MALONE. Unfortunately, I think he is in the hospital, and I have not discussed this with him, but we did agree that the only way there could be an equitable division of the waters, as a matter of fact, if a project were to be constructed now in any State, that would take a large amount of water, the only way such a division probably could be secured within a reasonable time would be by a court adjudication. I cannot speak for him now as to his current opinion. I understand that he submitted a written statement.

Senator MILLIKIN. Do your views coincide with those of the Governor of Nevada?

Senator MALONE. That I could not say, because I have not conferred with him on this particular matter. I understand Mr. Smith, who took my place as State engineer of Nevada, and worked for me a number of years before that time, will be here Saturday.

Senator MILLIKIN. I should like to ask the California representatives whether they have the same theory of Nevada's rights as those expressed by the Senator from Nevada.

Mr. SHAW. I might add to what Senator MALONE has said, Mr. Chairman, that Nevada does have two contracts with the Secretary of the Interior, naming the quantities of 300,000 acre-feet in the aggregate, qualified by the clause "subject to availability for use in Nevada." That does to some extent throw the matter again wide open. Nevada, I believe, considers that the quantity named is within reasonable limits and is properly to be expected to belong to Nevada.

This, I think, might be said on the subject, and I think Senator Malone would probably go along with the idea, that so long as there is no compact and no adjudication everyone in the lower basin is subject to being sniped at, and subject to having political determinations either in the executive departments or in Congress affect the working out of actual projects either to Nevada's benefit or detriment. The same is true as to Arizona and as to California.

Senator MILLIKIN. I think that we are still missing the point that I am driving at. I think Senator Malone has made it very clear. The Chair would like to know whether California is in agreement with the statement of Senator Malone to the effect that Nevada, at the present time, has no right to 300,000 acre-feet or any other number of feet of water from the Colorado River.

Mr. SHAW. It has contracts. We are then bound to determine whether these contracts confer a right. There has been debate on that subject as to whether they confer water rights or whether they are something of a different category.

Senator MILLIKIN. Has California resolved its views as to whether it does or does not have a right? I am speaking of Nevada's right, if it has one.

Mr. SHAW. I am unable to answer that question positively.

Senator MALONE. I might clear that matter up further. I did not mean that the State of Nevada has not advanced a claim, and I do not mean that California has not advanced a claim, and that Arizona may have advanced a claim, but I do mean that none of us have any particular amount of water that we can say unequivocally belongs permanently to Nevada or any other State until a compact is signed by the lower basin States, or the water has been adjudicated by a competent authority.

Senator MILLIKEN. I think the Senator has made that clear. The reason I am probing this, I have been under the opinion that it was conceded by all parties that Nevada had a right to 300,000 acre-feet of water, and, of course, if that is not correct, we certainly should throw all of the clarification we can on it.

Senator MALONE. In every conference I have sat in, Mr. Chairman—you see out of the seven and one-half million and the additional million to the lower basin States, the 300,000, a small amount, was generally taken for granted, but there has been nothing agreed upon officially or signed; so, if someone did question it, some new man representative of Arizona, or California, or Utah, or New Mexico, in the lower basin, it would throw a cloud on any claim we have, and if it were never adjudicated and no compact ever signed giving us 300,000 acre-feet, then financing any projects under it would be serious.

Senator MILLIKIN. I may have misinterpreted the Senator's testimony, but the impression is that the Senator himself has thrown a doubt on it, and if that is not correct, that ought to be made very clear.

Senator MALONE. That is correct. I myself believe implicitly that even your own State of Colorado has no specific amount of water that it can call its own in the upper basin until you would either agree by compact between the four upper basin States or until it has been adjudicated by a competent authority.

Senator MILLIKIN. I would like to ask the representatives of the upper States whether there is any claim that Nevada does not have 300,000 acre-feet of water by way of fixed firm right?

Mr. BREITENSTEIN. We concede that the Nevada contract gives her the right to use 300,000 acre-feet of the Colorado River water. When you talk about a right, Senator, we get into complications. A water right is a right of use, and it is not a right to a can of tomatoes.

Senator MILLIKIN. I suggest that under the compact that is not at all correct. The purpose of the compact, one of the purposes of the compact, was to avoid the necessity for us to mature a right by use.

Mr. BREITENSTEIN. Your compact defines beneficial consumptive use of water. Now, Nevada has the right, as we see it, to use beneficially or consume beneficially 300,000 acre-feet of water per year.

Senator MILLIKIN. Is that contested by any of the States in the upper basin?

Mr. BREITENSTEIN. Not that I know of.

Senator MILLIKIN. Is that contested?

Mr. BREITENSTEIN. I have never heard of that contested by any person speaking for an upper basin State.

Senator MILLIKIN. How about the States in the upper division?

Senator MALONE. Would Mr. Breitenstein identify himself for the record?

Mr. BREITENSTEIN. My name is Jean S. Breitenstein. I am a lawyer, and I am attorney for the Colorado Water Conservation Board, which is the water agency of the State of Colorado charged with the protection of or conservation of water resources of the State.

Senator MALONE. I would like to ask Mr. Breitenstein a question. Does the upper basin have anything to do whatever with the division of the lower basin water?

Mr. BREITENSTEIN. No, sir.

Senator MALONE. What difference does it make whether you advance a claim to the water allocated under the compact to the lower basin, or that you do not? The upper basin States have no interest in the lower basin water.

Senator MILLIKIN. Well, the Chair's purpose was to find out whether Nevada's right, if she has one, has been generally accepted or whether it has been a matter of opinion and possible conflict.

Senator MALONE. I want to say again, that the upper basin States have only one obligation, and that is to turn down 7,500,000 acre-feet of water annually, or 75,000,000 acre-feet in any 10-year period. The lower basin States have nothing whatever to do with the waters remaining in the upper basin and the upper basin States have nothing to do with the 7,500,000 turned down to the lower basin.

Senator MILLIKIN. I was not proposing to raise that question. I was simply trying to find out what the state of opinion is around here as to all of the States on the river, as to whether Nevada has a fixed right to a certain amount of water.

Now, as I understand it, the upper basin States do not challenge that right. If I am not correct in that, I would like to have someone correct me. As I understand it, California has not yet matured her conclusions as to whether that is or is not correct. Is that right?

Mr. SHAW. There are legal questions involved there as to the nature of these contracts from the Secretary of the Interior that I would rather not attempt to express a view on without pretty careful consideration, Senator.

May I add two thoughts, if you please. In a sense, each of the States on an interstate river has a right to equitable apportionment, that is, a right to a share of the whole use of the river. Now, that is something which must be taken into account in answering your question. I would like to make a little comparison. The State of Nevada has a secretarial contract under section 5 of the Boulder Canyon Project Act. It has two contracts aggregating 300,000 acre-feet. The States of Utah and New Mexico have no such contracts. Their position is therefore less advanced and less secure and less definite than that of the State of Nevada.

Senator MALONE. Could I ask a question of the witness? Are you referring to the paragraph that I read, where the Congress of the United States merely consents to a division of the waters, that that gave us a claim?

Mr. SHAW. I was not referring to that paragraph.

Senator MALONE. Will you tell me the one to which you refer?

Mr. SHAW. I was referring to the law of equitable apportionment, and that is something—if I may just complete the thought—undetermined and unadjudicated and still in full consideration of the Senator's question must be taken into account.

Senator MILLIKIN. Will you hold up just a moment? Does Arizona challenge the right of Nevada to 300,000 acre-feet?

Mr. CARSON. No; we do not. We have put in the Arizona contract this clause:

"Arizona recognizes the right of the United States and the State of Nevada to contract for the delivery from storage in Lake Mead for annual beneficial consumptive use within Nevada, for agricultural and domestic uses, of 300,000 acre-feet of the water apportioned to the lower basin by the Colorado River compact, and in addition thereto, to make contract for the use of one twenty-fifth of any excess or surplus water available in the lower basin and unapportioned by the Colorado River compact, which waters are subject to further equitable apportionment after October 1, 1963, as provided in article III (f) and III (g) of the Colorado River compact."

Now, since Utah and New Mexico have been mentioned here, I would like to read the next paragraph in this contract.

Senator MILLIKIN. This is a contract between Arizona and the Secretary of the Interior?

Mr. CARSON. Yes.

Senator MILLIKIN. What is the date of that contract?

Mr. CARSON. The 9th of February 1944. It was ratified by the Arizona Legislature:

"Arizona recognizes the rights of New Mexico and Utah to equitable share of the water apportioned by the Colorado River compact in the lower basin and also water unapportioned by such compact; and nothing contained in this contract shall prejudice such rights."

Mr. SHAW. Would you be kind enough to read the next section?

Mr. CARSON. That was (g).

Now, I would like to offer this entire contract for the record.

Senator MILLIKIN. It will be put in the record.

Mr. CARSON. It appears on page 240 of the Bridge Canyon project hearings on Senate bill 1175.

Mr. ELY. We have already entered that as an exhibit to our testimony.

Senator MILLIKIN. Since it has been offered, would that be sufficient?

Mr. CARSON. I would like to have it entered.

Senator MILLIKIN. Put it in at this point, even at the risk of encumbering the record. I do not like to have to make all sorts of cross references all of the time to find the material.

Mr. CARSON. All right.

Then, in Arizona's view Nevada has a firm right to 300,000 acre-feet, plus one twenty-fifth of the surplus which comes from our half of the surplus, and the division is made in the lower basin by virtue of the California Limitation Act in article IV of the Boulder Canyon Project Act, which the Senator from Nevada did not read, but which limits California to 4,400,000 acre-feet.

Now then, that leaves for Nevada and Arizona the balance of the seven and one-half million acre-feet of III (a) water apportioned to the lower basin, plus that small part of Utah and New Mexico, which are in the lower basin, and there is no dispute between Arizona and Utah or New Mexico over that water, nor with Nevada.

Mr. SHAW. Could I have paragraph (h) of that contract read?

Senator MALONE. I would like to have section (h) read.

Mr. SHAW. With the chairman's permission, I would like to read into the record the subsection of this contract immediately following the two which counsel for Arizona read.

Senator MALONE. Is this a contract or is it something adopted by the State legislature?

Mr. SHAW. It is a secretarial contract, approved by the State legislature of Arizona:

"Arizona recognizes the right of the United States and agencies of the State of California to contract for storage and delivery of water from Lake Mead for beneficial consumptive use in California, provided that the aggregate of all such deliveries and uses in California from the Colorado River shall not exceed the limitation of such uses in that State required by the provisions of the Boulder Canyon Project Act and agreed to by the State of California by an act of its legislature, upon which limitation the State of Arizona expressly relies."

Now, I wish to make these two comments. Obviously, the formulas adopted in this contract for recognition of the rights of Nevada, Utah, and New Mexico and California are wide open to the questions, the legal questions, which have been presented. They are not self-defining numerical quantities in all respects. They are subject to the provisions of section 10 of the same contract, and "neither article 7 which contains these three subdivisions which have been read, nor any other provision of this contract shall impair the right of Arizona and other States and the users of water therein to maintain, prosecute, or defend any action respecting, and is without prejudice to, any of the respective contentions of said States and water users as to (1) the intent, effect, meaning, and interpretation of said compact and said act; (2) what part, if any, of the water used or contracted for by any of them falls within article III (a) of the Colorado River compact; (3) what part, if any, is within article III (b) thereof; (4) what part, if any, is excess or surplus waters unapportioned by said compact; and (5) what limitations on use, rights of use, and relative priorities exist as to the waters of the Colorado River system; provided, however, that by these reservations there is no intent to disturb the apportionment made by article III (a) of the Colorado River compact between the upper basin and the lower basin."

We, on the part of California, and I do not want to have any mistake about this, do not challenge the right of the State of Nevada or the privilege of the State of Nevada, or whatever you may call it, to use 300,000 acre-feet of water. Nevada, however, without any adjudication, is standing out here deriving what comfort it can from this contract, but without any definition by any court or any compact of its exact rights.

GOV. VAIL PITTMAN'S LETTER—NO LOWER BASIN COMPACT

Senator MILLIKIN. I believe, Senator Malone, I should bring to your attention the letter of Governor Pittman of May 10, 1948, to this subcommittee. In the course of the letter the following appears:

"Nevada is seriously concerned as to the effect of congressional action upon the promotion and development of projects in the other States in the lower basin, which may have undesirable repercussions upon Nevada's allotment of water and power.

"In the absence of an effective allocation of water between the States of the lower basin, these States may rely upon their respective State water codes, and

their rights as established by priority of beneficial use could result in depriving Nevada of a part of the water to which the State is entitled under the Colorado River compact and section 4 (a) of the Boulder Canyon Project Act. The amount of water Nevada would receive under this agreement (300,000 acre-feet), while very small compared with the proposed allocations to Arizona and California, is vitally important to the welfare of southern Nevada. The danger of loss of a portion of this water to Nevada is accentuated by the necessity of supplying water to the Republic of Mexico as required by the Mexican Water Treaty of 1945.

"Nevada has a contract executed by the Secretary of the Interior under the project act for 17.6259 percent of all firm hydroelectric power produced at Hoover Dam. The necessity of conserving as much of this energy as possible is of the greatest importance to Nevada. The electric power is imperatively needed for present operation and development of natural resources in mining and irrigation, which are rapidly expanding, and for the operation of Basic Magnesium project which is now being acquired by Nevada and War Assets Administration where industries of great benefit to the State and to the national welfare are in operation; and others are negotiating for space and power."

I shall make the whole letter available to you, Senator, but here is another part that I want to refer to:

"Nevada's past experience conclusively leads me to believe that a three-State compact or agreement cannot be reached and further discussions will prove futile. Our State for many years has spent much time and money in efforts to bring the three-State compact into being, completely without results. At last Nevada discontinued negotiations and on March 30, 1942, contracted directly with the Bureau of Reclamation for 100,000 acre-feet of water from Lake Mead storage as water was urgently needed for the wartime Basic Magnesium project. Meantime, Arizona petitioned Secretary Ickes for a contract of withdrawal of up to 2,800,000 acre-feet from the main stream, that State's entire allotment, less certain deductions and qualifications in the contract. This led Nevada to contract for an additional 200,000 acre-feet, the limit of our right under the authorized three-State contract. The right is only for withdrawal of stored water when it is available."

Now, for whatever bearing that may have I thought that you should have that directly before you.

Senator MALONE. Mr. Chairman, I appreciate that. No doubt the governor sent me a copy, but in the press of other business it did not reach me. It has not been called to my attention. He says the same thing in his letter that I have just said for the record. What I want to say again is that I appreciate very much the protection afforded by the contract that the Legislature of Arizona has ratified, but as you can see, California still leaves the gate wide open, and the only way it could bind the State of Arizona would be through a compact with Nevada, ratified by the legislatures of both States, and even then the remaining three States of the lower basin would in no way be bound. I think California questions the 4,400,000 acre-feet limitation indicated by the Boulder Dam Project Act, and there are various ways, you understand, that you can compute water. One might be through gross diversions, and others through beneficial consumptive use, and you will find that in Delph Carpenter's explanation of the compact it is always beneficial consumptive use. Arizona, for example, computes their use of the Gila River waters in a certain manner—other computations use a different formula—neither I nor the State of Nevada can say what method should be used, but a court of competent jurisdiction can resolve the question.

Consumptive use means that in Colorado, for example, or the upper basin, you could, and probably will, divert the water, a considerable part of it, several times, and you have in Colorado one of the highest duties of water of any State in the West, primarily because you have such a large return flow. I am talking about beneficial consumptive use; I think it is only a little over an acre-foot or between an acre-foot and 2 acre-feet per acre. Whereas, if it were diverted and never returned to the stream system, it might be several times that, but your return flow is such that your beneficial consumptive use is very low.

UNITED STATES-MEXICO WATER TREATY

I want to say a further word about this. Highly complicating this entire picture is the 1,500,000 acre-feet allocated to Old Mexico. That has been ratified by the Senate of the United States and it is duly signed, and there is nothing that

anyone can do about it. I examined personally the lands in Old Mexico in 1927 and 1928. I have a peculiar habit of looking at things that I have to do something about. They never at any time, in my judgment, irrigated over 30,000 to 40,000 acres at one time, but they had about 200,000 acres under cultivation due to irrigating a part of it for 2 or 3 years; and then shifting to other parts of the land.

But now instead of the three-quarters of a million acre-feet, which is at least 100,000 acre-feet more than anyone thought they would ever be allocated and certainly that much more than they had ever utilized at any one time prior to the construction of the dam, they get 1,500,000 acre-feet. The 1,500,000 acre-feet must come from some place. It immediately dissipates any idea that there is going to be any large unallocated surplus, or maybe even very little of that 1,000,000 acre-feet that is allocated to the lower basin, in addition to the 7,500,000 acre-feet to the lower basin to be delivered at Lees Ferry by the upper basin. Through all of the negotiations—and you understand that I am not passing on these questions—we tried to meet the necessary problems in the interest of harmony and to get development started on the Colorado River, feeling that the rest of it would be growing pains—just like we are going through now. I do not want to hurt any State in the basin, either the upper or lower basin.

Therefore, I want it clearly understood that in my opinion there is not now any allocation to any specific State in the basin. I know the Secretary of the Interior has made these contracts, and they have made them with California, and they are about to make them or have made them with Arizona, and they have made two with us, but the Secretary of the Interior in the last 15 years has had a habit of taking on a good deal of authority; and I think the chairman is fully familiar with all of the ramifications of that habit—and that all of the Department's actions do not have the weight of law.

The Secretary of the Interior, Mr. Ickes, was entirely unfamiliar with water law in the West, and this is no disparagement of him, and the present Secretary, Mr. Krug, is entirely unfamiliar with our methods of water use in the West, and therefore it comes back to the old saying, "No one can talk quite so convincingly on a subject as someone entirely unhampered by the facts."

ONLY LOWER BASIN COMPACT OR AGREEMENT CAN DIVIDE THE WATER

I cannot settle this problem between Arizona, California, Nevada, New Mexico, and Utah. Only those States can settle it through a compact—or the rights can be adjudicated by a competent authority.

I want to make this point, that Delph Carpenter, when he says what the compact means—and he leaves for the moment aside what the States ratified—he is just like GEORGE MALONE or our chairman or anyone else; he is just 1 out of 140,000,000 making up the United States. What he says, and he wrote the compact, and he evidently meant it to mean that it included the Gila River, and it included every stream and every foot of watershed in it and to be based on beneficial consumptive use, but nevertheless, that is only Delph Carpenter, and I have the highest regard for him. We used to call him the "silver fox of the Rockies." However, the questions of fact must still be left to the court if there is a disagreement.

MOVE ONE STEP AT A TIME—GROWING PAINS

What we did at that time seemed right to us, but there are so many interpretations of even the compact itself, as you have seen here this morning, that it is my earnest opinion that the way to save time and to utilize the waters of that basin, in view of the fact that I agree wholeheartedly with the Governor, who has, along with Tom Smith, our State engineer, sat in these conferences almost continuously since I left the Commission, that there would probably never be an agreement between the lower-basin States in the division of water.

I concur in that position, and I think my friends from Arizona and California would also concur. Therefore, it is very important that the Government of the United States not assist anyone, Nevada, Arizona, California, New Mexico, or Utah, in establishing priorities that might be inimical to the rights of any other State until such determination is made either by compact or adjudication.

I have been advised that if a compact is not possible the quickest way to determine the rights would be through an adjudication by the Supreme Court, and should not hold us up, perhaps, more than a year, which, in view of the fact that the Boulder Canyon project was held up 7 years, even after Mr. Hoover called the States together in Santa Fe, N. Mex. Since it has taken the States of the West

many years on all major projects to arrive at the proper solution, the time element would not be out of line when the importance of the subject is considered.

What I am saying is that rather than deprive California and Arizona and Nevada or any other State of their proper rights, 1 year more or less is relatively unimportant, and if they are unable to do it for themselves, there should be a competent body to do the job. Now, it did make some difference in my thought on the subject when the Bureau of Reclamation came in and said that they were going to pump the water from Parker Dam to central Arizona instead of taking it out of the Bridge Canyon, because if it were taken out of Bridge Canyon, I think the Governor of Nevada, Mr. Vail Pittman, has very well covered it, that would divert a large amount of water without any adjudication, compact, or determination of rights above Boulder and Davis Dams where power is developed and then used for irrigation; and, of course, acts as flood control. They are truly multiple-purpose dams, but it would change materially the matter of repayments by reducing the power development upon which the project was originally financed.

I want to make this one point again. Not in any part of the lower river basin with which I am familiar has power developed on the main stream been used to finance an irrigation district. The Bridge Canyon project, if it is built, will produce a lot of power. The water will go through the Bridge Canyon, then on through Hoover and Davis Dams. The power will be available to the basin States, wherever it can be economically transmitted. I understand at Parker it will take about a third of this power to pump the water back into central Arizona. Approximately one-third of the power is used for that purpose, and then the revenue from the power, the power is fixed at a price that will repay the Government for the Central Arizona project. It is an exact parallel, as I see it, to the All-American Canal that the Congress rejected, through denial of the use of Boulder Dam revenue with which to repay the Government for the cost of the All-American Canal.

I am not suggesting what should be done. I am merely outlining what has been done, and I think in order to meet the future developments on the river it is necessary for the committee to know what has been done and what precedents have been established and the real points at issue.

I heartily agree with the Senator, the chairman, in his conclusion that if you are going to write a book on this subject, you had better do it during the first 2 weeks before you become burdened with details, or else you had better wait several years, because once you begin to find out the real problems, you will be very reluctant to make a definite decision between the States on water rights. As a matter of fact, on none of these things, either in the Industrial Encyclopedia of the Eleven Western States, or in Senate Document 186 have drawn conclusions. I have nearly put down the evidence so that anyone can refer to the documents as interpreted by the men on the job at the time, and the actions of the Congress of the United States, and make up their own mind.

I want to adopt that attitude all of the way through. As we go along certain precedents are set and become common procedure—fair to the States involved—so that Congress has finally established a definite method of procedure.

The reason that I joined with other Senators in the joint resolution then was because the necessary adjudication, in the absence of a compact, could be made only by the Supreme Court in my opinion, since I felt that the States would never make it. Just as my Governor has said in his letter. He had not communicated with me before writing the letter, but we agree on principle.

Mr. Chairman, unless there are further questions, I think that that concludes my statement

Senator McFARLAND. There is just one matter that I would like to call Senator Malone's atention to, and I am sure that he is familiar with it, and that is (b) under article IV of the compact, which reads:

"Subject to the provision of this compact, water of the Colorado River system may be impounded and used for generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes."

Then I would like to ask him if he is not familiar with the fact that the Colorado-Big Thompson in Colorado is financel largely from power generated?

Senator MALONE. I am referring to the power developed on the main lower basin stream where two or more States are interested; also following a compact or an adjudication the amount that any one State might divert would be determined.

Senator McFARLAND. I do not care to go into it any further.

Senator MILLIKIN. I think that that is extraneous to the immediate matter.

Senator MALONE. I am entirely familiar with the provision which the Senator just read.

Mr. Chairman, it is perfectly clear that not a single one of the seven States in the entire Colorado River watershed has a firm right to the use of any specific amount of water until such time as the water allocated to the upper and lower basins respectively, under the Colorado River compact has been divided between the States in the respective basins either through interstate agreements or compacts—or by a court of competent jurisdiction.

It is equally clear to me that the lower basin States, Arizona, California, Nevada, New Mexico, and Utah will not, within any reasonable time, agree upon such a division—I, therefore, Mr Chairman, joined in the introduction of Senate Joint Resolution No. 145 to hasten the further development of the Colorado River.

Senator MILLIKIN. Thank you very much, Senator.

Senator MALONE. Mr. Chairman, I ask permission to further clarify my statement.

I am not opposed to either California or Arizona; I simply do not believe that the Congress of the United States will be a party to appropriating taxpayers' money for the purpose of assisting any State to appropriate or to utilize the water of a stream system, wherever located, that may belong to other States. Therefore I joined with other Senators in the joint resolution requesting an adjudication. I am advised that there are only two ways of settling the division of the water of the lower basin, first, by agreement between the States of the lower basin, which contains five States—and I want to emphasize that because it has been a source of considerable irritation to me that the fight, as held out to the country, is a two-State water fight, and therefore the partisans line up on that basis, without any discussion of the equities as concerns New Mexico, Utah, or Nevada, and while our use may be smaller, such needs are just as important as the larger amounts that Arizona and California may utilize.

So I want to say there are only two ways, as I did in the original statement, which will be reprinted in this text, and will be available. One way is by voluntary agreement among the five States of the lower basin, approved by the United States Senate, as has been done by the upper basin States. Senate approval of an interstate agreement is routine unless in some way the rights of the United States are jeopardized. So there would be no question if the five lower basin States agree on a division of the water, it would be approved in line with precedent in the United States Senate and that would be final.

The second method would be a court of competent jurisdiction, and I am informed the Supreme Court is the only place that could logically take jurisdiction. So, failing in a voluntary agreement, which they had done prior to the time I entered, I took over the work of the Nevada Colorado River Commission in January 1927 and have been continually informed of the work to the present time, about 22 or 23 years. It is my opinion that no interstate agreement is an immediate prospect. Mr. Smith informs me there has been no indication of an immediate agreement since I resigned from the committee. So I might say there is very little indication of voluntary agreement in the immediate future, therefore it leaves but one avenue for adjudication of the division of the water and that is the Supreme Court. That was my reason, Mr. Chairman, for joining with other Senators in introducing the resolution.

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To illustrate this, Mr. Chairman, I want to compare this controversy with the Boulder Dam project bill congressional debates, which was introduced in Congress in 1922 and finally passed in the fall of 1928. The situation there between the upper basin States—Colorado, Wyoming, New Mexico, and Utah—in regard to their position on the construction of Boulder Dam, which is now called Hoover Dam, was exactly the same position in which the three States in the lower basin find themselves in regard to California and Arizona, that is, a very friendly position but simply taking a position for their own protection.

Now, it will be remembered, and I went through that fight, Mr. Chairman, the upper basin States took the position, and I was friendly to it, that if they allowed the Boulder Dam to be constructed, before such time as the seven States of the Colorado River Basin had agreed on a compact reserving their share of the water for them, storing 30,000,000 acre-feet, the lower basin States could use most of the water in the river and there would be very little left for the upper basin States.

In the arid areas it is not a question of how much land you have, but how much water you have. Nevada has 70,000,000 acres of land and has water for only approximately 2 percent. That is the terrible thing for an arid State. So, we are now in the same position in regard to the use of the water by Arizona and California, as the upper basin States found themselves in with the lower basin States in regard to the construction of Boulder Dam, now called Hoover Dam. They set their feet in the Senate and in the House and said they shall not pass until this compact has been approved. As a matter of fact, I was friendly to the idea. The lower basin had no right to ask the United States Government to furnish the money to make available to them water which rightfully belonged to the upper basin—and the only way that could be done was by an interstate compact—or an adjudication by a court of competent jurisdiction—just as in the case now before the committee. They passed an act which provided that when six States had signed it, including California, then it would become law.

Arizona did not sign the compact. They figured if six States signed, including California, the upper basin felt very secure. Now, Arizona has signed the compact, which makes seven States. So, the 7,500,000 acre-feet, or whatever it is interpreted to be, is available to them in perpetuity.

They all voted for the Boulder Dam project act. We are now in the same identical position as between the States of the lower basin.

If projects are approved by the Congress of the United States for California or Arizona which may require the use of water belonging to other States, and the evidence in the record now shows a reasonable doubt that there is enough water, the project in addition to the States of Nevada, New Mexico and Utah's rightful share for the Arizona project as set up then these States are forever prohibited from requesting such projects.

So, until there is an agreement between the lower basin States, approved by the Senate, or an adjudication by a court of competent jurisdiction, then I must necessarily object to the approval of the

project by the Congress. The point I want to make, Mr. Chairman, is that the Congress of the United States does not undertake to make interstate compacts; nor can it adjudicate water rights. The work is not within their jurisdiction. If the lower basin States had been able to pass a Boulder Dam Project Act, without an agreement between the States of the basin, we could have ruined the upper basin States because the lower basin States could then have utilized practically all of the water in the river without regard to upper basin needs. The three States in the lower basin are in exactly that position now with respect to Arizona and California.

Now, Mr. Chairman, that completes my statement.

The CHAIRMAN. Without objection, it is so ordered.

(Whereupon, at 11:20 a. m., the subcommittee adjourned.)

AFTERNOON SESSION

The CHAIRMAN. Who is the next California witness?

Senator DOWNEY. Mr. Peterson.

Mr. Chairman, when we recessed yesterday, certain members of the committee desired to have California place in the record a showing of the funds contributed by the State of California, or its agencies, for the preliminary surveys on the Boulder Canyon Dam. Mr. Ely, have you those figures?

Mr. ELY. Yes, sir; I have them.

Senator DOWNEY. Mr. Chairman, would it be satisfactory to have Mr. Ely place those in the record?

The CHAIRMAN. That will be quite satisfactory.

Mr. ELY. Mr. Chairman, the question was asked yesterday as to advances by California to the Bureau of Reclamation for investigations and studies in connection with the Boulder Canyon project. I stated then that public agencies of the State of California had advanced substantial sums. I have here some of the figures.

I shall offer for the record a tabulation furnished by the Bureau of Reclamation for use in Court of Claims litigation which shows advances by the city of Los Angeles, the city of Pasadena, the Coachella Valley County water district, the Imperial irrigation district, and the Palo Verde joint levee district for the fiscal years 1921, 1922, 1923, and 1924, aggregating $141,000.

I have also figures submitted by the Imperial irrigation district in a telegram to Mr. M. J. Dowd, April 12, 1949, giving the amounts advanced during the years 1916 to 1939, inclusive, aggregating $225,000. Part of this overlaps the figures shown in the table I previously referred to, so that the net aggregate, apparently, of the two tabulations, is of the order of $296,000.

I understand additional information is coming in from the city of Los Angeles, and when that becomes available, I shall ask to include it at this point in the record, as well.

The CHAIRMAN. Thank you.

(The document referred to above is as follows:)

Advances by Imperial irrigation district to U. S. Government for investigations and plans on Colorado River development—Boulder Dam All American Canal project

1916	$15,000	1935	$10,000
1917	30,000	1937	10,000
1920	40,000	1938	20,000
1921	60,000	1939	20,000
1929	20,000		
1930	20,000	Total advances	225,000
1933	10,000		

By telegram from district to Dowd, April 12, 1949.

(Photostatic copies of tabulations are as follows:)

Analysis of funds and costs, Boulder investigations, fiscal years 1921, 1922, 1923, and 1924

	Fiscal year 1921			Fiscal year 1922			Fiscal year 1923		
	Advances	Share of costs [2]	Unexpended balances [3]	Advances	Share of costs	Unexpended balances	Advances	Share of costs	Unexpended balances
United States	[1] $30,000	$27,219.31	$2,780.69	[4] $15,000	$11,418.75	[5] $3,581.25	[6] $102,523.39	$102,523.39	
City of Los Angeles				55,000	41,869.13	13,130.87		13,130.87	
City of Pasadena				5,000	3,806.25	1,193.75		1,193.75	
Coachella Valley County water district	5,000	5,000.00		1,000	761.25	238.75		238.75	
Imperial irrigation district	40,000	40,000.00		30,000	22,837.50	7,162.50		7,162.50	
Palo Verde joint levee district	5,000	5,000.00							
Total	80,000	77,219.31	2,780.69	106,000	80,692.88	25,307.12	102,523.39	124,249.26	

[1] $5,000 of this amount was made available by the Kincaid law (finding 5) and $25,000 was allotted from appropriations for secondary projects.

[2] [3] Shares of costs and unexpended balances for fiscal 1921 are not specifically set forth in any of the accounts. Undisputed testimony, however, establishes that there were no funds in the account on July 1, 1921, and the total cost of June 30, 1921, is shown to have been $77,219.31. The inference is clear, therefore, that $2,780.69 of the advances by the United States lapsed on June 30, 1921. Compare the total shares of costs, showing a grand total, for the 4 fiscal years, of $325,354.81, comprised of $184,354.81 from appropriations, and $141,000 contributed or advanced by local agencies.

[4] See finding 7.

[5] Appropriations for the Interior Department were on an annual basis. The balance unexpended on June 30, 1921, was therefore not available for commitment after that date. Consequently, $3,581.25 reverted to the reclamation fund on July 1, 1921, and the balance carried over to fiscal 1922 actually consisted of $21,725.87 from funds advanced by contractors. For accounting purposes the Bureau of Reclamation restored the $3,581.25 to the account from 1922 appropriations, thereby reducing the allotment of $97,000 by that amount. See footnote 6.

[6] Out of an appropriation of $100,000 for Colorado River investigations, the Reclamation Service allotted $97,000 to Boulder Canyon investigations. It then spent $102,523.39 of appropriated funds, drawing the extra $5,523.39 from the 1924 appropriation, which became available on January 24, 1923. See finding 16. The evidence does not clearly establish what disposition was made of the $3,000 of the 1923 appropriation not allotted to Boulder Canyon investigations, although there is some indication that it was allotted to and spent on other projects.

Analysis of funds and costs, Boulder Canyon investigations, fiscal years 1921, 1922, 1923, and 1924—Continued

	Fiscal year 1924			Totals		
	Advances	Share of costs	Unexpended balances	Advances	Share of costs	Unexpended balances
United States	[7] $93,476.61	$43,193.36	[8] $50,283.25	$241,000	$184,354.81	$56,645.19
City of Los Angeles				55,000	55,000.00	
City of Pasadena				5,000	5,000.00	
Coachella Valley County Water District				6,000	6,000.00	
Imperial Irrigation District				70,000	70,000.00	
Palo Verde Joint Levee District				5,000	5,000.00	
Totals	93,476.61	43,193.36	50,283.25	382,000	325,354.81	56,645.19

[7] The appropriation for fiscal 1924 carried $100,000 for Colorado River investigations (finding 16). The Reclamation Service allotted $50,000 of this appropriation to Boulder Canyon investigations and $1,000 to another project. The figure here shown as advanced by the United States represents the $100,000 appropriated minus $1,000 allotted to a project other than Boulder Canyon, and minus the $5,523.39 used in fiscal 1923. See footnote 6.

[8] Appropriations were still on an annual basis, wherefore this sum reverted to the reclamation fund after June 30, 1924.

Senator McFARLAND. I do not want to go into that now, Mr. Chairman, but I would like to ask the Reclamation Service to furnish us information as to how much of this money went toward the engineering work on Boulder Dam and how much went to the California aqueduct.

Senator ANDERSON. Could we also have inserted at this point Mr. Debler's comments? Mr. Debler's comments were that Arizona had put up money on the surveys for the Boulder Dam. My remembrance was that at that time Arizona was surveying, but for the purpose of defeating Boulder Dam. I think it would be helpful when a point like this comes up if we could clear it up to where we are in some substantial agreement as to what actually did take place.

Senator McFARLAND. We will do that when the time comes, Mr. Chairman. It is a mistake to say that we ever wanted to defeat the Boulder Dam. What we were trying to do was to get a settlement of our water rights. We have always wanted the development, but we wanted some rights in it when it was finished.

Mr. ELY. Mr. Chairman, may I complete my statement?

The CHAIRMAN. Certainly.

Mr. ELY. The amount shown on the tables I have submitted relate to investigations for the Hoover Dam and the All-American Canal. I should like also to call attention in connection with another question raised by the Chairman with respect to the upper basin development, to the provisions of section 2 (d) of the Boulder Canyon Project Adjustment Act of 1941. That statute requires that the rates for energy at Hoover Dam be calculated on such a basis as to provide not only the cost of operation and maintenance, retirement of the investment, et cetera, but in addition the payment of $500,000 per year for the purposes specified in section 2 (d) to which I shall now refer, and $600,000 for the purposes specified in section 2 (c). Section 2 (d) provides as follows:

Transfer, subject to the provisions of section 3 hereof from the Colorado River Dam Fund to a special fund in the Treasury, hereby established and designated the "Colorado River Development Fund" of the sum of $500,000 for the year of operation ending May 31, 1938, and a like sum of $500,000 for each year of operation thereafter, until and including the year of operation ending May 31, 1987.

The next pertinent extract from section 2 (d) is as follows:

Receipts of the Colorado River Development Fund for the years of operation ending in 1938, 1939, and 1940 (or in the event of reduced receipts during any of said years, due to adjustments under section 3 hereof, then the first receipts of said fund up to $1,500,000) are authorized to be appropriated only for the continuation and extension, under the direction of the Secretary, of studies and investigations by the Bureau of Reclamation for the formulation of a comprehensive plan for the utilization of waters of the Colorado River system for irrigation, electrical power, and other purposes, in the States of the upper division and the States of the lower division, including studies of quantity and quality of water and all other relevant factors. The next such receipts up to and including the receipts for the year of operation ending in 1955 are authorized to be appropriated only for the investigation and construction of projects for such utilization in and equitably distributed among the four States of the upper division: *Provided however*, That in view of distributions heretofore made, and in order to expedite the development and utilization of water projects within all of the States of the upper division, the distribution of such funds for use in the fiscal years 1949 to 1955, inclusive, shall be on a basis which is as nearly equal as practicable. Such receipts for the years of operation ending in 1956 to 1987, inclusive, are authorized to be appropriated for the investigation and construction of projects for such utilization in and equitably distributed among the States of the upper division and the States of the lower division.

The next pertinent extract reads as follows:

Such projects shall be only such as are found by the Secretary to be physically feasible, economically justified, and consistent with such formulation of a comprehensive plan. Nothing in this act shall be construed so as to prevent the authorization and construction of any such projects prior to the completion of said plan of comprehensive development, nor shall this act be construed as affecting the right of any State to proceed independently of this act or its provisions with the investigation or construction of any project or projects. Transfers under this section 2 (d) shall be deemed contractual obligations of the United States, subject to the provisions of section 3 of this act.

Section 2 (c) of the act, relating to the $600,000 in addition, which the power revenues are required to supply reads as follows, in part:

(c) Payment subject to the provision of section 3 hereof in commutation of the payments now provided for the States of Arizona and Nevada in section 4 (b) of the Project Act, to each of the said States of the sum of $300,000 for each year of operation beginning with the year of operation ending May 31, 1938, and continuing annually thereafter until and including the year of operation ending May 31, 1987—

et cetera.

Those amounts have been paid. The investigation, or the advances by the State of Arizona to the Reclamation Bureau for the investigation of the central Arizona project now before you have been paid in part pursuant to chapter VI of the first special session of the sixteenth Arizona Legislature which appropriated approximately $200,000 for transfer to the United States for this investigation. That money is offset by and made available because of the payments by the power contractors to the State of Arizona in the amount of $300,000 per year.

(Discussion off the record.)

The CHAIRMAN. Mr. Peterson.

STATEMENT OF WILLIAM S. PETERSON, ASSISTANT CHIEF ELECTRICAL ENGINEER, CITY OF LOS ANGELES, CALIF.

Mr. PETERSON. Mr. Chairman, and members of the Committee on Interior and Insular Affairs, my name is William S. Peterson. I am assistant chief electrical engineer of the power system of the department of water and power of the city of Los Angeles. I appear here on behalf of the department of water and power, which is a municipal agency that is one of the original allottees receiving power from Hoover Dam Power Plant and is one of the agencies acting for the Federal Government in operating the power plant at Hoover Dam under the provisions of the Boulder Canyon Project Adjustment Act, and is one of the principal agencies supplying and distributing domestic water and electric power in southern California.

At this point in my testimony I would like you gentlemen to refer to what I have called the supplementary presentation in connection with my statement. I find that because of the way our presentations are being given at this time, it is desirable for me to make this supplementary statement. The great bulk of the data used is found in the secretary's report. Reading from my copy:

In advance of making my prepared statement I desire to present in a graphical form certain of the financial data contained in the Secretary's report on the central Arizona project. This memo will

principally serve to document the references necessary to give verification of the figures used.

Under section 3 of S. 75 "The estimated cost of the construction of the said works shall be determined by the Secretary." It should be recalled that the Secretary is to determine the parts of the cost to be allocated to a list of nonreimbursable items together with the operating cost for same, and is also to determine (1) the costs allocable to irrigation and returnable from irrigation revenues; (2) the costs allocable to irrigation and which can be returned from other revenue sources; (3) the parts allocable to power returnable from power revenues; (4) the part allocable to municipal water supply and probably be returned to the United States.

The Secretary thus becomes the arbiter of cost, and it is logical to look to his report for the prospective financial operation of the project. In the report the Secretary presents data on four different bases of consideration. However, the fourth one presented is the one which is summarized in the letter of transmittal for the report from the Commissioner of Reclamation to the Secretary and which is approved by the Secretary. The fourth method of financial analysis is that referred to on page R–68 of the report as "(4) the McFarland bill with minor modifications as recommended by the Regional Director and the Reclamation law, as it would be amended by the Rockwell bill." Presumably under S. 75 the Secretary is expected to follow such intent.

I want to inject, of course, that that bill did not pass. The report does not present the exact situation. However, I think the fourth method comes as close to being what would represent the Bureau of Reclamation's viewpoint on the paying out of this project, as any of them.

The methods and results of making allocations of costs are given in the appendix F to the report and for the fourth method are given in table F-7 which is at the end of the report.

That is this large thick volume to which you gentlemen have access.

Since it is rather difficult and tedious to read and analyze those figures, I have taken the same data and put it in a chart form using colors to make evident the allocations of cost.

I have here a very limited number of colored charts, which I would like you to distribute. I have a larger copy of the same. I will be glad to take any position at the table which you gentlemen desire, since I will be talking for several minutes. Would it be better to go up to that end?

This chart groups like developments together such as, for example—looking at the top—the Bluff and Coconino Dams and Reservoirs. The colored portion of the chart is so devised as to show the percentage of the total cost of this group that is allocated to power—note that percentages are plotted sideways; the red part here is allocated to power; blue to irrigation; brown, silt control; a little patch of green for recreation, and a purplish color for fish and wildlife. That is the set-up under which the $37,000,000, that represents the cost of Bluff and Coconino Dams and Reservoirs, is allocated to these various functions.

The length vertically from the top to this line (indicating) represents $37,000,000. Or more properly, this total area represents $37,-

000,000. This red area represents the portion allocated to power. Approximately each square inch on this chart is $2,500,000.

On the smaller chart which you have in front of you, that ratio is about $10,000,000 per square inch.

Looking at the chart for its detail now, you will note that about 40 percent of those two reservoirs is allocated to power; a little over 20 percent is allocated to irrigation: almost 40 percent, let us say 37 or 38 percent, is allocated to silt control——

Senator KERR. Wait a minute, please. Do you mean on the two, or one of the two?

Mr. PETERSON. I have grouped similar things together in this chart. Bluff and Coconino are taken as one total in this presentation. Then we have the two minor allocations for recreation and for fish and wildlife.

The Government nonreimbursable investments are shown as being subtended by these large cross marks. That is true throughout the chart.

Note that although Bluff and Coconino are primarily silt control works the storage capacity is valuable for power, by augmenting the small capacity of Bridge storage. This portion here [indicating], in fact the red and blue represents the investment allocated to the production of power. The blue part is the power set aside for irrigation pumping. As you go on through the chart, wherever you see power items there is a corresponding blue item for irrigation, which represents an allocation to irrigation because of the power being involved and set aside for irrigation purposes, for pumping.

Now, proceeding, the next big item is the Bridge Canyon Dam and Reservoir. That is a very substantial amount, and therefore is longer, $192,000,000. This much (about 50 percent) is for power; this portion (about 25.5 percent) is for irrigation power for pumping; the silt control is not a very large allocation: the recreation item is quite large. It includes probably 17 or 18 percent, with a small allocation for fish and wildlife.

Now, for the Bridge Canyon Power Plant next appearing, $73,000,000 is the total investment——

Senator ANDERSON. Excuse me. You just said fish and wildlife was somewhat small. It is $36,000,000, is it not?

Mr. PETERSON. No, fish and wildlife is small. The allocation to recreation, I think, is large.

Now, of the Bridge Canyon Power Plant portion it is naturally allocated only to two purposes, power for sale, and power dedicated to irrigation pumping, about 75 percent and 25 percent, respectively.

The next items are of a little different character. I have separated out a portion of the Arizona dams and reservoirs, $52,000,000 worth. In this case it is dedicated to a multiplicity of purposes. The red, (less than 25 percent) of course, is commercial power. The blue (approximately 45 percent) is dedicated to irrigation. Part of it is for the power purposes of irrigation pumping, and part, of course, is due to the reservoir storage capacity for irrigation.

Senator KERR. May I ask a question there? Is the blue in the unit above the Bridge Canyon Power Plant, is that all power for irrigation?

Mr. PETERSON. That is equipment dedicated to irrigation pumping.

Senator KERR. No storage for irrigation?

Mr. PETERSON. It is all power. This is power development and certain power capabilities are set aside for irrigation use. I have colored those in blue for the chart.

In the report of the Bureau of Reclamation that amount of money is dedicated to irrigation.

Senator KERR. To power for irrigation.

Mr. PETERSON. It covers the power for irrigation.

Senator KERR. Does it also cover storage of waters for irrigation?

Mr. PETERSON. No, not yet. This blue area in the first group of Arizona dams and reservoirs is the first item that has storage for irrigation among the items that I have discussed.

Senator KERR. And none of the water in the first three units will be used for irrigation?

Mr. PETERSON. Not on this chart. This is the plan that contemplates the pumping of water, taking it out from Havasu Reservoir.

Now, this is the first item involving storage for irrigation—Arizona Dams and Reservoirs. It consists of the McDowell, Horseshoe, and Buttes Reservoirs. Here the blue represents a combination of power for irrigation and irrigation storage. It also in this gray portion represents municipal water-supply storage. Then we have these other nonreimbursable items. The reddish purple is for flood control, the brown is for silt control; a small item for recreation and a small item for fish and wildlife.

Those plants or projects have a small strip here representing $5,000,000 in power plants. That is split up into power for sale and power for pumping, the power for pumping being the blue part.

Now, we come to the power transmission item of $84,000,000 which is to get this power to the market. That is split for the two purposes again, the commercial power being red, the irrigation power being blue.

Below this point all of the work is essentially of an irrigation nature. Two reservoirs, Charleston and Hooker, have an allocation—this little gray part in here—for municipal water supply. Then there are some Government nonreimbursables, flood control principally; a little bit for silt, recreation, and the fish and wildlife here is in purple.

Senator KERR. That is reservoir for irrigation waters?

Mr. PETERSON. They are reservoirs for irrigation.

The next is Granite Reef aqueduct. We might say that is purely for irrigation, although there was a very small allotment for fish and wildlife. It is so small on the end that it is difficult to detect on the chart.

Then there are the Havasu and McDowell pumping plants, the total being for irrigation. Those are the plants driven by power supplied from the plants indicated [indicating].

Finally, I have grouped together the remaining parts of the system. I have called it the Arizona general ssytem. It includes the distribution works, other local aqueducts, and a multiplicity of things that are contained in the report. Of that there is again an allocation here for municipal water supply; a very small allotment for fish and wildlife, and for flood control. This little white area on the end is for salinity control.

Those portions in red show the distribution of the money for power, which is a true interest-bearing investment. Interest is paid on that capital. The blue is non-interest-bearing or interest-free capital. Municipal water supply is interest-free. The nonreimbursables are, of course, supplied as capital by the Government.

This project sets out the pumping project. It is the second option of the bill which is the project that would probably be constructed first under it, involving pumping out of Havasu Reservoir, and the carrying of the water to central Arizona.

This total colored area represents the $738,000,000. The way it is distributed is evident from the diagram.

Now, I would call your attention to the bottom of page 3 of this supplement which summarizes those uses.

Summary of costs

Power, interest bearing, red area	$243,798,000
Irrigation, interest-free, blue area	397,693,000
Municipal, interest-free, gray area	16,605,000
Flood control, nonreimbursable, reddish purple	6,641,000
Silt control, nonreimbursable, brown	28,097,000
Recreation, nonreimbursable, green	37,459,000
Fish and wildlife, nonreimbursable, purple	3,129,000
Salinity control, nonreimbursable, uncolored	4,986,000
Total	738,408,000
Subtotal of nonreimbursables	80,312,000

Also refer to page 3 of letter of transmittal of the Secretary's report.

The total for the whole project for investment only, is $738,408,000. The subtotal of the nonreimbursables paid by the Government is $80,312,000.

Senator KERR. May I ask you a question at this point?

Mr. PETERSON. Yes, sir.

Senator KERR. The irrigation, interest-free, municipal, interest-free, are both reimbursable items?

Mr. PETERSON. They are reimbursed in the manner I will discuss in a few moments.

Senator KERR. Very well. Pardon me.

Mr. PETERSON. I did not mean to cut you off, Senator, but it will be developed in the course of my talk.

Senator KERR. That is fine, thank you.

Mr. PETERSON. This total is not inclusive of the long tunnel and other works authorized by the bill which would add another $550,000,000, but is for the works which "provide a means for the diversion * * * pending the construction of said tunnel."

Pertinent to the discussion of revenues and their disposition are three paragraphs from section C–3 on page R–70 of the Secretary's report entitled, "Annual Returns." These read as follows:

Revenues accruing to the central Arizona project would have as their source the sale of irrigation water, municipal water, and power. A price of $4.50 an acre-foot has been estimated by economic studies to be the rate at which irrigators can pay for water delivered to their farm headgates. This price has been used in determining the average annual return resulting from the sale of irrigation water.

A study of the municipal water rates of various cities and towns in southwestern United States indicates that an equitable charge for water delivered to the intake of the distribution system of the city of Tucson would be 15 cents

per 1,000 gallons. Therefore, in these financial studies, returns from the sale of municipal water have been evaluated on that basis.

In each financial analysis, the end result has been the determination of the price at which power would have to be sold in order to meet the repayment conditions established as the basis of the study. The price determined in each case must be sufficient to cover the repayment of all reimbursable costs not repayable from other sources. In all studies the costs which must, in equity, be determining the average annual return resulting from the sale of irrigation logically can be expected to repay.

I would like to emphasize that sentence in your minds. That is a quotation, and I interjected my remark there.

To the extent that irrigation revenues do not return to the United States all costs for which irrigation is liable, the excess of such costs must be returned by net revenues derived from the sale of municipal water and electric energy not required for project use.

A further reference is a paragraph taken from page R–71 of the report which is as follows:

The fourth financial study, predicated on the adoption of the combination of the McFarland and Rockwell bills, as modified by the regional director's recommendations, is quite similar to the study made under the terms of H. R. 2873. In regard to repayment obligations, the two studies differ in only two respects. One of these differences lies in the fact that costs allocated to irrigation and assigned for repayment by the water users would be repaid, without interest, over a 78-year period instead of within the 50-year period specified by H. R. 2873. The second difference arises because, under the recommendations, costs charged to municipal water supply would have 78 years for repayment rather than the 40 years permitted in the Rockwell bill. Interest on the costs for which municipal water supply is liable has not been charged in either study.

IRRIGATION REVENUES

As proposed in the original report, irrigation revenues were nearly 4½ million dollars less than operation, maintenance, and replacement costs for the irrigation allocation, but in the total balance such were made up from other revenue sources. The revenues were predicated on a charge of $4.50 per acre-foot. Because of this failure to meet operating costs the Commissioner of Reclamation included the following statement in his letter of transmittal.

Based upon payment of $4.50 per acre-foot for water delivered at the farmer's headgate, the regional director indicates a difference of about $5,000,000, or 2 percent, between returns from the irrigators and the estimated operation, maintenance, and replacement costs properly chargeable to the proposed improvements for irrigation. In view of the magnitude and complexity of the proposed project and of the long-range cost index projection involved, this 2 percent differential is considered to be well within the limits of accuracy of estimating operation, maintenance, and replacement costs and payments by irrigators. The $4.75 per acre-foot which local interests indicate they are willing and can pay, would in 78 years more than satisfy the estimated operation, maintenance and replacement costs.

The net effect of such charge is to produce an item referred to as "surplus" of approximately $13,000,000.

I now present another chart. This chart is fundamentally a revenue chart. The heights of the bars show the amount of revenues and from where received during the 78-year period. Now, having called this variation of $4.50 or $4.75 per acre-foot to your attention, this presentation will be on the original basis of the report. As you will see later, whether the water users pay $4.50 or $4.75 per acre-foot is not a large effect in percentage of the totals involved.

The cost and revenue data pertaining to irrigation is found in table F–8 and in discussion at two places on page F–28 of the appendix and is tabulated as follows:

I have shown irrigation, operation, and maintenance per year, and for 78 years, as each being $2,247,900 per year, or $175,336,200 in the total of 78 years.

Similarly, for irrigation replacements, the amount per year is $856,100; for 78 years that amounts to $66,775,800.

The total then for irrigation operation, maintenance, and replacement is $3,104,000 per year, or $242,112,000 for the 78-year period.

We are now talking of irrigation revenues. This blue cross-hatched chart represents irrigation revenues on the $4.50 per acre-foot. The little arrow a little bit above that represents the true cost of irrigation, which is a trifle more than the revenues received from irrigation.

However, if the price is raised to $4.75 per acre-foot, the second arrow, a little bit higher, indicates the revenues from irrigation as exceeding the operating costs on the investment allocable to irrigation.

Senator DOWNEY. Mr. Peterson, before you proceed, you at the last were only talking about operation and maintenance revenues?

Mr. PETERSON. Yes, maybe I had better take a little time and introduce you to the legend of that chart. The same colors are used for the same purposes. Solid red is for power investment; solid blue for irrigation investment; solid gray is municipal water supply.

Operating expenses have been shown with 45-degree slanted cross-hatching. Interest is shown by a vertical hatching in the space or area.

This is irrigation revenue [indicating]. The things they cover are operating expenses essentially for that purpose, but nothing else. In fact, at $4.50 they fall a little bit short.

The amount is shown in the figures on page 6 of my supplement, as follows:

	Per year	For 78 years
Irrigation, operation, and maintenance	$2,247,900	$175,336,200
Irrigation replacements	856,100	66,775,800
	3,104,000	242,112,000
Average annual water sold, 677,000 acre-feet.		
Revenue, at $4.50 per acre-foot	3,046,500	237,627,000
Balance to be made up from other revenues (see Municipal water)	57,500	4,485,000

The costs are $242,112,000 in the first 2 years, and the revenues are $237,627,000.

The balance unpaid of $4,485,000 I have chosen to say is made up from other revenues, and for reasons that I think are obvious I have let municipal water pay that value. The reason, I think, will become apparent when I go into the next discussion.

The cost and revenue data pertaining to municipal water is found in table F–8 and in discussion on pages F–23 and F–28 of the appendix. It is predicated on the sale of water at 15 cents per 1,000 gallons. The tabulation of data is as follows.

I will read only the 78-year figures. The others are provided in the following tabulation taken from page 7 of my supplementary presentation.

	Per year	For 78 years
Revenue at $0.15 per 1,000 gallons (about $48.90 per acre-foot)	$527,900	41,176,200
Municipal water operation and maintenance	45,400	3,541,200
Municipal water replacements	4,800	374,400
	50,200	3,915,600
Municipal water, interest-free investment		16,605,000
Total for municipal water		20,520,600
Irrigation, operation, maintenance, and replacement deficiency		4,485,000
Subtotal		25,005,600
Revenues from municipal water available to cover irrigation investment		16,170,600
Total		41,176,200

Average annual water sold, 10,800 acre-feet.

The municipal water operation and maintenance and municipal water replacements have a total of $3,915,600.

The municipal water interest-free investment, that we saw on the other chart, amounted to $16,605,000. Obviously those two things must be taken first out of municipal revenues and amount to $20,520,600.

Irrigation deficiency, which we just calculated, amounted to $4,485,000. That could well be paid by municipal water revenues.

With this added, municipal water revenues have been used to pay $25,005,600. That leaves available $16,170,600 that municipal water can pay of the irrigation investment.

On this chart I have done that. This little piece at the far left [indicating] represents in its total height the municipal revenues. The first little cross-hatched part is municipal operation; the gray part next is municipal capital repaid by municipal revenues, without interest.

The next blue cross hatching is that little bit of failure of irrigation to meet operating expenses at $4.50 per acre-foot, and the top, or blue part, is the portion of irrigation capital which municipal water supply is able to pay.

The remainder of the payments under the procedures of the Secretary and the Commissioner of Reclamation, in setting up the project, on capital investments, except for the nonreimbursables, are to be paid by power. The power revenues represent the total height of this third line. That is a total height representing $1,007,000,000.

Now, I will read from the text of my supplementary presentation under "Power revenues":

As indicated on page F-23 and table E-8 of the appendix to the Secretary's report, the amount of irrigation water to be pumped varies gradually from an initial value of 850,000 acre-feet per year to a maximum of 1,200,000 acre-feet per year at the end of 50 years. This taken into account together with decrease in stream flow due to upper-basin use, results in the generation of energy for commercial sale of 3,594,000,000 kilowatt-hours initially, and 2,543,000,000 kilowatt-hours after 50 years, without further diminution up to 78 years.

Later on, after I have finished the discussion of the Secretary's report, I will have special discussion on these power outputs.

When adjusted for line losses of 7 percent, there is obtained an average value of 2,679,000,000 kilowatt-hours per year referred to on page F-29 of the appendix, which reads as follows:

"Electric energy marketed at load centers during the 78-year project amortization period would average 2,679,000,000 kilowatt-hours annually. In order to

defray all reimbursable project costs not payable by the other revenue-producing facilities, a charge of 0.00482 cent a kilowatt-hour would need to be levied at load centers for the commercial use of this energy."

Reference should also be made to two other statements, the first given on page F–28 of the appendix, as follows:

"Project costs: In these studies, as was the case in the studies made under the Rockwell bill, the interest-bearing power debt is paid off as rapidly as possible by using the full net commercial power returns for this purpose. Upon the completion of this repayment, all next power returns are made available for the retirement of irrigation costs which are in excess of that repayable by water users. It is therefore necessary, prior to any determination of total project costs, to establish the period required for the payment of the power allocation. A series of trial calculations has established that the energy-unit charge necessary to amortize project costs under the provisions imposed by this study would liquidate power's capital costs within a period of 33.4 years."

The second statement is given on page F-29 of the appendix, and reads:

"The total interest component paid by power revenues would equal $3,560,900 annually over a 33.4-year period. One-fifth of this component, amounting each year to $712,200, is considered as a return applicable to the retirement of irrigation cost. The total value of this return accumulated during its period of accrual would be $23,786,800."

To verify the interest rate used for the amortization of power investment, it is necessary to refer to pages F–25 and F–26 of the appendix, and make reference to standard amortization tables to determine that the interest rate contemplated was 2.5 percent to be used for the 33.4 years. Reference should also be made to the summary of financial analysis in the letter of transmittal for the Secretary's report.

A tabulation of the requirements power revenue has to meet as a follows:

	Per year	For 78 years
Irrigation interest-free investment		$397,693,000
Paid from municipal water revenues		16,170,600
Remaining irrigation investment to be paid by power		381,522,400
Power operation and maintenance	$2,197,200	171,381,600
Power replacement	1,481,200	115,533,600
Subtotal		286,915,200
Power investment		243,798,00
Interest component amortizing in 33.4 years at 2½ percent	(3,560,900)	
Interest payable to U. S. Treasury, ⅘×$3,560,900		[1] 95,147,200
Total obligations to be covered by power revenues		1,007,382,800
Return by power revenues, 2,679,000,000 kilowatt-hours at $0.00482	12,912,780	1,007,196,800
Deficiency		186,000

[1] This item of ⅘ of interest goes to the Treasury as an interest return, the other ⅕ is used to pay on other noninterest bearing capital. The function and effect of such ⅕ of interest is no different than power paying for irrigation investment direct.

Irrigation, interest-free investment is the bottom blue portion. However, it is slightly less than the total irrigation investment.

Interest-free investment for irrigation is $397,693,000. That paid over here by municipal revenues was $16,170,600, leaving the amount shown in blue over in the third bar of $381,522,400 to be paid by power.

Now, power operation and maintenance is the next item shown. It is this red cross-hatched amount. For operation and maintenance and power replacement, the total is $286,915,200. That is this red cross-hatched area [indicating].

Senator KERR. Tell me again what that is.

Mr. PETERSON. What do you mean, sir?

Senator KERR. Power replacement.

Mr. PETERSON. The item called replacement is one growing out of the Boulder contracts, or the Hoover Dam contracts and was in addition to operation and maintenance. They had in the period of 50 years replacement of major portions of items of equipment, heavier than what might be regarded as normal maintenance. It was the replacement of short-lived items of equipment in the power plant. That term "replacement" is used to cover that.

It does not mean the entire replacement of the whole equipment like you would get in a depreciation set-up. Is that reasonably clear?

Senator KERR. Yes; thank you.

Mr. PETERSON. The next item, the solid red, is the power investment. That is the allocation taken from the other chart and is $243,798,000.

The interest-compound set-up which they used was to charge interest at 2½ percent, and then say four-fifths of that will be true interest paid to the Government. That is the item shown up here of $95,147,200 in the 78-year period.

Senator ANDERSON. Do you know why they set it up at 2½ and then dropped it back to 2?

Mr. PETERSON. No, I do not. The people who set it up are here. They will be able to explain that in greater detail. It is one of the provisions proposed, I think, in the Rockwell bill. Is that right, Senator?

Senator MCFARLAND. Yes. The 2 percent was our bill, S. 75.

Senator ANDERSON. Can you answer me one further question before you go on as to the $397,000,000 which becomes reduced to $381,000,000, and is to be repaid in 78 years.

Mr. PETERSON. Yes, sir.

Senator ANDERSON. Do I understand there is no interest charge of any kind against that?

Mr. PETERSON. I am going to come to that point later. There is no interest charge set up for power revenues to pay. If that will satisfy you for the moment, I will cover your point very thoroughly a little later.

Now, this is four-fifths of that 2½ percent interest charge [indicating]. The other one-fifth was said to go toward paying this [indicating]. I have this asterisk note on my statement on page 9:

> This item of four-fifths of interest goes to the Treasury as an interest return, the other one-fifth is used to pay on other non-interest-bearing capital. The function and effect of such one-fifth of interest is no different than power paying for irrigation investment direct.

So it makes no difference whichever way you do it.

Identification of the above figures with those offered in the letter of transmittal are as follows:

Power revenue	$1,007,196,800
Interest paid to U. S. Treasury, four-fifths of $3,560,900 per year	95,147,200
Total	912,049,600
Deduct one-fifth of $3,560,900 per year	23,786,800
Power revenue less interest	888,262,800

Before going on I want to be sure that you understand again this $1,007,196,800 is the total obligation of power to pay. It included

capital for irrigation, operation for power, power capital, and an item of true interest.

Senator KERR. I am very confused with reference to the meaning of true interest. I hesitate to interrupt, but if that could be clarified in my mind I think it would help me as we go forward.

Mr. PETERSON. Yes, sir. By true interest, I mean interest on the same basis as the Boulder project where the facility returning the payment, for instance, this much here [indicating] is not only paying its capital back to the Government, but is paying interest on that capital as interest, just the same way as when you buy a car on term payments you pay the cost of the car plus interest on that cost. You amortize the car over a certain period of time and pay interest on the balance unpaid month by month, or year by year, in this case year by year. That comes into the United States Treasury as a true interest payment. It comes in as being available to the Treasury, if you will, to cover the interest on the bonds they have had to sell to build the project. They have gotten their capital back; they have gotten back interest on their capital, the same as anybody who receives interest from a man to whom they loaned money.

Senator ANDERSON. At what rate?

Mr. PETERSON. This was four-fifths of 2½ percent. I suppose it comes out at 2 percent.

Senator KERR. That is what I was trying to find out, whether or not you were figuring this on the basis of 2 percent, by using the means that four-fifths of 2½ percent represents the true interest.

Mr. PETERSON. I say it represents 2 percent. In the figures here I actually used the amortization tables of 2½ percent, got the interest and took four-fifths of it. That is this value which checks with the value given in the Secretary's letter of transmittal.

Senator KERR. Where on the chart is the other fifth of interest, and how do you designate it?

Mr. PETERSON. I think we are about ready to get over here to where we unveil the other part of the chart.

I have something extra I want to insert at this point. While the charts are available and well in mind, I would like to point out the extent of the irrigation subsidy by power. The total revenue from power that formed the basis for the 4.82-mill rate was the $1,007,196,800. If it did not have to pay the capital cost for irrigation of $381,522,400, the rate could have been 38 percent less, or 1.83 mills less. That is, if power did not have to pay all of this (total height of bar), but only had to pay this much instead (only the red-colored portion), it would obviously be less by this percentage [indicating].

Senator ANDERSON. You mean the rate would be under 2 mills?

Mr. PETERSON. No, it would be 1.83 less.

Senator ANDERSON. I mean, under 3 mills.

Mr. PETERSON. It would be about 3 mills; yes.

Senator ANDERSON. We do not have a rate that low on any of these power projects, do we?

Mr. PETERSON. The lowest rate I know of is on the Bonneville project. I have not reviewed it for some little time, but my memory of it is $17.50 per kilowatt-year.

The CHAIRMAN. A statement of the rates on all public power projects will be inserted in the record. I am having it prepared.

Mr. PETERSON. It depends, then, on how many hours of use you make of the particular kilowatt, as to what it will cost you. In connection with aluminum production where they use power for 90 to 95 percent of the total hours in the year, that rate at Bonneville was of the order of 2¼ mills. If you had other power it would be 4 mills.

Senator DOWNEY. Mr. Chairman, I dislike interrupting the witness, but in stating the lower rate that would have been available if the power revenues had not been used to amortize the interest investment or the irrigation investment, what value do you give at all with reference to the factor of power used in pumping the irrigation water? Does that enter into that?

Mr. PETERSON. The investment here [indicating] that power is paying included in substantial part some allocations from power equipment and power projects.

I cannot give you the answer now in dollars, but roughly speaking all of this blue which appears above where I am holding the cards [indicating] represents power costs dedicated to irrigation and included in irrigation capital, and thereby become interest-free and repayable out of commercial power revenue.

Senator DOWNEY. Mr. Peterson, let me ask this question. I hate to do this, Mr. Chairman, but I think it will clarify it as we go along.

I think you said if the power revenues were not used to pay off the irrigation investment the rate would be 38 percent less?

Mr. PETERSON. Yes.

Senator DOWNEY. Does that mean you likewise would exclude out of your problem the use of about a third of your power for pumping in Arizona?

Mr. PETERSON. It did in that comparison. I wanted to take another step, because obviously we do not stop there. I am trying to show so far the part of the power revenue that went to that purpose.

Another approach is found by determining the cost, as a total power project; assuming only Bridge, Bluff, Coconino, Bridge power plant, and essentially all of the transmission—that is all of this power project investment—assuming all of those, and assuming pay-out with real interest at 2 percent—and I will give you some other figures as well, but starting at 2 percent—the rates would be approximately, on that basis, 3.56 mills per kilowatt-hour for a 50-year amortization and 3.06 mills per kilowatt-hour for a 78-year amortization. This also assumes energy will be available to the extent stated in the Commissioner's report.

This indicates, in comparison with 4.82 mills, that those values would be 1.26 and 1.76 mills per kilowatt-hour lower when no irrigation is involved. If you want the figures on a 3-percent basis—3-percent interest and 50-year amortization—it produces a rate of 4.1 mills per kilowatt-hour. That would be the case under present reclamation law, or approximately so. If it were for 2½ percent interest and 50-year amortization, the rate would be 3.82 mills per kilowatt-hour.

Now, in these cases power is paying interest on capital that formerly went interest-free, when applied to irrigation. So much for that.

I would now like to take up the subject of Federal Government disbursements in aid of the central Arizona project.

In connection with the development of the project and as given in tables F–7 and F–8, the Federal Government carries the original investment of certain nonreimbursables and pays the operation, maintenance, and replacements for the same.

In addition, your attention is directed to certain paragraphs of the Secretary's report in the section devoted to benefits and costs. The quotations from pages R–75 and R–76 are as follows:

(*b*) *Annual costs*

(*1*) *General.*—In developing return-cost ratios, annual costs are limited to the reimbursable annual expenses of operation, maintenance, and replacement, plus the annual costs of repaying the reimbursable capital cost of the project. However, in comparing national benefits and costs, annual costs to the Nation are considered as including the charges necessary to amortize all capital costs, both reimbursable and nonreimbursable, as well as all operation, maintenance, and replacement expenses.

(4) Annual amortization cost has been computed on the basis of retiring all project construction costs over a 78-year period at an assumed national interest charge of 2 percent on the unpaid balance of the debt. This annual charge has been computed to be $18,774,600.

The same figure is given in table F–9 on benefits and costs.

Of the total amortization cost it has been shown that municipal water supply and power revenues have returned all capital costs to the Government except the nonreimbursables, and power revenues have returned certain interest components to the Federal Treasury.

A tabulation of the costs is as follows:

The total amortization in 78 years at $18,774,600, amounts to $1,464,418,800.

Now, the total investment, which is all returned in the manner I have just indicated, is $738,408,000.

The total interest component and the total financing of this project is the remainder, and it is $726,010,800.

Now, of that amount, power revenue paid as true interest, as I have previously pointed out, is $95,147,200.

The interest to be paid by the United States Treasury over the 78-year period is the difference between those two items and is $630,863,600. A tabulation of the foregoing and other items to be discussed is as follows:

Total amortization 78 years at $18,774,600	$1, 464, 418, 800
Total investment	738, 408, 000
Total interest component	726, 010, 800
Power revenue interest paid as such	95, 147, 200
Interest to be paid by U. S. Treasury over 78-year period	630, 863, 600
Nonreimbursable capital investments:	
Flood control	6, 641, 000
Silt control	28, 097, 000
Recreation	37, 459, 000
Fish and wildlife	3, 129, 000
Salinity control	4, 986, 000
Total	80, 312, 000

Nonreimbursable operating, maintenance, and replacement:		
Flood control	$12,400	$967,200
Silt control	28,900	2,254,200
Recreation	37,300	2,909,400
Fish and wildlife	8,300	647,400
Salinity control	89,400	6,973,200
Total		13,751,400
Deficiency item from tabulation of power revenue and disposition		186,000
Total cost of U. S. Treasury over and above all returns from other revenue sources		725,113,000

On the chart I have the following items: At the bottom is shown the operating expenses associated with the nonreimbursables. They are so relatively small you cannot make much out of them except to say that they total something on the order of 13¾ million dollars. The next group of solid colors represent the nonreimbursable capital, which is a little over $80,000,000. It is subtended by the bracket.

Now, in a 78-year period, 2 percent interest amortization set-up, the interest component represents a value of 98½ percent of the capital being paid off. So that you can get a picture of that here, this striped section of varied colors represents the Government's interests in the period of pay-out, or amortization of the $80,000,000 for nonreimbursables—and it is practically the same length, as you will notice, during that period as the capital value.

Immediately above is the Government's interest payment in the 78 years to cover the municipal water investment shown over here [indicating].

When we come to the blue section we have a complication. The amortization of power, as you will remember, was accomplished over a 33.4-year period. During all that time this irrigation investment was not being reduced, it was carrying full interest. I want to show you the effect of that. This length of blue from above the municipal value, and up to this point [bottom of small red area] would have been the interest on this irrigation investment shown in solid blue. It would be almost the same amount of money.

Now, forget the red right above that for a minute. But above that is another interest component, still all chargeable to the blue, because there is nothing else left to charge it to, so to speak, and that is the result of that 33-year wait. So it adds some more interest that the Government has to pay.

Somebody wanted to know the size of this other fifth of interest which power used to pay irrigation capital. I have shown it over here merely for size. It is not, and is not intended to imply, that it helped pay this interest [indicating]. It did not. This little block was used over here [referring to solid blue area] to pay irrigation capital here. I have merely shown it for size.

The total interest assignable to irrigation amortization processes is that total length shown there [indicating]. The figures are given in detail in the report, and I will present them now.

Incidentally, as shown at the top of page 12 of this supplementary statement, when you got all through figuring the money at 4.82 mills, it actually produced out of these many millions of dollars a $186,000 deficiency.

But that is meant to be the essential balance.

Now, the total cost to the United States Treasury over and above all returns from other revenue sources is that $725,113,000. That is the total height of this line [indicating].

Senator DOWNEY. Mr. Peterson, is that calculated now under S. 75?

Mr. PETERSON. That is calculated under this fourth method as proposed by the Secretary, the one he thought enough of to put in his letter of transmittal. I cannot tell you definitely that that is what S. 75 will actually do, because there is not too clear a set-up in the bill to let you know exactly what you can do. The bill does not make reference to the reclamation law, as I understand it. It tells the Secretary to make these allocations and get the funds back.

This interest arrangement here, where power pays interest, is a little different than what the Secretary has used in many cases where he has taken all power interest and used it, not as a true interest return to the Government, but has said, "Let's pay irrigation capital with it."

Now, he might choose to do that, I do not know, but I am taking this other. It is not a perfect shot. I might say there is not a perfect presentation which has been made by Government that is definitely related, so far as I know, to the bill as it stands. I may be questioned on that and I may be wrong but I am going to say this: I have chosen this one to present because the Secretary used it. I am going to say I have chosen this one because it at least goes along on the basis I like to go along on, where power pays some true interest. I have chosen it for that purpose.

I will say further that whether you choose this method or some other method it is going to be fairly representative of the total costs involved, in any event.

Senator DOWNEY. Under S. 75 is it contemplated the Government will get any interest back on its power investment?

Mr. PETERSON. I will let the Senator from Arizona speak on that.

Senator MCFARLAND. I think the bill speaks for itself. It draws 2 percent interest except on the nonreimbursable items.

Senator KERR. Let me ask the witness this question to see if it will not clear the thing up in my mind. This amount of interest you have talked about is what you figured the interest would be on the nonreimbursable part of this investment, is it not?

Mr. PETERSON. That is correct. I have started with the Secretary's statement that that represents the true, full cost of the project, when it is comparing benefits and costs. This is his figure, not mine.

Senator KERR. I understand, but what you are bringing out here is that if the Government makes this part of the investment which is to be made on a nonreimbursable basis, the interest which it would draw if it were reimbursable and being paid back in that period of time would amount to those amounts of money?

Mr. PETERSON. I am going to take that a little differently but I will be answering your question, I believe.

Senator KERR. Is that substantially correct?

Mr. PETERSON. I think you said "nonreimbursable" when you meant interest instead of capital. I will cover the point, I believe. My intent is to answer you.

Now, these items that are to be paid without interest, being interest-free, give money back to the Government for its original investment in capital only. The Government presumably had to buy bonds to do

that. The Secretary has estimated the interest on those bonds at 2 percent. He has figured the amortization of the total $738,000,000 over the 78-year period at 2 percent, as representing the cost to the Government on a national basis. That ended up as being nearly a billion and a half dollars in the total time.

The Government got some of it back. It got the capital back here by virtue of power and municipal water paying it. It got power capital back from power. It got all of the $738,000,000 back, but nobody except power helped toward the interest payment. Power paid that little chunk of interest there [indicating $95,147,200] leaving the rest for the Government to carry. The total interest item of the Government is that amount of money.

The CHAIRMAN. Mr. Peterson, you referred to that "little chunk of interest there," $95,147,200, am I right?

Mr. PETERSON. Yes, sir.

The CHAIRMAN. That leaves a balance on your table on page 11 of $630,863,600?

Mr. PETERSON. That is right.

The CHAIRMAN. On your column, however, I find the figure of $724,927,000, which does not include the $186,000 deficiency. The total of those two figures would be $725,113,000. How do you check those figures?

Mr. PETERSON. The figures I am aiming to show when I get up to the vicinity of $725,000,000 are to cover Government interest, Government nonreimbursable capital at $80,000,000, Government nonreimbursable operating at $13,750,000 and the $186,000 deficiency.

On this chart the figure I have of $724,927,000 was plotted and written in here in my process of working this out and I did not have the $186,000 included. It is a portion of the total cost.

The CHAIRMAN. What I am trying to get clearly in my own mind is what you are contending. Do you contend, as on page 11, that the Treasury pays interest in the amount of $630,863,600?

Mr. PETERSON. That is the total interest item; yes, sir.

The CHAIRMAN. Then what does the $724,927,000 represented on your column mean?

Mr. PETERSON. That represented an addition to the interest of the nonreimbursable capital of the Government which nobody else pays, $80,312,000 and the year-to-year operating, maintenance and replacement expense of the several nonreimbursable capital investments of $13,751,400, which nobody else pays.

Then in preparing this there is the negligible item of $186,000 by which there was this theoretical deficiency. I added that in to make a total cost to the United States Treasury, over and above all returns from other revenue sources, of $725,113,000. That is the figure I contend the Government is paying out of the Treasury for this total project.

The CHAIRMAN. That is on the assumption that the government is borrowing money at 2 percent interest?

Mr. PETERSON. Yes; and that is the assumption the Secretary used in his presentation.

Senator ANDERSON. Do you happen to know, when he actually comes to amortize this investment, whether he will charge each year the true interest rate or will charge this assumed rate of 2 percent? On certain other Government obligations I happen to know the Govern-

ment charges the borrowing agency what the average rate of interest has been. The Commodity Credit Corporation, for example, pays on its obligations at what it has cost the Government that year to carry money. Does he amortize these power operations and the construction of multipurpose dams on an actual cost basis or on a previously determined basis?

Mr. PETERSON. I frankly cannot answer that question, but I would assume the Secretary and the Commissioner of Reclamation selected 2 percent as representing that average, as nearly as they could.

Senator ANDERSON. It happens that it was way above that many years ago and way below it a few years ago.

Mr. PETERSON. If I knew what the true cost was I would say that is the thing to use.

The CHAIRMAN. Mr. Peterson, could it not properly be said that if the annual budget of the Federal Government were balanced during the years in which a project of this kind were constructed and the appropriations came out of the general fund, that actually there would be no real interest on the capital investment, inasmuch as there would be no borrowing? It would be paid out of current revenues?

Mr. PETERSON. In answer, of course I would say this, that as long as any institution has a debt it cannot regard money that is actually invested for long terms as being money taken out of current revenue without figuring that it is adding to the debt, and therefore to the interest, just as we have done in this picture.

Although the Government bookkeeping is not strictly as shown here I would say there are normal operating expenses of the Government in which no investments are involved such as Boulder, Bonneville, or long-term things of that nature. Those operating expenses should be paid out of the current revenues from taxes first. Then with the national debt being in effect you would use some surplus left over for the retirement of the national debt.

But it would not seem logical to me to say, "Well, we are going to build this long-term project out of this current money that is coming in, we will let the national debt take care of something else." I would not agree that that would be good bookkeeping or good economics. That is my viewpoint of it and I think the Secretary agrees with me, too, because that is the approach he has made here.

Understand, I am not contending for this representation as being my representation. I am still at the point where I am trying to give you, before I jump off on my criticism, if you will, or argument, a picture as a starting point. This is what the Secretary says. You will have him available and you can ask him what his objective is and the logic of doing this thing, if you wish. He is the proper man to answer. This is simply put up for your convenience.

Senator ANDERSON. Do you find yourself in opposition to the theory that has been carried in many bills for a long time that there is a value in having interest-free reclamation funds? There are a great many of us strongly devoted to the principle that reclamation funds on a general project should be interest-free.

Mr. PETERSON. I am glad you asked that because I do not want to create the idea that I am contending power has no right to pay any irrigation. I think in a project of this nature—I am speaking of reclamation in general where irrigation is involved—that power can

and should assume some obligation to pay for irrigation features, or features related to irrigation. But, if you do not mind my saying so, I think this one is excessive.

Senator ANDERSON. I think you missed my question. Let me assume, then, a small project in which there is not a multiple-purpose dam and a lot of other things. Those projects for a long time were being constructed under the Reclamation Act which provided interest-free money. Do you have objection to that principle on the construction of reclamation projects?

Mr. PETERSON. As to interest-free money for irrigation, I do not believe I have a general objection to it in principle. My objection, and the one in this case which I will take opportunity to develop hard after a bit, is with the amount of money involved here. I think these amounts are very, very large and overload the project. I did not want to get into that argument yet.

Senator MALONE. Mr. Chairman, I suppose the witness is familiar with the fact that the Imperial canal was constructed with interest-free money, $33,000,000.

Mr. PETERSON. I would check that.

Senator DOWNEY. That is correct, it is a Reclamation Bureau project.

Senator MALONE. It is not necessary to check it, I will assure you.

Mr. PETERSON. Yes.

Senator MALONE. At first it was proposed in the original Swing-Johnson bill, which bill became the Boulder Canyon Project Act, that the money be donated and paid for by power. There was an amendment, mostly suggested by myself, before the committee which made it a project of its own because it had nothing to do with Boulder Dam, or Hoover Dam as it is now called.

Mr. PETERSON. Yes.

Senator MALONE. So it was taken out of the project. It was supposed to cost $35,000,000 at that time. There was a discussion about revenue in lieu of taxes, so we were looking around for money. The first suggestion, as I say, was that the total cost of the Imperial Valley canal be repaid from Boulder Dam power. It was discarded through an amendment but they did get interest-free money for the entire cost. I suppose that included the Coachella canal.

Mr. PETERSON. I am not, in general, against that principle.

Senator ANDERSON. I was only anxious about it because in so many of these projects which are constructed—and I think both Bonneville and Grand Coulee Dams were included—there is provision that as this power revenue pays back it goes into the general reclamation fund, does it not? That becomes interest-free money. There are a great many of us who felt that it was extremely fine to have this interest-free money for reclamation.

I would not want to get that principle mixed up in the general discussion of the use of power.

Mr. PETERSON. In this case my fundamental purpose is to call your attention to the amount involved in this interest-free situation.

I want to also say that I believe in all cases the power investments should be charged interest, but also that that interest should find its way to the United States Treasury as an interest payment. I am speaking personally now. I do not like the use of interest money from

power to be used so that it is said that it pays irrigation capital. There are two sides on that question. The Bureau of Reclamation has taken a viewpoint contrary to that recently. I am merely expressing a view against that, but I had better say that is a personal view.

Senator ANDERSON. I am glad you do because there are some of us who still believe it is nice to have this money available for development.

Senator KERR. Let me get back to the question asked a while ago. The amount of money you are discussing is a compilation of the interest that would be paid in taking care of an item, if it were a reimbursable item, or an interest-bearing item, rather than one which, if it becomes a project, an act of the Congress will declare either to be an interest-free item or a nonreimbursable item?

Mr. PETERSON. I do not quite get that.

Senator KERR. What you are doing is to show us what it costs us for Congress to follow the policy of either interest-free projects or nonreimbursable projects? Is that correct?

Mr. PETERSON. I am trying to show you the cost to the people or to Congress of carrying interest-free projects.

Senator KERR. On nonreimbursable projects?

Mr. PETERSON. Or nonreimbursable projects, that is right.

Senator KERR. That is what I wanted to get.

Senator MCFARLAND. This same rule would prevail in all irrigation projects.

Senator KERR. All interest-free irrigation projects.

Mr. PETERSON. All interest-free irrigation projects.

Senator MCFARLAND. All of them are interest free.

Mr. PETERSON. In recent years.

Senator MCFARLAND. Yes; that is true.

Senator MALONE. Mr. Chairman, to clarify the situation, of course there is some Hoover Dam power which pays 3-percent interest on the entire investment, is that true?

Mr. PETERSON. Yes.

Senator MALONE. Except that amount allocated to flood control, which is deferred?

Mr. PETERSON. Yes; that is true.

The CHAIRMAN. It is now almost 12 o'clock. It was agreed this morning that the committee would hold a session this afternoon in the effort of the California witnesses to conclude. The Chair has arranged for the use of the gallery room, G–23, formerly the Territories and Insular Affairs Committee room. If it is agreeable we will meet there at 2:30 o'clock.

Senator ANDERSON. Mr. Chairman, could I have just a moment to get into the record what I am seeking for myself here?

The CHAIRMAN. Certainly.

Senator ANDERSON. I recognize the Bureau of Reclamation has made a number of studies in upper-division States, or upper-basin States, in whichever category you desire to use them. The Big Thompson project in Colorado, representing a great diversion from the Colorado River over into another basin, is a project on which the Bureau has unquestionably spent a large amount of money. In my own State, in the San Juan-Chama Trans-Mountain diversion project, suggest-

ing the lifting of water from the Colorado into the Rio Grande, we have one project. We have the Shiprock irrigation project. I am not worrying about those projects. They are outlined to some degree in the Colorado River report, although I do not think there has been a great deal of study behind some of the projects.

But steadily the question of storage in the upper basin States has come up. In connection with this very project the engineers say that if Bridge Canyon is built and the Coconino and Bluff dam sites are developed, there still will be need for additional projects in the upper basin.

I am trying to find out what the Bureau of Reclamation has done in these intervening years, since the passage of the compact, to provide that storage in the upper basin States. Colorado is very much interested as, I am sure, are the home State of the chairman and Utah. It is important to know how far the plans have progressed for the storage of water for the fulfillment of this obligation to supply 7,500,000 acre-feet.

The CHAIRMAN. Request was made of the Bureau for that information. Letters have been received by the chairman. I have not yet had the opportunity to read the letters but they are in my office. I will show them to the Senator this afternoon and if they do not cover the information we all desire we will have another try at it.

Senator ANDERSON. I appreciate the chairman's patience with me.

The CHAIRMAN. The committee will stand in recess until 2:30 this afternoon, when it will reassemble in room G–23.

(Whereupon, at 12 m., the hearing was recessed to 2:30 p. m. of the same day in room G–23, Capitol Building.)

AFTERNOON SESSION

Senator ANDERSON (presiding). Mr. Peterson, the chairman would like to have you start in again.

Mr. PETERSON. Without waiting for him?

Senator ANDERSON. Yes.

Senator MCFARLAND. Mr. Chairman, may I correct the record on one point before we start. Mr. Peterson, as I understood, asked me about the interest provision in S. 75; but that contained no provision in regard to 2 percent interest. The interest provision was in the first bill that we introduced on the central Arizona project which, I believe, was S. 2226 in the Seventy-ninth Congress. S. 1175 contains the same provisions as S. 75, which provides that it be governed according to present reclamation law. I just wanted to straighten that out.

STATEMENT OF WILLIAM S. PETERSON—Resumed

Mr. PETERSON. Yes. I want to, in augmenting Senator McFarland's remarks, indicate that there is no accurate report religiously following the content of bill S. 75. They are all approximations in one way or another.

The interest requirements, if any, are applied as a result of S. 75. As best I can tell from studying it, it would be up to the Bureau of Reclamation to interpret, and what they would finally interpret, I do not know.

I used their interpretation in the report as my only guide, and I am merely trying to present their statement of it.

Some of the allocations are to be made by them according to the bill S. 75, and they are to arrange for payments.

The picture I have given thus far is an approximate one, but probably the only available one to go by.

If I may resume from approximately where I was this morning, it occurred to me that there may be confusion as a result of two items of money that are very nearly alike. I will repeat merely to clarify.

The net interest of all kinds that I get to be paid by someone over and above the capital which is returned under the bill is $726,010,800, and it just happens that when you subtract from that the power interest paid back to the Government, and add to it the nonreimbursable features of expense which the Government provides, we come up with another figure which is $725,113,000, very much alike.

But that last one is the one that represents the total cost to the United States Treasury over and above all returns from other power revenues.

It was at that point where we discontinued before recess.

(The chairman is now presiding.)

Mr. PETERSON. It should be pointed out that all of the interest components remaining after crediting power for interest returns is the result of a municipal water supply, irrigation and Federal nonreimbursable investments.

If the nonreimbursables are deducted, the remainder is the result of the so-called non-interest-bearing projects. The results of such are as follows: The interest on the nonreimbursables is $78,962,800 in the 78-year period, which, deducted from the $630,863,600 of interest payable by the Government leaves $551,900,800.

Then, deducting again from that the interest cost for municipal water investment in order to end up with a figure which is applicable for irrigation investment only, I end up finally with a figure for irrigation investment interest, which is $535,574,800.

Now, that figure, if we refer to this chart—and maybe I will leave it flat now because it would be difficult for everybody to see—that interest is this total length that is put in blue, including the little block in red.

Senator KERR. I may ask you a question right there: That is for the 78-year period?

Mr. PETERSON. That is for the 78-year period; yes, sir.

Senator KERR. It is just a matter of mathematical calculation that causes you to extend it for that period or to limit it to that period?

Mr. PETERSON. No, that is——

Senator KERR. I mean, as far as this discussion is concerned.

Mr. PETERSON. No, the determination of the amount is a mathematical figure based on retiring money at over a 78-year period at 2 percent interest.

Senator KERR. But based on the general principle of interest-free money for irrigation purposes, why either extended the 78 years or limited to 78 years? Just continue it on ad infinitum, and see what it costs in a thousand years?

Mr. PETERSON. This project is predicated on paying out in 78 years; that is the assumption made here; and in the process of paying out, the money flows back.

Senator KERR. Oh, the principal would have been returned?

Mr. PETERSON. The principal would have been returned to the Government in that period.

Senator KERR. I see.

Mr. PETERSON. In the meantime the Government is paying the interest on what is not yet returned here, returned all through the period.

Now, I am trying to, at this point, indicate the subsidy or the cost, I had better say, of handling the irrigation investment. I have just shown that the interest handled or taken care of by the Government is $535,000,000 plus.

Then, we have seen in the development this morning that the irrigation investment was repaid upon municipal water revenues, and largely by power revenues to retire $397,693,000, and that there was, on the basis of four and a half dollars per acre-foot revenue rate for irrigation a little item of $4,485,000 which could be handled by municipal water in aid of paying the operation, maintenance, and replacement of irrigation costs.

That meant that the total cost of irrigation over and above all revenues from irrigation (irrigation has practically paid its operating costs), but these costs are over and above that, and they amount to $937,752,800. That is nearly a billion dollars for that irrigation portion of the project. This is for the so-called rescue part of the project.

For this money, paid mostly by the Federal Government considerably by power and slightly by municipal water, possibly 226,000 acres are saved from going out of production.

The total project involves costs and revenues that may be summarized as follows——

The CHAIRMAN. Before you go to that, Mr. Peterson—

Mr. PETERSON. Yes.

The CHAIRMAN. (continuing). Will you turn back to page 11, and in your tabulation of the costs: The last figure in the first group, $630,863,600——

Mr. PETERSON. Yes.

The CHAIRMAN (continuing). That is the figure with which you begin the tabulation on page 12, is it not?

Mr. PETERSON. Yes; that is correct.

The CHAIRMAN. All right. Now, as you described on page 11 it is interest to be paid by the United States Treasury over 78 years.

Mr. PETERSON. Over 78 years.

The CHAIRMAN. Is the verb "to be paid" a strictly accurate one?

Mr. PETERSON. Well, it is accurate on the assumption that money advanced for a project like this is advanced out of bonds, and I am thoroughly in agreement that it should be a logical cost of the Government; I mean, that it is logical to call it a cost to the Government; and after all, as I said before, I am still presenting the Secretary's story.

The CHAIRMAN. Yes; I understand that. But would it be——

Mr. PETERSON. I think it is proper to say that it is to be paid by the Treasury. We have bonds which are outstanding, and the Government will have to pay interest.

This project will bring in what tremendous investment; while the returns are coming back to the Government, I think the Government is bearing the weight of the interest in this matter.

The CHAIRMAN. Well, see if I understand you correctly. Do you not mean that this is the amount of money which the Treasury would collect?

Mr. PETETSON. The Treasury will not collect——

The CHAIRMAN. Now, you permit me to ask the questions.

Mr. PETERSON. Yes, I am sorry.

The CHAIRMAN. Do you not mean that this is the amount which the Treasury would collect if the interest charge as calculated by the Secretary were actually levied and collected through the power rates?

Mr. PETERSON. That is correct.

The CHAIRMAN. What you mean here is that this is interest which is actually lost or forgiven by the Government under this project.

Mr. PETERSON. Correct.

The CHAIRMAN. Yes. So that when we come over to page 12, the phrase, "total interest cost to the Federal Treasury" is meant to carry the idea that $630,863,600, which might be collected as interest if the interest charge were included in the calculations, would amount to that sum.

Mr. PETERSON. That is correct; and I think it is a very close estimate to what the Government——

The CHAIRMAN. I do not doubt that.

Mr. PETERSON (continuing). Will put up in that period in carrying such bonds through.

The CHAIRMAN. But it is not a cost to the Federal Treasury in the sense that this is an additional amount of money laid out by the Treasury, except to the degree that it may have to—the Treasury pays interest on other bonds, but it is not directly.

Mr. PETERSON. It pays interest on the national debt, and this has increased the national debt.

The CHAIRMAN. That is correct.

Senator KERR. You take the position if this has not increased the national debt, it has prevented its being decreased.

Mr. PETERSON. That is right.

Senator KERR. Aside from the fact that Congress might levy taxes and appropriate money in a current year, develop an irrigation project, when, if they were faced with the alternative they would not levy money—levy taxes and collect money to reduce the national debt to that extent if the irrigation project were not under consideration and not being financed.

Mr. PETERSON. I think if I follow you correctly, my answer is "Yes".

Senator KERR. I think you are able to follow it.

Mr. PETERSON. Yes.

Senator MCFARLAND. Do you give any consideration to the income that is collected in the form of income taxes because of this development?

Mr. PETERSON. I have not as yet. I will give it a little discussion in a few moments.

Senator MCFARLAND. Very well.

Mr. PETERSON. Next I make reference to page 13 of my supplement, which is as follows:

Investments:	
Municipal water	$16,605,000
Irrigation	397,693,000
Power	243,798,000
Federal nonreimbursable	80,312,000
Total	738,408,000
Operating, maintenane and replacement:	
Municipal	3,915,600
Irrigation	242,112,000
Power	286,915,200
Federal nonreimbursables	13,751,400
Total	546,694,200
Interest:	
Carried by power	95,147,200
Carried by Federal Government	630,863,600
	726,010,800
Grand total	2,011,113,000
The revenues and sources by which this amount is paid are as follows:	
Municipal water	$41,176,200
Irrigation	237,627,000
Power	1,007,196,800
Federal Treasury	725,113,000
	2,011,113,000

This serves to set out the grand total of everything for the 78-year period; first, for the investments, $738,408,000; then the total for operating, maintenance, and replacement, $546,694,200; the interest burden carried by power and carried by the Federal Government, making a total of $726,010,800; the grand total for everything then for this total project, 78-year basis, is $2,011,113,000. The revenues by which this amount is paid are as follows: Municipal water, $41,176,200; irrigation, $237,627,000; power, $1,007,196,800; and then the Federal Treasury item, such as we have just recently discussed, $725,113,000.

Since the purpose of this portion of the presentation is to merely present the figures given in the report, and to reasonably interpret them, no conclusion will be stated, other than that the committee should indeed give serious consideration to the benefits to be derived from so large an expenditure. Further argument will be developed in the course of my testimony.

Now, I desire to interject some material which I will present at this time. There is another phase of returns I would call to your attention. This is proposed as a supplementary water project, that is, water which you use when the normal supply fails.

Years, typified by 1905 to 1923, or maybe as far along as 1927, were years of liberal run-off. Those are the years that were in the picture at the time some of the early suits of Arizona were in process, or about to be—it is a little earlier than the suits, but it was the type of experience they had in their mind at that time, and supplementary water in the years of that nature would not have been required.

Actually, that is the type of a period when Arizona claimed as much as 2,900,000 acre-feet of use in court proceedings. Now, keep that in mind in comparison with a later period when very much less water was available.

The revenues would not develop because then there was a lot of natural water.

Now, following such a high run-off period, Arizona, as I say, testified to a consumptive use of 2,900,000 acre-feet.

The succeeding years have been years of low run-off, and that has produced the cry for supplemental sources. For such a period the supplemental water would be in demand. In the long run, either the irrigation revenues may not reach the average shown, or else agriculture will again be overexpanded in wet cycles, and further developments of supplementary water demanded in dry cycles.

I merely want to point out that I believe there is enough variation in the flow of the river naturally that there may be departures from the available revenues from irrigation water through the fact that in liberal years water may be so available they do not have to buy this supplementary supply.

That is a point only in passing.

On page 2 of the report, the active irrigated acreage is given as 566,000 acres. The water received from this project supplement the supply for this acreage, and permit 73,500 acres of other lands to be brought back to production.

In the report this has been stated as the equivalent of saving 152,500 acres from going back to the desert, and adding 73,500 acres of land that has been used at some time, making a total of 226,000 acres of total additional benefit to be derived from this project.

The water duty of the land, as given on page R–8, is 3.4 acre-feet per acre on the upper Gila, including about 7 percent of the land, and 4.0 acre-feet per acre on the main lower area, constituting the remainder.

Senator KERR. Four point what?

Mr. PETERSON. 4.0, 4 acre-feet per acre.

Senator KERR. Why the 4.0?

Mr. PETERSON. That is just the figure used.

Senator KERR. It is just an even four?

Mr. PETERSON. Yes.

On the basis of a maximum delivery of 749,000 acre-feet at the headgate, and that is the maximum delivery contemplated under this project in the later years of its development, the equivalent acreage of full benefit is more nearly 749,000 divided by (a slight adjustment I am making now, because some of the acreage has a lower duty), 3.96. That would give us the acres profiting definitely from this project as being approximately 190,000 acres.

If an average water use for revenue purposes is taken as the measure of the acres benefited, the value becomes 677,000 acres, divided by 3.96, or approximately 170,000 acres.

I now propose to reduce some of the cost figures to values per acre, and will use the two extreme values of benefit, 170,000 acres, and 226,000 acres.

Within these limits the irrigation capital allocation of $397,000,000, that part which has been represented in solid blue on these charts,

amounts to from $2,335 to $1,755 an acre, depending on which basis you want to adopt, which is to be compared with a normal value for such land as stated in the report with water on the land, of $300 per acre.

Thus, the power users will be spending six to seven times the value of the land to put water on it.

Now, those figures can be verified generally from page R–42 for salable water, and from page R–8 for water duty, and from page R–10 for land value.

On page 12 of my supplementary statement of cost, the subsidy for irrigation only was pointed out.

Reduced to per acre values, these are as follows: I have two columns, on the 170,000-acre basis and the 226,000-acre basis. The capital subsidy which I have just given to you paid partly by municipal water and mostly by power, was $2,335 on the 170,000-acre basis; $1,755 per acre on the 226,000-acre basis. The interest subsidy by the Government, that $535,574,800 interest subsidy if put on a per acre basis, is $3,150 per acre on the 170,000-acre benefit basis, or $2,370 per acre on the 226,000-acre basis.

The same figures for the small contribution by municipal water to operation, maintenance and replacement are $26 per acre for the first basis, and $20 per acre for the other.

The total subsidies included in this wherever obtained, from power, municipal water supply or interest payment by the Government are as follows: If the project is on 170,000-acre benefit basis, the cost per acre in the 78 years is $5,511; if you want to go to the 226,000-acre basis it is $4.145 per acre.

Now, recall again that those things are applied to land which, in the report, is also stated to be worth, after the water is on, $300 per acre.

If the total Government burden is considered on the basis that if it were not for the irrigation project the nonreimbursables might not be spent, and I do not know whether that is a good basis or not, I am offering it only for your information, then the Government subsidy of over $725,000,000, exclusive of all other revenue sources, becomes for the 78 years on the 170,000-acre basis, $4,270; and on the 226,000-acre basis, $3,210.

Now, those are a lot of variable figures. All I want to convey to you is that it is a lot of money per acre when you consider the value of the land that is improved by the putting on of such water.

In compiling the cost figures I had occasion to refer to table F–9 giving a comparison of the benefits and cost. Crop benefits were given in terms of gross sales, and at $25,268,000 per year, and at that value, represented something between $148 and $112 per acre, depending on whether you used the 170,000- or the 226,000-acre basis.

Testimony before the House committee by a farmer indicated that a value of $147 was the gross crop return per acre.

The use of gross crop values takes no account of the other expenditures for producing crops, labor, fertilizer, equipment, water, and so forth.

In most business enterprises choices of methods and procedures are based on a comparison of competitive alternatives, and a justification is found in the effect on profits and not on total return.

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As I am not a professional economist, I only raise the question for your own investigation and judgment. My own approach to the problem herein presented is this: Land values are probably closely related to the profits derivable from their use. I would judge that the profit, after excluding a reasonable allowance for the work of the farmer's family, is of the order of $30 per acre, $50 per acre; you set the value. It does not make too much difference; it is in that general range.

It is probably not appreciably more than that or we would not hear so much discussion about the farmer's not being able to spend more than $4.75 per acre-foot of water—or $19 per acre per year for water.

Assume that the farmer is a large holder of land, and is in the 30 percent income-tax bracket, he would not pay as much as $10 per year per acre for income tax, and again I say let that vary over a wide range in accordance with your own judgment.

Now, go back to the interest subsidies or even the broader subsidies to be paid by the Federal Treasury if this project goes through.

I previously outlined these subsidies. They ranged for the 78-year period from a minimum of $2,370 or $3,150 for interest alone on the irrigation allocation, to values of $3,210 or $4,270 where other Government expenditures were included.

Per year the Federal Government would be paying out anywhere from $30 per year per acre to $55 per year per acre, depending on what you want to regard as subsidy, and how many acres measure the benefit.

I do not think that, as a matter of public policy, you gentlemen of Congress can justify Government subsidies for a project where such subsidies range from 3 to more than 5 times as large as the taxes to be derived directly from the operations.

Certainly, the Government cannot do that for all of its people and still remain solvent and pay all the tremendous obligations our Government now faces.

Arizona has a population of probably something over a half million people. The entire country has a population of 150,000,000, 300 times as much. Figure it out for any of the figures I have used here as totals. Multiply them by 300, and think of it as a job to do for the entire Nation, and you are dealing with figures comparable with World War II as the job you have in front of you.

Also some other States may want some money available for their reclamation developments. Now, if the Government finds need for subsidizing agriculture as a matter of national policy, then, does it not need to determine where the best opportunities occur, to determine whether it is most economical to subsidize maybe by less costly irrigation projects or by erosion control or by economical pumping rather than by pumping water 985 feet, when the farmer does not believe he can afford to pump one-fifth to one-tenth that height within his own economy?

Think again of this project in terms of a comparison in Arizona. The Salt River Valley Water Users Association supplies water to 242,000 acres. It has some power development in it. The entire capital involved in that project, if I understand the man who testified the other day before the House committee, is of the order of

$50,000,000, $200 per acre capital, not $2,000 per acre capital. That is the point I want you gentlemen to really seriously consider.

I say on the showing just made, using only the figures taken from the Secretary's report, without yet getting into other things which I will present, this project is fantastically uneconomical. I do not believe you will be a party to it with costs so high and returns so meager.

I now want to point out other difficulties and deficiences that will have the effect of increasing the costs or decreasing the returns beyond those I have now mentioned.

For this purpose, I would like to have you gentlemen now refer to the original statement, and beginning on the first page at the heading "Integration." On the basis of figures presented in Project Planning Report No. 3–8b.4–2, that is the Secretary's report on the central Arizona project, submitted by the regional director of region 3 of the Bureau of Reclamation of the Department of the Interior, over three-quarters of the revenue upon which the central Arizona project depends as proposed in S. 75, is to be derived from the sale of electric energy made available to a large degree by coordinated operation of the power plants at Hoover Dam, Davis Dam, Parker Dam, and at Bridge Canyon.

Despite the fact that the Bridge Canyon plant, by itself or even augmented by the storage afforded by the silt control reservoirs at Bluff and Coconino, is a project with very limited capabilities for the generation of firm energy, yet for the purposes of this project it has been credited with the total incremental benefits derived from the coordinated use of all generating equipment presently installed at Hoover Dam, plus the use of over 287,500 kilowatts of generating equipment at Hoover Dam yet to be installed for this purpose, plus the free use of storage capacity in Lake Mead so as to firm up the inherent secondary energy of the Bridge plant. For this service no payments or credits are given to the Hoover Dam project or to the contractors or allottees that have guaranteed and are returning to the Government the cost of that project with interest.

Over 2 years ago, in Los Angeles, a preliminary conference was held with the power and water contractors of the Hoover Dam project at the invitation of the Bureau of Reclamation to feel out the possibilities of instituting and operating a fully developed plan of integration for the power plants along the Colorado River. It became evident in this meeting that under the present contracts and regulations there was not an obligation to integrate the use of the river without at the same time taking into account the right of the principal contractors to integrate the operations of the Hoover plant with their own systems.

I have given quotations from the contracts which are in this statement. The following quotations from sections 20 (a) and 20 (b) (i) of the agency contract express this idea as follows:

20. (a) The United States, subject to the statutory requirement referred to in article 20 (b) (i) hereof and pursuant to agreement with the district, will interchange energy from its hydroelectric plants on the Colorado River below **Boulder Dam with energy allocated to the District and generated at Boulder power plant insofar as such interchange can be effected without interfering with service to the district and without impairing or extending the rights or obligations, respectively, of other allottees. The United States will so interchange**

energy insofar as practicable, as a means of effecting integration of operations as between Boulder power plant and other projects on the Colorado River owned and operated by the United States at which power is or may be developed, as the primary step in any program of integration of operations agreed upon, decided or determined pursuant to article 20 (b) hereof.

(b) (1) Subject to the statutory requirement that Boulder Dam and the reservoir created thereby shall be used: First, for river regulation, improvement of navigation and flood control; second, for irrigation and domestic uses and satisfaction of perfected rights mentioned in section 6 of the project act; and third, for power, the operation of Boulder power plant shall be reasonably integrated with the operation of other projects on the Colorado River owned and operated by the United States at which power is or may be developed and with the operations by the operating agents of their respective systems, including their other sources of electrical energy; provided that the time and rate of delivery of energy to allottees and contractors other than the City & Edison Co. (while they are operating agents under this contract) shall not be affected by any program of integrated operation agreed to, decided on or determined under this article 20. Such reasonable integration of operation shall be with the view of effecting economical and efficient use of generating machinery and equipment and economical and efficient use of water at Boulder Dam and such other projects and at the operating agents' other sources of electrical energy. It is understood and agreed that within the limits of use of water for power purposes at Boulder power plant fixed in a program of integration of operations agreed upon, decided or determined under article 20 (b) hereof, and during the effective period of such program, the manner of integration between Boulder power plant and the other sources of power on the respective systems of the operating agents shall rest with the respective operating agents, it being the intention of the parties that the programs of integration, although agreed upon, decided on or determined for the purposes and with the views set forth above, shall directly control only the manner in which the operating agents shall or may operate Boulder power plant and shall not affect the manner in which the operating agents operate their respective systems, including their other sources of electrical energy, except as such operations by the operating agents of their respective systems may be consequentially affected by such direct control of Boulder power plant operations.

The figures for firm energy generation resulting from the construction and operation of the Bridge Canyon power plant are derived from a study presented in table E–7 in appendix E of the Project Planning Report No. 3–8b.4–2 on the central Arizona project.

In this study, interchange and integration is largely between Hoover Dam plant and the Bridge Canyon plant, that is, during periods of high run-off during May, June, and July, Bridge plant is operated at high capacity and Hoover plant is held back and then during low run-off in August and September Hoover is operated at high capacity.

In many instances the range of monthly output from Hoover is called on to vary from as low at 183,000 kilowatt-hours to 576,000 kilowatt hours which difference, variation there, exceeds the firm power output of the plant.

In years like the calendar year 1934 the amount of such auxiliary stand-by capacity and energy to meet the deficiency in the firm energy output credited to the Bridge Canyon plant would be 2,044 million kilowatt-hours and 600,000 to 700,000 kilowatts of capacity.

This interchange of power is beyond that contemplated by present contracts calling for interchange of energy with Government plants below Hoover Dam. It is further stated that the integration operations are on the basis of 36 percent of the energy, presumably the energy allocated to the meteropolitan water district, being supplied at a uniform rate and that 64 percent of the firm output at Hoover power plant would be produced in a pattern suitable for integration with

power produced at hydroelectric and fuel-burning plants in southern California.

Although the pattern of generation would vary from year to year depending on the availability of hydroelectric energy in California, actually in the study a fixed pattern of energy use was used and the one selected was not a typical one. Whereas high use of Hoover Dam energy is apt to occur in May, June, and July because of Southern California Edison system load conditions, and in December and January due to city of Los Angeles load conditions, as well as Edison Co. conditions, the high demands for energy assumed in this study were shown as occurring in April, August, and September with low values occurring in March and July.

The systems supplied from Hoover Dam plant have each become responsible for certain generating equipment because of their needs for this capacity not only to generate energy, but to use it for stand-by for emergency outages or for overhaul of equipment or to meet peak demands for kilowatts on their systems. Under their Hoover contracts, the agents would vary the outputs also to integrate with other California hydroelectric plants as wet and dry years are encountered.

For the operations proposed by the Bureau of Reclamation, it is clear that the demands on Hoover Dam plant equipment will directly interfere with the use contemplated by the power contractors on their own systems. Also, since no estimate of cost is included in the report for completion of generator installations at the Hoover Dam plant, it must have been assumed that the power contractors were going to assume that responsibility also. The only reason for such generators going in would be to supply Nevada and Arizona loads separate from the California utility loads, and let the California utilities preserve their present peaking capacity, for integration with their own systems.

The use of such equipment to the extent contemplated by the Bureau of Reclamation is incompatible with that use which is the present right of the contractors.

The report does not indicate that any consideration has been given to the limitations incorporated in the Hoover Dam power contracts. The program of coordinated operation proposed by the Bureau of Reclamation for the advantage of the central Arizona project, would require substantial and fundamental changes in the existing contracts that would not be acceptable to the present principal allottees of Hoover Dam power.

The study of coordinated operation made in this manner and the resulting energy outputs set forth in table E–7 of the report by the Bureau of Reclamation represents a perfection of integrated operation that can only be obtained by having a foreknowledge of the entire 10-year period of water supply used for the study. Such results could not be achieved in practical operation. Although future 10-year periods will be undoubtedly as deficient in total run-off as the one under consideration, the monthly, seasonal, and annual distribution of the run–off would be different, and neither the distribution nor the approach of such an extended critical period of run-off could be known in advance. A sequence of dry years could occur even with the same 10–year run-off, which would result in depletion of Lake Mead to the point where the available storage would be insufficient to meet generating requirements and have a disastrous effect on the firm power outputs, and value of the energy.

To summarize at that point, I believe that the operation of the plant, with the perfection that is shown in these studies, cannot be achieved in practical operation. If you were to look at the estimates of forecasts for the run-off of the river, you would find that even now there is a very wide variation in those forecasted values, almost a ratio of 2–to–1 in what they expect in the way of water to come down in the ensuing months.

In order to appraise the output capability of the Bridge Canyon power plant with its related facilities as proposed in the report under review, and do that on a more realistic operating basis, independent studies have been made, by the department of water and power.

For this purpose, studies have been made for coordinated operation of existing and authorized power plants on the Colorado River, with and without the potential Bridge Canyon development. These studies are based upon water supply during the period 1930–41 as used in the Bureau report and downstream water requirements are also substantially the same as assumed therein, both corresponding to what are termed in the Bureau report as "initial conditions."

The first study was made for coordinated operation of Hoover, Davis, and Parker plants, based on the above assumptions, with Hoover power plant operated so that the contents of Lake Mead would not exceed 22,800,000 acre-feet on April 1 of each year, in order to insure the availability of the required flood-control storage space on that date.

For comparison, a second study was made on the same basis but with the inclusion of the proposed Bridge Canyon power plant operated in conjunction with the central Arizona project and in coordination with the operation of Hoover, Davis, and Parker plants, and with the further assumption that the permissible contents of Lake Mead on April 1 could be increased to 25,800,000 acre-feet—3,000,000 acre-feet higher than the previous figure—because of the proposed flood-control storage regulation in Bluff and Bridge Canyon Reservoirs.

The studies were based on the assumption that the existing and proposed plants would be operated similar to operations under the Hoover Dam contracts, with power generated and disposed of under similar terms and conditions to those prevailing thereunder and with due regard to the system characteristics of the allottees.

Now, this study was made for average water conditions in California. The study that should be made would include one that would take into account highly variable water conditions in California. Neither the Bureau of Reclamation nor the department of water and power has had time and manpower, apparently, to devote to that very complex problem, and so, the results we get from the study are less extreme than what it would be forecast for actual operation where water availability in the California watersheds would be varying widely.

In all the studies consideration was given to the fact that run-off conditions throughout the critical period could not be known in advance, and to the probability that the sequence of annual run-off conditions would be different and possibly more critical than the sequence during the period 1930 to 1941. Because of the variation of run-off, the amount of energy that could be produced would vary from year to year.

Under this assumed basis of generation and disposal of power output, it is considered that "firm energy" would constitute the amount of energy that is continuously available, in accordance with the definition of firm power by the Federal Power Commission. In other words, firm energy would be the amount that could be made available as a minimum in any month of the most critical period.

On this basis, the studies of coordinate operation of the three plants, Hoover, Davis and Parker, show that the annual firm energy that would be available under initial conditions during a critical period of run-off such as 1930 to 1941 would be as follows:

	Million kilowatt-hours
Hoover	4,150
Davis and Parker	1,550
Total	5,700

Because of Lake Mead storage and the firming capability of Hoover power plant, this 5,700,000,000 kilowatt-hours could be divided into 12 equal monthly quantities, resulting in a monthly firm output of 475,000,000 kilowatt-hours.

Comparable studies of coordinate operation with Bridge Canyon power plant added to the Hoover, Davis and Parker plants show that the energy output of the four plants under initial conditions with run-off such as occurred during the period 1930 to 1941 would range from 9,600,000,000 kilowatt-hours to over 12,000,000,000 kilowatt-hours annually. The firm energy output of the four plants would be the minimum during the critical period, namely 9,600,000,000 kilowatt-hours annually, which is—and this I want to give emphasis to—1,125,000,000 kilowatt-hours less than shown in the report by the Bureau of Reclamation. There is that much less power per year than what they show.

Of the total energy output, the studies show that Bridge Canyon would contribute an annual energy output ranging from 2,700,000,000 to 5,600,000,000 kilowatt-hours annually; however, that the monthly output of the Bridge Canyon plant would be only 200,000,000 kilowatt-hours in several months of the period studied. Therefore, the firm annual energy output of the Bridge Canyon plant would be 2,400,000,000 kilowatt-hours.

Under coordinated operation of the four plants including Bridge Canyon, no advance planning for the use of Bridge Canyon power on the part of the allottees would be possible, as is now done for Hoover power early in each contract year, because the energy produced at Bridge Canyon would depend to a large degree on actual inflows as they occur, and to a lesser degree on the run-off forecasts for the ensuing flood season. Therefore, 200,000,000 kilowatt-hours a month are all that could be credited to Bridge Canyon as firm energy output. The balance of the increase for four-plant operation over three-plant operation would be made possible from Hoover, Davis, and Parker plants by the firming capabilities of Lake Mead storage. The production of monthly firm energy for four-plant operation under initial conditions for the period 1930–41 would be as follows:

The original value of the three plants mentioned would be 475,000,000 kilowatt-hours per month. That found with the four plants

would be 800,000,000 kilowatt-hours per month, which was an increase of 325,000,000 kilowatt-hours per month.

The monthly firm energy of Bridge alone is 200,000,000, which gives us an additional firm energy resulting from Lake Mead storage of 125,000,000 kilowatt-hours. That is per month. The additional 125,000,000 kilowatt-hours per month, or 1½ billion kilowatt-hours per year, would be made possible by the permissible decrease of 3,000,000 acre-feet in space reserved for flood control in Lake Mead, together with coordinate four-plant operation.

I want to inject here that that 1½ billion kilowatt-hours, although I credited it in here and in the rest of my discussion to Bridge Canyon, is one that I have considerable misgivings about when I credit it in there. It is first of all something granted to Bridge that is not totally evolved from the presence of Bridge. It is getting a free ride on Hoover Reservoir.

Also in actual coordinated operation, if we could make a study that would include the effects of California water supply also varying, this figure would come out lower. I do not know how much, and cannot tell the committee at this time. I merely want to say, although I am using 1½ billion derived from that type of operation, and it goes into my report to the credit of Bridge, I still believe it is an overestimate.

The utilization in the commercial market of the large and variable amounts of energy output that could be produced by the Bridge Canyon plant in excess of the firm energy output could be made only by provision of auxiliary capacity from other sources, chiefly, if not entirely, by steam generating plants. The energy output of Bridge Canyon in excess of the firm output would become essentially, after allowing for transmission losses, fuel replacement energy, as the steam generating capacity would be available to carry the load irrespective of such secondary energy.

The studies show that the maximum firm energy output of the four plants under coordnate operation would not exceed 9,600 million kilowatt-hours annually or 800,000,000 kilowatt-hours per month; and that even to obtain this amount of combined firm energy output, Hoover, Davis and Parker plants with Lake Mead storage would be called upon, in the most critical year of the period studied, to furnish 1,500 million kilowatt-hours of energy annually in excess of their combined firm output. Such a firming operation would use capacity and energy that the Hoover Dam power allottees now have contractual right to use, and that are needed for proper integration with their other sources of power. Moreover, such a firming operation could not be continued during two successive dry years as severe as the driest year of the period studied. Therefore, it would be unsound to depend upon auxiliary or stand-by capacity furnished by a hydroelectric plant or plants on the same stream.

The next problem has to do with silt. The silt problem on the Colorado River must be viewed from its long-term effects and in general no sacrifice must be made to expediencies. Under the proposed project the Bluff Reservoir of 3,000,000 acre-feet is receiving silt at the rate of 29,300 acre-feet per year. The Coconino Reservoir with a capacity of 1,700,000 acre-feet is receiving silt at the rate of 27,500 acre-feet per year. With such dams in place, the Bridge Canyon

Reservoir of 3,720,000 acre-fet is receiving silt at the rate of 70,200 acre-feet per year.

In this matter, it is not the all-important consideration to say that in 102 years Bluff Reservoir will be filled with silt or that in 62 years Coconino Reservoir will be filled with silt or that in 53 years Bridge Canyon Reservoir will be filled with silt. It is important to realize that as you get part way along on the projects, the reservoir capacity for water regulation is gradually getting less, and the kilowatt-hours that can be obtained with integrated control are vastly reduced, with tremendous effects on the salable firm energy. Also, in the course of a few years, the flood control assumed for these reservoirs could no longer be obtained.

To indicate these effects I have made a study to approximately determine the performance of the project as silting and upper basin depletion take place. Of the two effects the silting effect is about seven times the importance of the depletion effects.

After 40 years, the storage in the reservoirs, particularly Bridge Canyon Reservoir, will have been reduced in capacity to where the firm energy, determined for initial conditions, can no longer be obtained. In 48 years, the firm power will have been reduced to the point that the full demands of the pumping system can no longer be met, in minimum years, when the pumping would be most urgent. By the end of 50 years, six-sevenths of the flood control of 3,000,000 acre-feet that has been transferred to Bridge Canyon and Bluff Reservoirs—and mainly upon which the 1½ billion kilowatts that I spoke of a few moments ago depends—will have been transferred back to Lake Mead with a consequent loss.

As a result of this, we find that essentially all firm commercial energy that is being depended upon to pay back the costs of the project is not available after 50 years of operation.

The firm energy creditable to the project corresponding to the initial value of 3.9 billion kilowatt-hours per year in accordance with our own studies for the 50-year period is 167.1 billion kilowatt-hours of which 69.7 billion kilowatt-hours will be required for the pumping operation, thus leaving for commercial sale 97.4 billion from the Colorado River portion of the project system. Over the 50-year period this, together with that added by the Arizona plants included in the project, brings the average annual commercial energy to 2.016 billion kilowatt-hours.

After decrease for transmission losses, the total salable firm energy at the market to liquidate the project is 1.875 billion kilowatt-hours per year average over the 50 years and none available thereafter, assuming the project rests on its own resources. It will not be an average of 2,679 million kilowatt-hours of firm energy, as set out in the Secretary's report to obtain the revenue of $1,007,000,000 that were shown on the charts this morning.

In addition to the primary or firm energy, there is an average of 1.6 billion kilowatt-hours of secondary energy at the market which would have a fuel saving value of not over 2 mills per kilowatt-hour on a long-term basis.

Senator ANDERSON. May I stop you for just a second to ask you where that silt would otherwise go if these dams were not there?

Mr. PETERSON. The silt would go on down into Boulder.

Senator ANDERSON. Do you take that into consideration anywhere in connection with these offsets?

Mr. PETERSON. Boulder's silting capacity, ability to absorb silt, is approximately something in between 200 years and 250 years, I will not try to give it more accurately. It is of that order. That is not sufficiently long, and in the long-time run of this thing we should protect it. It is in my mind that the most logical protection we can go to is the Glen Canyon Reservoir, and that silt problem is a very important one for the Government.

I think some justification of silt investment by the Government is valuable on the basis that it guarantees future revenues, beyond the contract period of 50 years or 78 years or whatever you have, as being from a future resource. I do not mean that the Government should go wild on that thing. I mean to give it only honest reasonable consideration.

That silt would go to Boulder; that is the point.

In order to determine the effect of these limitations of energy on the salability of the power or the ability of the project to pay operation and replacement costs and reimburse the Federal Government for the capital cost of irrigation and power investment and interest on the power investment within the period of 50 years, I make reference to table 5–8 in the report entitled, "Views and Recommendations of State of California on Proposed Report of Secretary of Interior on Central Arizona Project, December 1948." Using this table of annual costs—and I here assume that that report is already a part of your record—it is that one in front of you—using this table of annual costs and making allowances for revenues received from water and secondary energy, it is found that if the costs are to be met, the following revenues must be received from firm power available during the physical life of the project: If the figures are computed at 3 percent interest, it will take 9.45 mills per kilowatt-hour to pay out; if at 2½ percent interest, 8.98 mills per kilowatt-hour; at 2 percent interest it would be 8.53 mills per kilowatt-hour.

Obviously, power cannot be sold in competition with fuel-produced energy at any such price, as such prices are more than double that which could be contracted on a long-time basis.

Even at 2 percent interest the Government subsidy on the basis of failure to get more than one-half the required return from firm power is $8,000,000 per year for 50 years, or $400,000,000.

This is in addition to the subsidies previously pointed out in the financial study.

For emphasis, let it be repeated that the physical life of the project, predicated upon a reasonable operation of the project, due to effects of silt, is 50 years, and its financing and pay-out must be on that basis, and those responsible for its conception cannot contemplate revenues for 78 years that are not there.

Provided herewith is another statement, referred to as appendix I, which contains much of the detail of this last study, and one which is purely engineering detail. You would gain no greater knowledge by my going through it in detail. I would merely like to file it for the record, and distribute such copies as are available now.

Senator ANDERSON (presiding). Without objection, it will be so incorporated.

(The document referred to follows:)

APPENDIX I

STATEMENT OF WILLIAM S. PETERSON BEFORE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE, ON S. 75, CENTRAL ARIZONA PROJECT

DETERMINATION OF THE TERMINATION OF AVAILABILITY OF FIRM COMMERCIAL ENERGY

Due to silting up of the reservoirs contemplated in the Central Arizona project there will ultimately come a time at which firm commercial energy will become either very small or disappear. On the basis that the project is self-contained and receives no other help than that afforded by its own structures the following conditions pertain:

1. Length of availability of firm commercial energy

Rates of silting:

Bluff at 29,300 acre-feet per year, $\frac{3,000,000}{29,000}$=102 years to fill reservoir.

Coconino at 27,500 acre-feet per year, $\frac{1,700,000}{27,500}$=62 years to fill reservoir.

Bridge at 70,200[1] acre-feet per year, $\frac{3,720,000}{70,200}$=53 years to fill reservoir.

[1] This figure is with Bluff and Coconino in service. Without them the time to fill Bridge Canyon Reservoir would be 29 years.

Commercial firm power is that available over and above pumping requirements.

Pumping requirements for Parker route—Central Arizona project, as taken from table E–8, are as follows:

	Billion kilowatt-hours
First year	1.154
Fiftieth year	1.633
Average	1.393

In a study worked out by engineers of the department of water and power the firm energy of power generated at Bridge Canyon was 200,000,000 kilowatt-hours per month. This was the result of flow and storage conditions existing from water conditions given for the 8-month period for the months of August 1934 to March 1935, inclusive, covering the points of highest and lowest reservoir content. For this period the water inflow was 1,915,000 acre-feet augmented by 1,873,000 acre-feet from storage to give 3,788,000 acre-feet for power generation during the period.

The effects of depletion due to upper-basin development applicable for the period of 8 months' flow under consideration are as follows:

Months of critical flow	Acre-feet of flow for depletion conditions	
	1948	1998
1934:		
August	179,000	92,000
September	172,000	65,000
October	177,000	67,000
November	203,000	106,000
December	255,000	138,000
1935:		
January	302,000	302,000
February	322,000	322,000
March	397,000	397,000
Total	2,007,000	1,489,000

Change in 50 years, 518,000 acre-feet; rate of change, 10,360 acre-feet per year for the 8-month period involved.

As Bluff has a relatively long life, examination of power study indicated that it might make contributions ranging from very little but generally of 500,000 to 1,000,000 acre-feet of stored water during such period, limited not by its capacity but by the water available in the stream.

For this study an intermediate value of availability of stored water from Bluff was assumed as 700,000 acre-feet.

For Bridge Canyon Reservoir, capacity was decreasing at the rate of 70,200 acre-feet per year average.

Using such data and making trial figures, it is found that at 40 years the reservoir capacity and minimum river flow will be such that the firm power output is influenced by lack of storage capacity to augment the otherwise low flow. From this time on the firm power decreases. The data are as follows:

	Acre-feet
Bridge storage, 3,720,000—40×70,200	912,000
Assumed storage at Bluff	700,000
Water flow 1,915,000—40×10,360	1,500,000
Total water	3,112,000

For average head available kilowatt-hours per acre-foot	513
Output for 8 months in kilowatt-hours	1,597,000,000
Average per month, approximately	200,000,000

By the time 50 years is reached the reservoir capacity has decreased to the point where the firm output is approximately equal to the pumping requirements. The data are as follows:

	Acre-feet
Bridge storage, 3,720,000—50×70,200	210,000
Assumed storage at Bluff	700,000
Water flow, 1,915,000—50×10,360	1,397,000
Total water	2,307,000

Kilowatt-hours per acre-foot	532
Total energy for 8 months—kilowatt-hours	1,225,000,000
Average per month	153,000,000

This is very close to the amount of energy needed for pumping and will be regarded as the end of firm energy for commercial sale, particularly as a heavy influence on the amount of power available is help from Bluff Reservoir and the assumption of 700,000 acre-feet of stored water available there, for low water is very liberal.

It has thus been determined that the firm power value of 200,000,000 kilowatt-hour per month will be subject to reduction after 40 years and all commercial firm power will be eliminated after about 50 years, or perhaps sooner.

2. Total commercial firm energy at Bridge Canyon

On basis of preceding data commercial firm energy at Bridge Canyon is given by:

	Billion kilowatt-hours
40×12×200,000,000 kilowatt-hours	96.0
Plus average of tapering down to pumping requirements, 10 (12×200,000,000+1,633,000,000) $\frac{1}{2}=10\times\frac{(2.4+1.6)}{(\ 2\ )}$ billion	20.0
Total firm energy in 50 years	116.0
Less pumping=50×1.393 billion	69.7
Remainder, commercial firm energy	46.3

3. Other firm energy credited to Bridge Canyon

Studies by engineers of the department of water and power indicated that as a result of transferring 3,000,000 acre-feet of flood control to the Bridge, Coconino, and Bluff Reservoirs there was obtained another 1.5 billion kilowatt-hours generated at Hoover but creditable to Bridge Canyon. (This is not intended to convey the idea that such generation is the result of a legal right to be granted without valuable consideration.) In a 50-year period the storage at Bridge will be negligible. However, about half of Bluff storage on the San Juan river will be useful. The San Juan River contributes only 13 percent of the total run-off at Lee Ferry. Since the timing of floods on various tributaries of a stream is not identical, the beneficial flood-control effect of this dam is still

further reduced to, say, 0.7×13 percent or, say 9 percent of the flood control that was originally transferred.

The flood control at Bridge would maintain its original value for the period required to fill the dead storage which is $\frac{1,070,000}{70,200}$=15 years.

The firm energy creditable to Bridge Canyon as a result of shifting and reshifting flood control is calculated as follows:

	Billion kilowatt-hours
15×1.5 billion	22.5
$\frac{35}{2}$×(1.5+.09×1.5) billion	28.6
Total	51.1

The total firm commercial energy available for the 50-year period is the above plus that previously determined for Bridge Canyon. These amounts are:

	Billion kilowatt-hours
Bridge Canyon	46.3
Flood control effects at Hoover	51.1
Total	97.4

The total firm energy available, including the amount of 69.7 billion kilowatt-hours used for pumping, is 167.1 billion kilowatt-hours.

4. Bridge secondary energy

Average Colorado River run-off conditions prevailed in the 1938–39 contract year. From the department of water and power study for coordinated four-plant operation, the total generation creditable to Bridge, including effects of flood-control shift, was calculated to be 5.433 billion kilowatt-hours which is a reasonable value for initial conditions under average water conditions. With average water conditions but with depletion considered as of 1998, the annual total generation creditable to Bridge for coordinated operation was calculated similarly to be 4.706 billion kilowatt-hours.

Assuming that the depletions increase uniformly from initial to 1998 conditions, then the total generation is as follows:

	Billion kilowatt-hours
$\frac{5.433+4.706}{2}$=50	253.5
Less firm energy	167.1
Secondary energy available	86.4

5. Assumed value of secondary energy

Although it is difficult to forecast the true value of secondary or fuel-replacement energy over a 50-year period, it will be assumed to be 2 mills at the load center corresponding to an oil price of about $1.30 per barrel and a fuel economy of 650 killowatt-hours per barrel. The total value at load center of such energy is then determined to be: $\frac{0.93\times86.4}{50}$billion×$0.002=$3,213,000 per year.

6. Required rate for firm energy

(See table 5–8, page 138, of "Views and Recommendations of State of California on ——— central Arizona project" (Project Planning Report No. 3–8b. 4–2). Table is applicable to 50-year project life.)

Assumed interest rate on commercial power investment	3 percent	2½ percent	2 percent
Average annual costs	$24,209,400	$23,329,500	$22,491,000
Average annual water revenue	3,284,300	3,284,300	3,284,300
Average annual costs to be borne by commercial power	20,925,100	20,045,100	19,206,700
Average annual revenue from secondary energy	3,213,000	3,213,000	3,213,000
Required average annual revenue from firm commercial power	17,712,100	16,832,200	15,993,700

The average annual bridge commercial firm energy delivered to load center assuming a 7-percent loss is:

$$0.93 \quad \frac{97.4}{50} \text{ billion kilowatt-hours} = 1.812 \text{ billion kilowatt-hours}$$

To this must be added that energy derived from Arizona plants within the project amounting at the load center to 63,240,000 kilowatt-hours. The resulting total is 1.875 billion kilowatt-hours.

With this availability of energy and the required revenues as given above, the rates per firm energy have to be as follows:

	Interest rates		
	3 percent	2½ percent	2 percent
Required average revenue from firm commercial energy	$17,712,100	$16,832,200	$15,993,700
Rate per kilowatt-hour	9.45	8.98	8.53

These figures are substantially higher than power can be marketed for in load centers in competition with other power sources.

Mr. PETERSON. In connection with filing matter, I would like very much to request to include the colored charts that were scattered in limited amount this morning as part of the supplement to my statement which I read at that time. I think that will be for completeness.

(The chart referred to is herewith inserted.)

Mr. PETERSON. My conclusions, I would like to reiterate that in conclusion it is submitted for your earnest consideration that the bill, S. 75 and the companion bills, H. R. 934 and H. R. 935, under which the central Arizona project would be authorized, should either be not acted on or should be disapproved for the following reasons:

1. The project as proposed in the report of the Bureau of Reclamation contemplates subsidies, essentially provided from power revenues, amounting to $397,000,000 for irrigation capital which is six or seven times the value of the benefited land after the water has become available to such land.

2. Similarly, after allowing for true interest on the power capital paid from power revenues, the project involves additional subsidies in the form of Government interest burden of over $630,000,000 which is close to one-third of the gross crop values derived from the benefited lands and vastly exceeds the net income from the land.

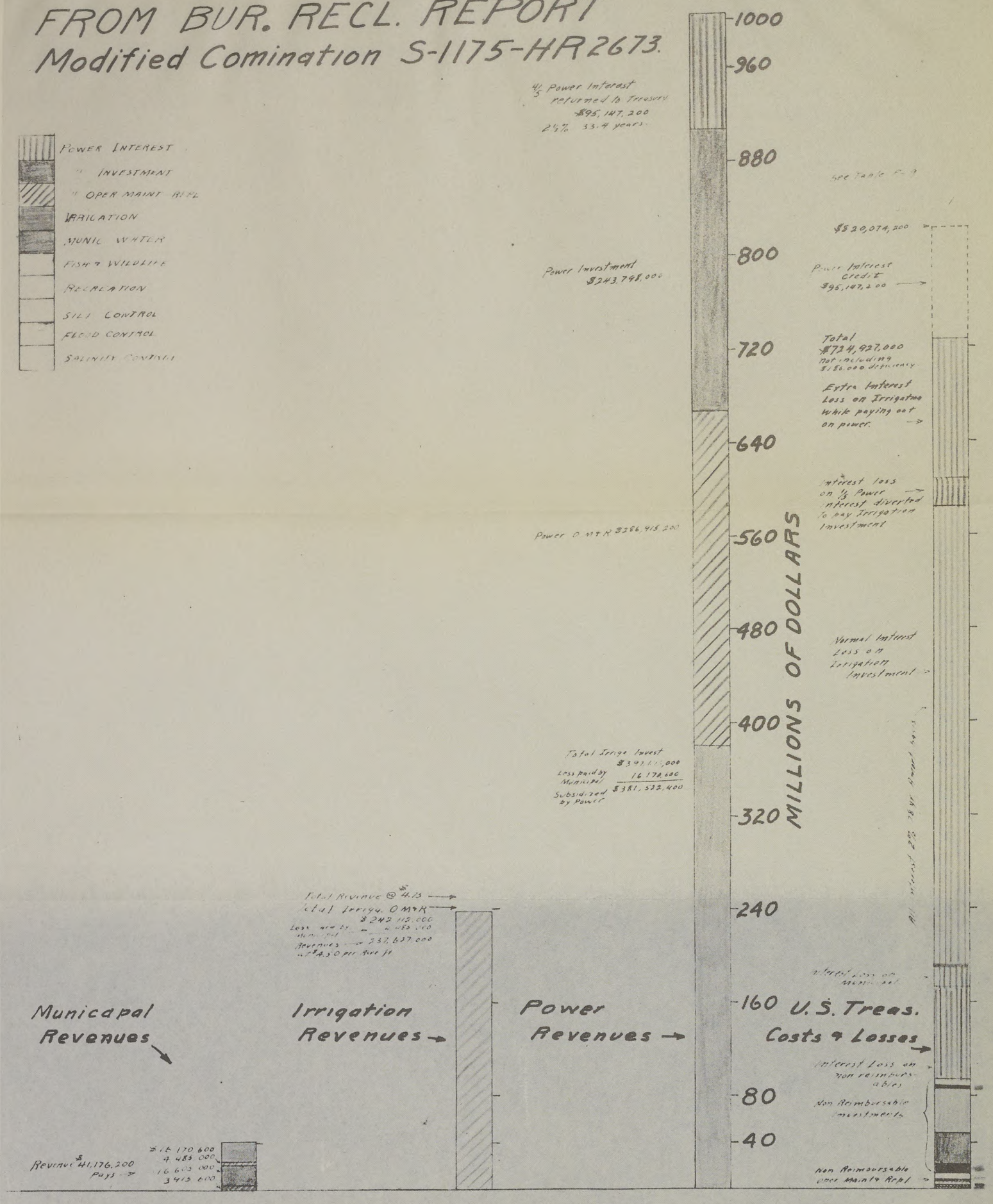
3. No costs have been charged to the central Arizona project for the benefits derived from the Hoover Dam power plant and Lake Mead which enhance the value of the Bridge Canyon power output and thereby provide revenue to subsidize irrigation in Arizona.

4. Operations on the scale proposed for integration cannot be presumably conducted on the basis of present contracts.

5. No appropriate arrangements under which the proposed integration operations could be carried out have been made.

6. The data provided to judge the results of integration and the estimates of the firm energy that can be produced by the project are based on a perfection of operation that is not realistic and exceeds the energy determined by a parallel study of the Department of Water and Power, by about 1,000,000,000 kilowatt-hours per year for the initial conditions.

REVENUES - DISPOSITION
FROM BUR. RECL. REPORT
Modified Comination S-1175-HR2673.



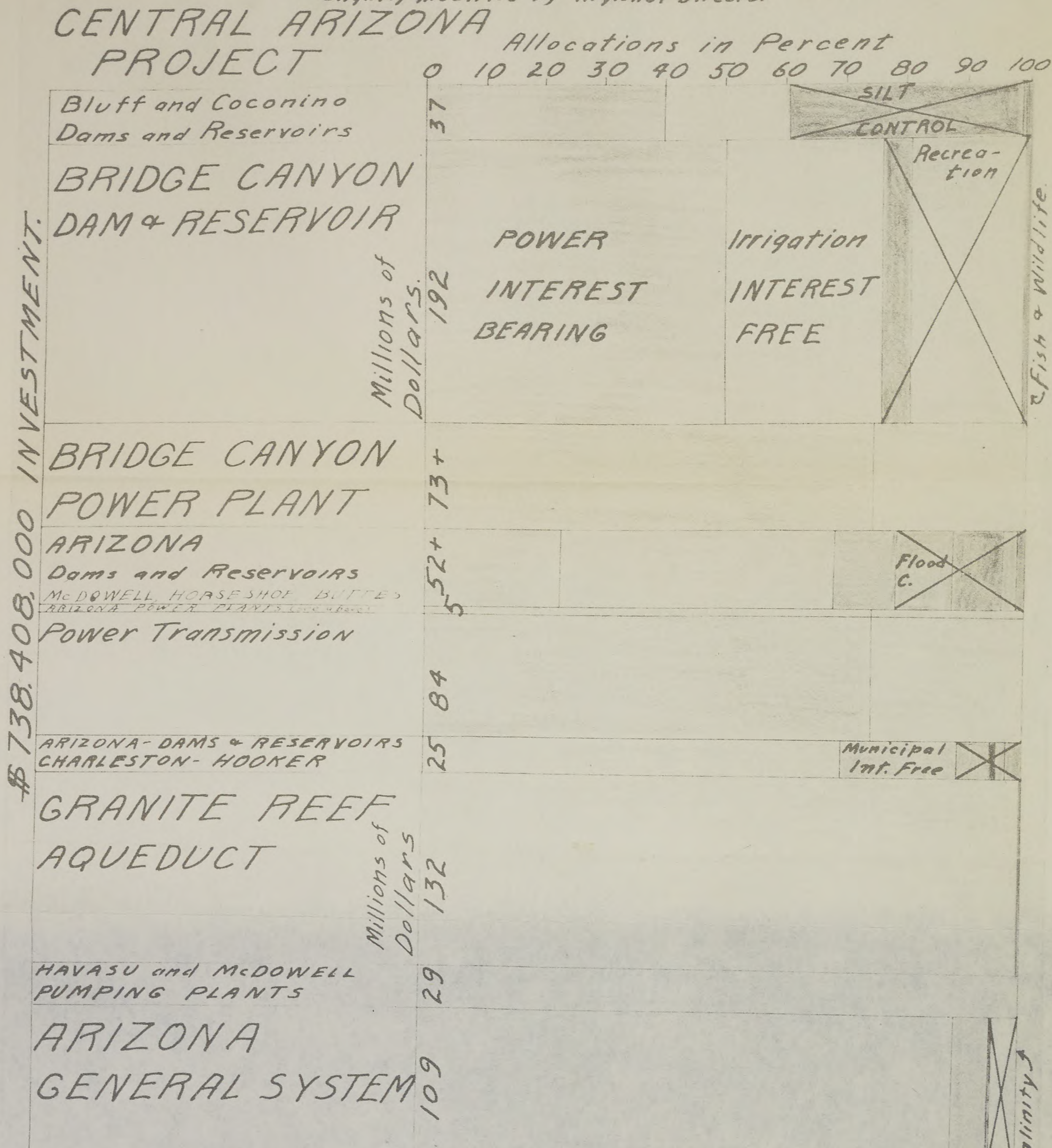
SUMMARY OF COSTS

FROM TABLE E-7

FROM TABLE F-7.

SUMMARY OF COSTS

Allocations based on Combination of S-1175 and HR2673.
Slightly modified by Regional Director



CENTRAL ARIZONA PROJECT
Allocations in Percent
0 10 20 30 40 50 60 70 80 90 100
$738,408,000 INVESTMENT.
Millions of Dollars
Bluff and Coconino Dams and Reservoirs
37
SILT CONTROL
BRIDGE CANYON DAM & RESERVOIR
192
POWER INTEREST BEARING
Irrigation INTEREST FREE
Recreation
Fish & Wildlife
BRIDGE CANYON POWER PLANT
73+
ARIZONA Dams and Reservoirs
McDOWELL HORSESHOE BUTTES
52+
Flood C.
ARIZONA POWER PLANTS
5
Power Transmission
84
ARIZONA - DAMS & RESERVOIRS CHARLESTON - HOOKER
25
Municipal Int. Free
GRANITE REEF AQUEDUCT
132
HAVASU and McDOWELL PUMPING PLANTS
29
ARIZONA GENERAL SYSTEM
109
Salinity
0 10 20 30 40 50 60 70 80 90 100
%

90762 O - 49 (Face p. 486) No. 2

7. Adequate consideration has not been given to the all-important item of silt from the viewpoint that the encroachment on reservoir capacity by silt seriously reduces the amounts of energy obtainable from the integrated operation as proposed.

8. The effect of silt will be to reduce the economic life of the projects to 50 years as no firm commercial energy will be available after that and the pumping energy thereafter will be deficient in years of low run-off.

9. When the economic life is shortened to 50 years, and integration operations conducted realistically with limited ability to forecast the supply of water for power purposes, the required returns would require power revenues more than double the market value of the power.

10. If the power is then sold at a reasonable market value, the Government in addition to subsidies previously mentioned will have the burden of over $400,000,00 due to lack of revenues to meet the contemplated program.

That completes my formal statement.

Senator ANDERSON. Senator McFarland, did you plan some questions at this point?

Senator MCFARLAND. Yes; I had just a few, Mr. Chairman.

Mr. Peterson, you appear here, as I see, as assistant chief electrical engineer of the Department of Water and Power in the city of Los Angeles, as their representative?

Mr. PETERSON. Yes, sir.

Senator MCFARLAND. That is the extent of your interest in this project? You are interested in the protection of power in southern California, and for the power department, and to see that they get as cheap power as possible?

Mr. PETERSON. I am interested in having power developments on the Colorado River. I am interested that they be handled in such a way that we would be justified in contracting for long periods of time for power, with due regard to the variations in the costs of power production by competitive sources.

We are, as I said this morning, not objecting to irrigation, in degree, being carried by power projects, but we do not want one that is so tremendously subsidized that it runs beyond reasonable pay-outs by the power, and represents undue burdens to be carried by a power project.

Senator MCFARLAND. In other words, what you want to do, and I deem it you take it your duty to do that, is to get power for your users at the cheapest possible rate.

Mr. PETERSON. No; only at a rate that makes it feasible to contract on a long-time basis and compete with other power sources.

Senator MCFARLAND. Now, you gave quite a number of figures, quite a bit of figures here which, of course, were interesting in that you showed what the Government was subsidizing for irrigation and that it was providing interest-free money for irrigation.

Mr. PETERSON. Yes, sir.

Senator MCFARLAND. Did you ever figure any project other than this project as to what it cost?

Mr. PETERSON. On this same basis?

Senator MCFARLAND. Yes.

Mr. PETERSON. Yes; I have looked at some other projects.

Senator McFARLAND. Have you looked at the Central Valley for California?

Mr. PETERSON. Yes, sir.

Senator McFARLAND. And how does that—what does that amount to?

Mr. PETERSON. If I may refer to some notes I have on it——

Senator McFARLAND. Yes. Probably I can develop it in this way, if you have——

Mr. PETERSON. No; I have it here now.

I have made reference for this very purpose to this document, the Central Valley Federal reclamation project, a report presented to Secretary Krug by the Bureau of Reclamation of this Department on August 6, 1946, on the Central Valley reclamation project in California.

It is House Document 146, Eightieth Congress, first session, and I compiled the figures and as a result of compiling the figures which I have here in this sheet, I can read in a very brief paragraph the comparisons, if you would like.

The Central Valley project in California, in comparison with the central Arizona project, costs very little over half as much; benefits three times as much land; produces nearly three times as much salable water at approximately half the price per acre-foot of water; requires only 18 percent as much energy for pumping; and produces—this is the unfavorable part—only half as much salable electric energy. California irrigation produces a capital repayment equal to one-quarter of irrigation allocation, whereas no capital return is made by Arizona irrigation, and the unreturned interest burden on the Federal Government for the Central Valley project is only 41.5 percent as great as for the central Arizona project.

Now, if you wish, I will file with the committee——

Senator McFARLAND. Well, those are conclusions.

Mr. PETERSON (continuing). This copy.

Senator McFARLAND. I would like to get some definite figures here.

Mr. PETERSON. The figures are here that support those conclusions.

Senator McFARLAND. Well, maybe you can give them to me, Mr. Peterson.

Mr. PETERSON. Would you be content with totals to save time?

Senator McFARLAND. I want to tell you what I want.

Mr. PETERSON. All right.

Senator McFARLAND. How much interest-free money is applied to the Central Valley project of California?

Mr. PETERSON. I think I will read the figures and make the comment, and the answers will develop——

Senator McFARLAND. Can you give me that?

Mr. PETERSEN. I think the quickest way is to read the figures and comment.

Irrigation for Central Valley, $221,000,000—I will read round number figures—$221,000,000; that is interest-free money; municipal and industrial water, $9,000,000 interest-free money; power, $104,000,000, which has an interest charge against the power, but the charge of interest is diverted to pay capital on irrigation. That is different from the Arizona project as I presented it. Whether it is different in the way the project will work out if you authorize it, I do not know, because there is no control, complete control, as I understand it, on the

bill. At any rate, there is an element of doubt there, but to take it as I have presented it this morning.

Navigation and flood control for Central Valley are approximately $49,000,000, and represent the Government's nonreimbursables.

Senator McFARLAND. That is navigation and what?

Mr. PETERSON. Flood control. The flood control is $31,000,000, and navigation is $18,000,000.

Senator McFARLAND. How about salinity control?

Mr. PETERSON. There was no special allocation of salinity control, although salinity control is involved in the project, but not set out as a separate allocation.

Senator McFARLAND. What was that figure you just gave me, $49,000,000, did you just say?

Mr. PETERSON. For the two, $49,000,000 for flood control and navigation; they are the nonreimbursables.

Senator McFARLAND. Now, you have there, not counting the salinity control, $279,000,000, part of which is interest free, and part of it, the $49,000,000 is nonreimbursable—$230,000,000 of interest-free money, I believe.

Now, have you figured, Mr. Peterson, on the same basis as to how much that $230,000,000 would multiply to if the——

Mr. PETERSON. Yes, I did.

Senator McFARLAND. What is that figure?

Mr. PETERSON. That would be the interest situation, would it not?

Senator McFARLAND. Yes.

Mr. PETERSON. All right. The amortization interest burden at 2 percent, the same thing that corresponded to the $630,000,000 figure for the Arizona project, and the California project is $262,400,000. That is the basis for my statement here that this Central Valley project—the interest burden on the Federal Government for the Central Valley project—is only 41½ percent as great as the central Arizona project.

Senator McFARLAND. Does that $262,000,000 include the $49,000,000 of nonreimbursables?

Mr. PETERSON. Yes, it is the identical basis; it includes both.

Senator McFARLAND. You included both?

Mr. PETERSON. Yes.

Senator McFARLAND. Now, Mr. Peterson, when did you figure this up?

Mr. PETERSON. A couple of weeks ago.

Senator McFARLAND. Two weeks ago. You did not figure it before this project was authorized then?

Mr. PETERSON. No, just in anticipation of your questions.

Senator McFARLAND. Yes, I understand that.

Mr. PETERSON. I reviewed what I had, and have given it to you.

Senator McFARLAND. I understand, but you did not have sufficient interest as to what this was going to cost the Government, this project, this Central Valley of California project, as to what it would cost the Government to figure it before the project was authorized?

Mr. PETERSON. I did not have an interest in it, because it is not one that is apt to affect my Department.

Senator McFARLAND. Well, that is what I am getting at. In other words, your interest here in this particular project is because you say it affects——

Mr. PETERSON. We are looking, frankly, to the Colorado River water for power purposes; yes, sir.

Senator MCFARLAND. Yes; before the Big Thompson project was authorized, did you figure that?

Mr. PETERSON. No, sir, Senator.

Senator MCFARLAND. And have you figured it?

Mr. PETERSON. No.

Senator MCFARLAND. According to these figures—I cannot say whether they are correct—the central California project provides for a subsidy of 0.68 of a mill, and the Colorado Big Thompson project provides for a subsidy of 0.89 of a mill.

Mr. PETERSON. Yes.

Senator MCFARLAND. And the central Arizona project provides for a subsidy of 0.72 of a mill.

Mr. PETERSON. Well, with respect to that figure of 0.72, I have hunted for the means of derivation, and I have not found it, and that is why I gave the figures I did this morning, if you will recall, for certain power figures.

Senator MCFARLAND. Well, of course, I do not——

Mr. PETERSON. I gave those figures for power costs, and you recall my 38 percent situation this morning, that type of thing.

Senator MCFARLAND. I am not trying to state that this figure was correct, but it was given to me.

Mr. PETERSON. Yes; I am not saying it was wrong; I merely say I do not know how it was derived, and I hunted by my own methods of calculation to evolve it, and I did not ever find anything that low for this project.

Senator MCFARLAND. Well, we will try to find out about it before we get through here.

Mr. PETERSON. Yes; that is all right.

Senator MCFARLAND. So, your chief reason, then, for your interest in this project is that you feel that it affects the power users in your part of the State?

Mr. PETERSON. That is one of the principal interests, but you recall that I am also affiliated with the department of water and power.

Senator MCFARLAND. Yes.

Mr. PETERSON. And I am very much interested in the legal problem of rights to water because we are a prospective and very heavy prospective customer of the metropolitan water district.

Senator MCFARLAND. We will not get into the legal aspects of it because you have not covered that and, of course, while I have said that all the engineers think they are lawyers and all the lawyers think they are engineers, we had probably better stay in our respective fields, and for that reason I will not ask you very many more questions, but will leave it up to engineering data to refute your testimony in rebuttal.

Mr. PETERSON. Yes, sir.

Senator MCFARLAND. Now, when the Boulder Canyon Dam, or the Hoover Dam, was built, one-third of it was charged to flood control, was it not?

Mr. PETERSON. I do not think it was that much; $25,000,000 was charged to flood control.

Senator MCFARLAND. Well, I was informed that it was a third, but I might be mistaken.

Mr. PETERSON. No, it is not a third.

Senator MCFARLAND. The estimate was $78,000,000 for the dam——

Mr. DEBLER. The estimate was $79,000,000 for the dam, and $25,000,000——

Mr. PETERSON. Twenty-five million is the correct figure.

Senator MCFARLAND. Yes. Well, whatever that is.

Mr. PETERSON. And I think the investment is running higher than $79,000,000, way higher. It is more nearly double that—not quite.

Senator MCFARLAND. Well, whatever it may be, that flood control could have been paid by the power users, could it not? I mean, the power could have been priced in a manner charging us that much more and thus regained that full value?

Mr. PETERSON. Well, the Government chose to pay that for flood control, just as it has paid for flood control elsewhere.

Senator MCFARLAND. I understand, and just as they give free-interest money elsewhere.

Mr. PETERSON. Yes, that is true.

Senator MCFARLAND. Free-interest money elsewhere on irrigation. But that could have been done, could it not?

Mr. PETERSON. It might.

Senator MCFARLAND. Well——

Senator KERR. Does the Senator mean to give free-interest money or to loan, advance, free-interest money?

Senator MCFARLAND. Advance free-interest money.

Mr. PETERSON. If you do not mind, for the record, I have been handed a figure which, I think, is correct: Hoover Dam is set here at $125,000,000, and that does include flood control—flood control deferred. The statement is made that in connection with that flood control a similar allocation, that it will be paid off by the project power sales at the termination of the 50-year period; that is the first obligation to be paid off at that time.

Senator MCFARLAND. Does that include the power plant?

Mr. PETERSON. The power plant will have been paid off by——

Senator MCFARLAND. No, with these figures that you gave——

Mr. PETERSON. Yes, the whole business.

Senator ANDERSON. His figure was $79,000,000 for the dam, of which $25,000,000 was flood control.

Mr. PETERSON. I see.

Senator ANDERSON. That was all it was for the dam, and the rest was electrical installation.

Mr. PETERSON. Yes.

Senator MCFARLAND. But the power plant there was furnished by the companies, paid for by them, and they get cheaper power for that reason, is that not so?

Mr. PETERSON. No; the power plant investment was on the same basis as the investment for the dam, which was advanced by the Government.

Senator MCFARLAND. But they get for the falling water——

Mr. PETERSON. The investment in the dam, the repayment of it, the interest, the operation and maintenance and replacement expenses for operating the dam, together with such other moneys that are spent, such as $300,000 per year to Arizona, $300,000 per year to Nevada, and $500,000 per year to the Colorado River development fund, all, as I understand it, enter into the falling water charge.

Senator McFARLAND. In other words, here, Mr. Peterson, the Government put up all the money.

Mr. PETERSON. What is that?

Senator McFARLAND. The Government put up all the money.

Mr. PETERSON. The Government advanced the money, and with the exception of flood control it is being repaid, that money, with interest; there is complete amortization at 3-percent interest in 50 years.

Senator McFARLAND. Well, that is all right; but the flood control is not reimbursed.

Mr. PETERSON. Not until after 50 years.

Senator McFARLAND. And now, that means cheaper rates for the power users in southern California, does it not?

Mr. PETERSON. At the time the proposition went through the Hoover power rates were quite close to the then existing steam plant costs——

Senator McFARLAND. But it means——

Mr. PETERSON. For power delivered in Los Angeles.

Senator McFARLAND (continuing). Cheaper rates, does it not?

Mr. PETERSON. Yes, but maybe if you put the other on, it would not have been as attractive to purchase.

Senator McFARLAND. Well, I am not saying it would or it would not.

Mr. PETERSON. That is correct.

Senator McFARLAND. But the fact is that if you want to take the same argument that you are making in regard to irrigation, the Government is subsidizing the industries of southern California.

Mr. PETERSON. To a minor extent.

Senator McFARLAND. Yes; and is it more important to subsidize the industries of southern California or to subsidize the farmers, the grassroots farmers of the Nation?

Mr. PETERSON. I have indicated in my previous testimony that I am not averse to a certain amount of subsidy. I am averse to subsidy of the fantastic amount which we have developed in connection with this project.

Senator McFARLAND. Well, your subsidy here is, according to the figures I am handed, 72/100 of a mill.

Mr. PETERSON. I object to that figure; I do not think it is right, if I can express it so.

Senator McFARLAND. If it is right—I cannot argue that it is not——

Mr. PETERSON. I know you cannot.

Senator McFARLAND (continuing). If it is right, is that fantastic?

Mr. PETERSON. It is if it makes the difference between whether you can sell the power or not.

Senator McFARLAND. Do you think that this power can be sold at 4.82 mills at the stores? I mean at the delivery points?

Mr. PETERSON. If you had sufficient power in this project over the total life of the project to produce the 4.82 mills, and if that were all a fact, and good, then we are up against the proposition that on a 50-year deal, we are contracting for power at not far from the current cost of steam, as we encounter those costs in our planning.

Senator McFARLAND. Could it be sold at that price, do you think?

Mr. PETERSON. I would hesitate to enter into a contract for 50 years at 4.82 mills at the present time.

Senator McFARLAND. What kind of a contract did you enter into in regard to the Davis power?

Mr. PETERSON. I did not get any.

Senator McFARLAND. You did not get any? You applied for it, did you not?

Mr. PETERSON. That is right.

Senator McFARLAND. And that was slightly under 5 mills?

Mr. PETERSON. Correct.

Senator McFARLAND. Now, do you think that the Bridge Canyon Dam ought to be built? I am just leaving aside these other things that you are talking about, which we understand you are objecting to, but other than those.

Mr. PETERSON. In my judgment, we should build—consider very seriously the prompt building of both Glen and Bridge Canyon Dams. the reason for both is that in that way you hurdle, to a large degree, the problem of who is paying the subsidy for silt. You build that project and set it up properly, and it will protect the others, the projects below it. Since Glen Canyon would be for a considerable period a power enterprise, and then later in its life would become of value not only for large continued silt control, but would become of value for reregulation of water to satisfy 3(d) of the compact by which the upper basin would deliver its average of 7,500,000 acre-feet past Lee Ferry for any consecutive 10 years, that you may pick out. Glen would provide that type of performance. Power could, to a large degree, and I am not prepared to state the amount at this time, because we have not completed a lot of figures on that, but it would appear that power, to a large degree, could probably largely contribute to that project and have the reregulation for compact use as its donation, if you will, to the irrigation set-up. That is part of the project. Just as Boulder Dam project has no particular set-outs of expense in the main part of the project for irrigation, nevertheless it is operated to make water available for irrigation, and regulation and control have been available throughout the years for irrigation. Power stands it without any particular allocation at all to irrigation. We are in favor of that type of thing to a limited amount.

Senator McFARLAND. Yes. I am not trying to brush aside your objections; I am just trying to find out how much we can agree on.

Mr. PETERSON. Yes.

Senator McFARLAND. Now then, I take it from your answer that you personally feel that the river should be fully developed as far as these dams are concerned, and that the dams mentioned herein should be built, with an additional dam at Glen Canyon?

Mr. PETERSON. Yes.

Senator McFARLAND. And that if built in accordance with your ideas, why, that would be good for the river and for the country as a whole.

Mr. PETERSON. I do not mean it to be devoid of irrigation possibilities, now, understand that. I want irrigation to be reasonable.

Senator McFARLAND. I am not trying to make you answer something you do not want to answer, Mr. Peterson.

Mr. PETERSON. I know that. Thank you.

Senator McFARLAND. Let us come on down the river a little way to this Imperial Valley down here. If this water were to be placed—of course, I have mentioned a lot of times here, and I expect I will continue to mention it, that the Secretary of the Interior has made a report that the east mesa is not irrigable and that it is not feasible

for irrigation—but assuming that the mesa would be, that it would be irrigated in accordance with a contract.

Mr. PETERSON. Yes.

Senator MCFARLAND. Now, that mesa land has not previously been irrigated; and as far as that land is concerned, and the cost of storage of the water used thereupon, the whole venture would be completely subsidized, would it not?

Mr. PETERSON. Yes.

Senator MCFARLAND. Because the Boulder Canyon Project Act provides that no cost shall be imposed for that water for land which has never been irrigated before.

Mr. PETERSON. That is correct.

Senator MCFARLAND. So, of course, you and I, we cannot be responsible for what was done back there. But that was a pretty good deal for that mesa land if it ever gets water.

Now, I do not think it is necessary for us to figure out what that subsidy might amount to, but it would be kind of hard to figure. I just wanted to call attention to the fact that it is subsidized, and I am glad you agree with me.

Mr. PETERSON. I also put that forth as being a type of subsidy which I think power might have a right to provide.

Senator MCFARLAND. But unfortunately it is just over on the other side of the line.

Mr. PETERSON. But I think those matters of subsidy are matters of judgment by Congress to find out whether the subsidy is too large or too small; in other words, is the project worth the price? That is the point.

Senator MCFARLAND. Yes, I understand. I understand your position, I think.

Mr. PETERSON. Yes.

Senator MCFARLAND. We come now to this other subject here that is rather technical for someone like me, but I wanted to ask you a few questions about it anyway, and that is your integrated——

Mr. PETERSON. Integrated operation.

Senator MCFARLAND. Operation.

Mr. PETERSON. That is the first subject in that statement you have.

Senator MCFARLAND. You have so many statements here that I am getting lost. Yes, I have found it now.

Would the companies receive any less power under this system?

Mr. PETERSON. I would say this: If we had this project operating as proposed by the Bureau of Reclamation there would be times where there would be pinches on power because of the need to integrate Hoover to firm up Bridge Canyon power, and if you study the actual report or study, even as the Bureau of Reclamation has presented it, or as our men have studied it, you will find that there is a year there, approximately 1934, where the reservoir is pulled down to levels which, as we have been operating, the Bureau of Reclamation would not countenance at all, because of the fear of the succeeding year being another low-water year. That is what I am getting at: that under that kind of operation there would be places where if it did not work exactly like the 10 years under study, if a man made a bad guess or just the best guess he could, he would not achieve what they say, and we would be cut in some way, either that Hoover would not have

the firm output we expected or we could not use the equipment when we otherwise had a right to use it; and we would have to have built up our system in some other way to supply that power.

Senator McFARLAND. But the report does not contemplate that you would receive any less power, does it?

Mr. PETERSON. No; not from Hoover.

Senator McFARLAND. Yes, I mean the companies would not receive any less power.

Mr. PETERSON. They would receive the same from Hoover.

Senator McFARLAND. And if it was so operated, the integrated system was so operated, as they contemplate here, that you did not receive any less power, you would not be injured, would you?

Mr. PETERSON. Yes, because I interpreted your word "power" to mean energy content from the project; but I am talking in integration more definitely with respect to the use of the power plant capacity and the demands on the generators, and their ability to handle peaking power or to meet demands on the systems depending on California water when it is low, for example, or there are emergencies to meet or whatever nature, things that are inherently right at Hoover, would be violated somewhere in this program as proposed; that is all.

Senator McFARLAND. I understand, Mr. Peterson, that maybe you do not agree with their report that it would be so operated; but if it were so operated, you would not be injured, would you?

Mr. PETERSON. If it could be so operated. If you will accept that, I will agree.

Senator McFARLAND. Well, I do not see any difference in them, but——

Senator KERR. It would have to "could be" before it "would be."

Mr. PETERSON. Yes.

Senator McFARLAND. If it would be, there would not be any injury to you.

Mr. PETERSON. Not if it would be operated that way.

Senator McFARLAND. And, as a matter of fact, it would have to be so operated.

Mr. PETERSON. That you do not have control over. Mother Nature controls that. I do not think they could.

Senator McFARLAND. Well, I am not going to argue the point with you; but, as a matter of rights, it would have to be done.

Then, I want to ask you this question: Do you believe that as a method, integration of power plants is a good thing for the conservation of power?

Mr. PETERSON. Yes.

Senator McFARLAND. I am not talking about this particular thing.

Mr. PETERSON. Yes. Integration, in general, is a very proper thing to do. We presently have a right to integrate a certain portion of the Colorado River and the Hoover plant with all of our plants; it is not exclusive, as well as integrating with the rest of the Colorado River, and those integrations items are good.

Companies integrate with each other and set up means of pricing their power and service to each other, and that is what is lacking in this proposal. They are using a valuable resource for the advantage of Arizona without giving any price return to the project that is making it possible for them to do what they claim or approach doing what they claim to do.

Senator McFARLAND. Well they do, according to your statement to Senator Anderson, receive some advantages in the matter of protection from silt.

Mr. PETERSON. That is true.

Senator McFARLAND. And if you got the same amount of power there would not be any damage to you. Now, I am not trying to get you to admit that your testimony is wrong or anything. I am just wanting to bring out that if this project were operated, or should be operated, as the report contemplates, there would not be any damage to you.

Mr. PETERSON. I would agree to that. But, of course, again I say I do not think it can be operated that way.

Senator McFARLAND. I understand that.

Mr. PETERSON. All right.

Senator McFARLAND. Now, so much for that.

You state that you question whether over a long period of time this power could be sold at 4.82 mills.

Mr. PETERSON. Yes, sir.

Senator McFARLAND. If that power were used would you have any objection to other users, other than those in southern California, using all that power?

Mr. PETERSON. In my contemplation of the use of the Colorado River power, I contemplate that it will be used for the benefit of not only our market, but also Arizona, Nevada, and Utah.

Senator McFARLAND. But would you object to other people paying that rate if you did not want to pay it?

Senator DOWNEY. And New Mexico.

Mr. PETERSON. No.

Senator McFARLAND. And you have recently tried to purchase power, Davis power, that cost approximately that amount of money, slightly——

Mr. PETERSON. Slightly less, I think, but it is marginal, too.

Senator McFARLAND. I understood it was a little bit more but approximately the same.

Mr. PETERSON. It is marginal to us, and I might say that a person's actions are often predicated on the condition that is prevailing at the time.

You will recall when I testified here a year ago in July, that I indicated that oil was on the way up in price. I presume that it reached prices higher than it was even at the time I was testifying; and when you have a price rise going on, there is a tendency for human beings to think, "Well, that is going on up; we had better do the best we can on power."

I have no objection to saying that for the price of oil at that time Davis power was of interest to us, and we made an application for it.

You will be interested to know that since that time there has been a decided and very quick and unforeseen drop in the price of oil.

Senator KERR. Since when, Mr. Peterson?

Mr. PETERSON. Last fall.

Senator KERR. I thought you said July a year ago.

Mr. PETERSON. As late as November the prices of oil in our use were of the order of $2.35 a barrel. Now, in the last few weeks we made a very large purchase of oil at $1.74 per barrel. That price difference

between $2.35 and $1.74 is of the order of 60 cents per barrel. Now, 60 cents per barrel on oil corresponds to 1 mill on power.

Senator McFARLAND. What would it cost you to produce power with the price of oil at $1.74?

Mr. PETERSON. About five mills, a little over; not very much, 5.15 or thereabouts.

Senator McFARLAND. And is that about as cheap as you can expect to produce power in this present——

Mr. PETERSON. I do not know. Oil took a very sudden change downward. Suppose it falls another 60 cents? Where would we be then?

Senator DOWNEY. You have an expert here. What are you going to do with the market, Senator?

Senator KERR. The same thing you boys are with this project, the best I can. [Laughter.]

You said you were here in July a year ago, as I understood it?

Mr. PETERSON. Yes.

Senator KERR. Do you mean July 1948 or July 1947?

Mr. PETERSON. It was the hearing on S. 1175; that was 1947.

Senator McFARLAND. 1947, 2 years ago.

Senator KERR. And you say that oil now is 60 cents less than it was a year ago, than it was in July 1947?

Mr. PETERSON. No, I said that I testified in 1947 that the price of oil was going up rapidly.

Senator KERR. I thought you said there had been a 60-cent barrel drop in it since that time?

Mr. PETERSON. No; there has been a 60-cent drop since the highest point it reached after that time.

Senator KERR. You do not know what its present price is with reference to July 1947?

Mr. PETERSON. I do not know; I cannot tell you now.

Senator KERR. Would you be surprised to know that it is higher today than it was in July 1947?

Mr. PETERSON. No.

Senator KERR. You know that then?

Mr. PETERSON. Yes; I was talking of a trend then. That trend was confirmed up to a very high value of price for oil. We thought it was going still higher, and all of a sudden it made a very sharp veering downward.

Senator KERR. You thought in July 1947 is was going still higher?

Mr. PETERSON. I thought it might.

Senator KERR. And it did.

Mr. PETERSON. And it did.

Senator McFARLAND. Well, Mr. Peterson, I just want to make this little observation: If you find yourself wanting to get rid of some of this hydroelectric power that you have, why, I would call your attention to the fact that Arizona wanted all the Davis power instead of what it got; and if you want to get rid of it, some of it, why, we will be glad to take it.

Mr. PETERSON. We did not get any except indirectly. If Nevada gets its share, and cannot use it right away, we might take it off their hands, but that is only a temporary situation.

Senator ANDERSON. May I ask you a question or two here on this investment that you have? It is on page 11 of the original statement that you made. It is the last one you will read, really.

Mr. PETERSON. Yes.

Senator ANDERSON. You recognize that I am neither a lawyer nor an engineer, so——

Senator KERR. You start with the Bluff Reservoir.

Mr. PETERSON. Yes.

Senator ANDERSON. And you say it has 3,000,000 acre-feet receiving about 30,000 acre-feet per year of silt; and then you estimate that it takes about 102 years for it to be filled?

Mr. PETERSON. That is right.

Senator ANDERSON. By the same sort of general figures they apply to the others, including Bridge Canyon?

Mr. PETERSON. Bridge Canyon is the shortest—3,720,000—and receiving silt at the rate of 70,000 feet per year.

Senator ANDERSON. How did you get the figure of 53 years, by dividing——

Mr. PETERSON. By dividing 3,720,000 by 70,200.

Senator ANDERSON. In your studies of silt did you find that reservoirs always silted up at that annual rate, that the same deposit came in?

Mr. PETERSON. No; these figures have been given to me by men within my organization who have studied the reports of the Bureau of Reclamation, and my intent here is to use the figures for these very things as reported by the Bureau of Reclamation.

Senator ANDERSON. Well, does the Bureau of Reclamation estimate that the Bridge Canyon Dam will silt in 53 years?

Mr. PETERSON. To my best knowledge and belief they would not object to what I have said.

Senator ANDERSON. If they would, I would be surprised, because, as I say, I have had no experience, much, but do you not find——

Mr. PETERSON. The intent is to comply——

Senator ANDERSON. Do you not find that when a dam is erected that the flow of the stream begins to back up for a long distance up the bed of the stream, and you have aggradation of the stream back a hundred miles in the stream bed that you never had before? I realize that you are an engineer and I am not, as I asked that, but is not that accepted theory on silt?

Mr. PETERSON. The water flow up above becomes slower.

Senator ANDERSON. That is right, and it deposits the silt.

Mr. PETERSON. Because the level of the river gradient is changed; but by actual experience I would say that when you go up to the top end or entering end of Lake Mead, you find a very sharp cut-off line very close to where, so far as I understand, the river gradient hits the reservoir gradient, and then there is a gradual drift of silt from that sandbar created at that point on down to the foot. I do not propose to or undertake to be an expert on silting; in fact, the Bureau of Reclamation is now studying that problem very carefully at Lake Mead.

At any rate, these figures are based on the amount of silt carried in the streams, based on the analysis and measurements of the Bureau of Reclamation, and that much dirt, so to speak, is in the water, and ready to be deposited in the vicinity of the reservoir, and work its way down into the reservoir.

The effect you speak of, I do not think carries very far above the reservoirs; that is, it is relatively close.

Senator ANDERSON. Well, is not there a little law of diminishing returns that comes in there? It takes its full deposit the first year, and it takes a little bit less each succeeding year?

Mr. PETERSON. No, I think the silt that comes into the reservoir depends on where the water has picked it up, and the water continues to operate in about the same manner at that location. The dropping of it is only accomplished when it has a violently changed reduction in its flow velocity, and that occurs when it hits the reservoir, not very far above, although I will admit there is some slowing, and you might drop heavy particles.

I have been handed something here that is meant to be on that subject: The Federal Power Commission in reporting on this project says:

> The Commission staff believes that the Glen Canyon Reservoir project on the Colorado River upstream from the Bridge Canyon site should be initiated very soon after the Bridge Canyon Reservoir is constructed. This will be necessary to prolong the period of usefulness of the storage capacity at Bridge Canyon, which would otherwise be entirely filled with silt in from 40 to 50 years.

Senator ANDERSON. Now, again you have got to the Federal Power Commission in place of the studies of the Bureau of Reclamation.

Mr. PETERSON. I say that the figures I have taken, the figures I mean to use, and if they are at variance with the figures from the Bureau of Reclamation, I am perfectly willing to have them corrected.

Senator ANDERSON. Well, it makes some $100,000,000 difference here on page 14 if you take the Bureau of Reclamation figures or your figures.

Now, obviously, the Bureau of Reclamation did not figure that the Bridge Canyon would silt up in 53 years, or they would not talk about a 70-year pay-out.

Mr. PETERSON. I am sure that the figures, the approximate facts are that there is a little variation of silt that I could go into, but the approximate fact is very close to what I have said, and I do not believe the Bureau of Reclamation men will take issue with me on what I have presented here.

Senator KERR. May I ask a question here that might clarify the thing a little?

Senator ANDERSON. Yes.

Senator KERR. When you talk about the thing being silted up in a given period of time, are you referring to the entire reservoir or to that part of the reservoir which, at the beginning, is set aside for siltation control?

Mr. PETERSON. I am talking about the complete reservoir, clear up to the overflow point in the dam.

Senator ANDERSON. I think we ought to have finally some testimony from the Bureau of Reclamation because I, at least, am familiar with a dam or two that are in my vicinity, and the studies have certainly indicated that siltation of that cannot be predicated on what the inflow would be the first year; that you do have a slackening as the stream bed builds up back of the dam, back of the lake. I mean, farther upstream, and in my home State, for example, in the area around San Marcial, N. Mex., that has been flooded because it is miles upstream from the lake, but aggradation of the stream bed has built up gradually.

Mr. PETERSON. I want to rest my story in this regard on the testimony of the Bureau of Reclamation engineers.

Senator ANDERSON. But it would make a great deal of difference as to the computation of the figures with respect to pay-out.

Mr. PETERSON. These figures come from the report.

Senator ANDERSON. I tried to find it in the report here.

Mr. PETERSON. But the point is—whether my assistants took that figure from the comprehensive report or from this report, I do not know.

Senator ANDERSON. You have unquestionably taken the total capacity of the dam, taken the amount of silt, that would now be passing by the river at that point.

Mr. PETERSON. Correct.

Senator ANDERSON. And regarded that as a figure that would continue undiminished year after year after year. I should certainly believe that there would be a change in that.

May I ask if the Bureau of Reclamation has made a study of the Bridge Canyon Dam?

Mr. NIELSEN. Yes, sir. In this sense, we are being urged by California, California providing $60,000 of funds, to investigate Glen Canyon Dam. The Salt Lake office in the Bureau of Reclamation will show in the report that is discussed in that letter that Senator O'Mahoney gave you this morning, that there will be a requirement for Glen Canyon to come into the picture in 1957 to take care of power.

We have seen enough of California's energy to anticipate that they will urge Glen Canyon beginning about that time.

Senator KERR. But speaking of it in reference to siltation——

Mr. PETERSON. That brings in the point——

Senator ANDERSON. I do not have the answer to my question.

Senator KERR. I am very much interested in the answer to your question.

Senator ANDERSON. Is it the experience of the Bureau of Reclamation that the construction of a dam results in that dam taking the same load of silt year after year after year, or is it your experience that because of the slowing down of the stream back of the lake there is a tendency to deposit that silt farther and farther and farther upstream as the level of the water comes up?

Mr. NIELSEN. Within our knowledge of the behavior of silt deposits, it deposits first at the head of the reservoirs and then backs upstream about at the process that you describe. The process of moving it down into the reservoir, we are not clear on. We are now making intensive investigations on that with the Navy Department, with the USGS, but there is undeniably a phenomenon there of silt being deposited at the head of a reservoir, and above the reservoir.

Senator ANDERSON. What figure have you calculated for the life of Bridge Canyon Dam?

Mr. NIELSEN. We predicate the life of Bridge Canyon Dam on the assured anticipation that Glen Canyon will come in, undeniably that Echo Park in Utah will come in, and several other reservoirs.

Mr. PETERSON. With respect to that, nothing would please me more than to have Glen Canyon built promptly and thereby protect this property if and when built; that is the project at Bridge Canyon.

Now, the reason I make the contentions I do is not because I think Glen Canyon will not be built; it will be built sometime; we do not

know when. We could take the power very shortly if it were built, but I am saying this project has no right to ride on something that it is not paying for.

Glen Canyon is not included in this project. I am talking about the project standing on its feet, and that is where I get the 50-year deal. Now, I would be happy, again I say, if Glen was started tomorrow for that matter, and if Glen is started and is incorporated with Bridge as a possibility that you have an integrated project, both for silt and water power, then you have got something that is really good. But as this project stands alone, it is not good.

Senator McFARLAND. Well, Mr. Peterson, just one point here on your 53 years. You predicate that on the assumption that every bit of silt that comes down the river is lodged in or behind the Bridge Canyon Dam.

Mr. PETERSON. Behind Bridge Canyon.

Senator McFARLAND. When the river is full and the water is coming down, does not part of it go on through?

Mr. PETERSON. No.

Senator McFARLAND. No silt goes through at all?

Mr. PETERSON. No. As soon as silt hits, that is, the upper end of the reservoir, the water is clear so fast that you can draw a line across the reservoir sharply, practically, where the silt is making a muddy yellow stream, and then clear water. It is that suddenly, and then it is carried on down by the general trend of flow-out of silt. The movement of that silt within the reservoir is below where it creates muddiness, and you see a nice clear reservoir. But this silt is gradually moving down. The finer the particles are, the farther they move, and they come to rest in the ultimate case against the dam. I do not mean that all the sand gets that far, but finally the reservoir fills up. The water has to get into the reservoir some way, and when it gets there it is carrying the silt.

Senator ANDERSON. I think you are making sort of a good case with the theory that come us have, that lots of these projects need to be tied together, not only for the benefit of Bridge Canyon; we need the reservoir up above the project, and we need Bridge Canyon to make sure that Hoover Dam will be there for 200 or 300 years.

Mr. PETERSON. Correct.

Senator ANDERSON. To supply a growing community on the west coast. I just believe that that water which would leave Bridge Canyon would be of some benefit to you in your silt problem in Lake Mead.

Mr. PETERSON. It would.

Senator ANDERSON. And, therefore, that that benefit cannot be measured, and may be the benefit that Bridge Canyon has cannot be measured; we have got to go farther upstream to control it, and all of us recognize that you may have to go farther than that.

I just wonder if you will excuse me a second, I would like to ask Mr. Nielsen: Regardless of this other dam, how long do you believe if the other dam is not built that it might take to silt up Bridge Canyon?

Mr. NIELSEN. Well, that would take a study in which you would have to, I would think, inspect the canyon for gradient above Bridge Canyon. We have not made that detailed study.

Senator ANDERSON. The Colorado moves pretty rapidly above it?

Mr. NIELSEN. It is above it; it is Grand Canyon, yes.

Senator KERR. May I ask him a question?

Senator ANDERSON. Yes.

Senator KERR. Is it not probable that the expanding economy of the entire Pacific Southwest will bring such pressure upon the Congress for the development of the Colorado that not only the dams that you have referred to here and have been referred to will be indicated and built, but also others on up both the main stem and the tributaries of the Colorado will be called for in connection with meeting the growing demands of the economy of that entire part of the Nation?

Mr. NIELSEN. Yes, sir; we are already behind in that development, and I would like to keep pace with it.

Senator MCFARLAND. I just wanted to say, Mr. Chairman, that I think probably we will need to get other engineers' data in regard to all of this silt being deposited behind this dam, because I do not believe all the engineers will agree with Mr. Peterson in that regard.

Senator DOWNEY. Mr. Chairman, inasmuch as the Senator from Arizona contrasted or compared the Central Valley project with the proposed central Arizona project, I wish to read just a few brief figures from the letter of the Acting Secretary of Interior, being House Document No. 146 and being a report of the findings of feasibility by the Bureau of Reclamation or the Department of the Interior on the Central Valley, and I would like to ask to have this filed as a part of the record. But with the chairman's consent, I would like to read a few brief figures.

Now, first, let me say that at the time this letter was transmitted to Congress, the total contemplated cost to the Central Valley project was $384,000,000. Admittedly, I believe, that since then the Secretary has increased the estimates, perhaps by some 10 percent, and that can be presented later.

I would like to point out that that cost is approximately in very round figures about one-half of the central Arizona project, so there we have a 50-percent diminution of the cost.

The particular items making up the $384,000,000 may be of interest: Navigation, $18,000,000; flood control, $31,000,000; irrigation, $197,000,000; canal capacity for future water, $18,000,000; municipal industrial water, $12,000,000; and commercial power, $103,000,000 Making a total of $384,000,000.

Now, Mr. Chairman, in our Central Valley project we will develop what we call class I and class II water to the extent of about 2,000,000 acre-feet, and that is the amount that will be actually available.

There we have another differential of over 2 to 1, because our class II water will be stored underground in our underground storage basin such as Arizona itself has and it will probably be cheaper and more adequate than our class I water, so there we have another differential of 2 to 1. We have more than twice as much water that will be delivered.

Now, we have another factor that is probably of as much value as these other factors put together. In addition to the 2,000,000 acre-feet of water, which will irrigate something in excess of 1,000,000 acres of land, we will store in the Shasta Reservoir about 3,000,000 acre-feet of water for salinity repulsion, and that water will be flushed

down the Sacramento River in periods of otherwise low run-off, thereby permitting the successful irrigation of about a million acres of very rich fertile land in the delta of the Sacramento that otherwise would be gradually impregnated with the salts so, therefore, we have another great item.

I have been over almost every important project in the Central Valley, and I would estimate that at least one-half of our acreage is in orchards, citrus and deciduous, and is in other very valuable crops, and that a minimum value of those is at least an average of a thousand dollars an acre; and the other land ranges along, perhaps, $300 or $400; so we have a differential here from central Arizona that will cost half as much; it will irrigate more than twice as much land; it will provide salinity control that will permit the irrigation of another million acres of land, and it deals with land that has at least a very much higher value than the average in the central Arizona project.

Senator ANDERSON. If the Senator will permit me, I do not understand the point made by the Senator from Arizona that his project was better than the Central Valley project of California. We all recognize that the central California project is an excellent project, and most of us have cast votes to try to help it along. I think his point was——

Senator MCFARLAND. And would have been happy to do so.

Senator DOWNEY. That was not the point. The Senator from California is not making that point at all. I thought the Senator put that in for the purpose of showing that here was something of a comparable cost.

Senator ANDERSON. No, I thought he was trying to establish the fact that we had a principle of not calculating the carrying forward in interest charges against nonreimbursable items and irrigation lands. We may carry forward a lot more of them in the central Arizona project, and I think all of us would agree that the carrying forward would be much greater.

Senator DOWNEY. Let me draw my own conclusion, then, that in my opinion the Central Valley project does not cost more than 20 percent per unit value delivered of the central Arizona project.

Now, Mr. Chairman, to proceed, it is expected and anticipated by the Bureau of Reclamation that the irrigation features of the valley will pay out about $75,000,000 out of irrigation sales, and there will be available about a net of $27,000,000. These are net figures I am giving you from the commercial water, and it makes a total of $100,000,000, or approximately 50 percent of the irrigation benefit that will be repaid by irrigation and municipal water revenue; and again I point out the central Arizona project will scarcely pay its own operation and maintenance charges.

Now, I wish to further point out—and, Mr. Chairman, I do this only because the Senator from Arizona raised the point, that the total amount of interest on the power investment proposed that will accumulate against the power investment is $109,000,000 over a period of 50 years from the full operation of the projection, and if I made any mistake in these figures—and I do not believe I have—why, they will be corrected by the pamphlet itself.

(H. Doc. No. 146, 80th Cong., 1st sess., entitled "Central Valley Federal Reclamation Project" was received by, and is on file with, the committee.)

Senator DOWNEY. Now, Mr. Chairman, there was some discussion here about the financial arrangement worked out on the Boulder Dam project and the reimbursement for flood control.

I want to read from section 7 of the Boulder Canyon Adjustment Act which is the controlling feature, I think. [Reading:]

> The first $25,000,000 of advances made to the Colorado River Dam fund for the project shall be deemed to be the sum allocated to flood control by section 2 (b) of the Project Act, and repayment thereof shall be deferred without interest until June 1, 1987, after which such advances so allocated to flood control shall be repayable to the Treasury, as Congress shall determine.

I would like to repeat, at the risk of being repetitious, that, of course, under that project, why, we paid into the Federal Treasury the interest upon the whole power investment.

Now, Mr. Chairman, I would just, for my own sake, like to elicit one simple fact from Mr. Peterson, and then I will desist.

Mr. Peterson, taking the assumptions of the Bureau of Reclamation itself on the power operations at Bridge Canyon, and assuming, however, that Bridge Canyon power project is not used to assist as a subsidy for irrigation benefits in central Arizona or elsewhere, what, then, would be the cost per kilowat-hour of power delivered at the load centers where it would probably be sold?

Mr. PETERSON. Do you mean also assuming the same availability of energy that the Bureau of Reclamation assumed, too?

Senator DOWNEY. Yes; assuming the hypothetical statement of the factors made by the Bureau of Reclamation, but disregarding the use of any power money for irrigation subsidy. What would be the cost, if you please, say, to California power users of Los Angeles per kilowatt-hour?

Senator KERR. Did he not cover that as being slightly over 3 mills?

Senator DOWNEY. You have a good memory, Senator.

Mr. PETERSON. Your memory is correct. For the purpose of the record, in answer to the question, assuming only Bridge, Bluff, Coconino, and Bridge power plant, and essentially all of the transmission, and assuming pay-out with real interest at 2 percent, and an amortized payment over a 78-year period, which is the period involved in this project, then the rate would be 3.06 mills per kilowatt-hour.

Senator DOWNEY. Mr. Peterson, how much of a percentage of increase would there have to be upon the cost of that power to reach the point indicated by the Bureau in its figures to subsidize out the central Arizona project?

Mr. PETERSON. It is about 57.5 percent increase.

Senator DOWNEY. Above what the power could otherwise be sold for down in the Los Angeles market.

Mr. PETERSON. Yes.

Senator DOWNEY. Mr. Chairman, I want to add only one thing on the findings of feasibility on the central California project. The Bureau of Reclamation, in making its calculations in operating revenues for the sale of the electric energy, used these figures: irrigation pumping, 2½ mills; firm power 4.57; nonfirm, 1.5 mills.

Mr. Chairman, I think that is all we have this afternoon.

Senator ANDERSON. I just wanted to ask one thing in reference to the payments: The $300,000 paid to Arizona and Nevada each year are paid for what purpose?

Mr. PETERSON. I think largely in lieu of taxes, because if you read the Project Adjustment Act you will find that there is a mention that if any State does undertake to tax the project, that the $300,000 or such part of it as is necessary will be deducted from their payment.

Senator ANDERSON. Now, the $500,000 per year which are paid to the Colorado River development work are paid to whom?

Mr. PETERSON. That is paid—I would rather Mr. Ely answer that. He is up on the legal questions.

Senator ANDERSON. It is just a very short answer that I want.

Mr. ELY. $500,000 is paid to the United States for deposits in the separate fund for the purposes stated in section 2 (d).

Senator ANDERSON. Is that the development of the Colorado River Basin?

Mr. ELY. That is correct, sir.

Senator ANDERSON. How long has that been paid?

Mr. ELY. Over a period—it became operative in 1941 and it runs until 1987. The statute was retroactive.

Senator ANDERSON. I thought it started in 1937.

Mr. ELY. The statute is retroactive—excuse me, in 1937.

Senator ANDERSON. Therefore, some $6,000,000 are now in that fund?

Mr. ELY. Something of that order has been paid in; part of it has been expended, I assume.

Senator ANDERSON. I wonder if, skipping this witness, the Bureau of Reclamation can tell us how much of that $6,000,000 have been spent for study?

Mr. NIELSEN. I do not have those figures.

Mr. BENNETT. Our latest figures show that almost the entire amount which has been paid into the Treasury has been reappropriated and spent, with a small exception of what has not yet been spent of the last year's appropriation.

Senator ANDERSON. Now, may we have filed with the committee a statement showing where that money was spent in the Colorado River Basin, and for what purpose?

Mr. BENNETT. I think we can get that quite readily.

Mr. PETERSON. Apropos of Senator McFarland's remark, may I also indicate that in addition to regulating water for the Imperial Valley irrigation, that Hoover Dam is also regulating water, and that is the basis under which the present Gila project, which was taking water out of the main stream below Hoover, is receiving this water. I mean there is a benefit there, too, and not one that we are objecting to.

Senator MCFARLAND. But, Arizona has to pay.

Mr. PETERSON. I do not know whether you do or not. I do not think so.

Senator ANDERSON. If there is no objection, we will adjourn until 10 tomorrow morning.

(Whereupon, at 4:55 p. m., the committee adjourned, to reconvene at 10 a. m., Thursday, April 14, 1949.)

90762—49——33

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

THURSDAY, APRIL 14, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Clinton P. Anderson presiding.

Present: Senators Anderson, Downey, McFarland, Kerr, Malone.

Senator ANDERSON. The committee will come to order.

Senator O'Mahoney is unavoidably detained by a previous engagement which he made many weeks ago and finds it impossible to be here this morning. But in view of the commitments we have made to try to complete California's case today we shall proceed with the hearing.

A question has been raised as to the date of adjournment when the California testimony is completed. If it is agreeable with the other members of the committee we will adjourn when we finish this hearing today, as far as the committee hearings on S. 75 and Senate Joint Resolution 4 are concerned; those hearings will be suspended until the 26th day of April.

Is that agreeable, Senator McFarland?

Senator MCFARLAND. Well, if that is the date Senator Downey wants. I would prefer the 25th, but I will not quarrel with him about the day. At 10 o'clock on the 26th.

Senator ANDERSON. Ten o'clock on the 26th.

I have a statement from the Assistant Commissioner of Reclamation with reference to contributed funds. Since it is mainly for the information of other members of the committee who are not here, I think perhaps we better just put it into the record, because there may be some questions about the contributions in 1918 and 1920. This does show a list of $141,000 of contributions from various sections of California.

(The letter is as follows:)

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
April 14, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate.

MY DEAR SENATOR O'MAHONEY: Representatives of the Bureau of Reclamation who were present at the hearings before your committee on Senate Joint Resolution 4 and S. 75 on April 12 tell me that inquiry was made about the amount of money expended on investigations of the Boulder Canyon project. I understand that the questions raised concern particularly the investigation costs

related to Hoover Dam, the amounts contributed for such investigations by local interests, and the inclusion of investigation costs in the capital cost of the project.

The Bureau expended for Boulder Canyon project investigations (exclusive of All-American Canal investigations) $506,734.88, of which $141,000 was contributed funds, and $365,734.88 was expended from appropriations from the reclamation fund.

The reclamation fund has been reimbursed from appropriations made to carry out the provisions of the Boulder Canyon Act of December 21, 1928 (U. S. C. Supp. III, title 33, ch. 15A) in the amount of $365,734.88. This amount is included in the cost of the Boulder Canyon project and repayable by the power contractors.

The following is the list of contributed funds:

Imperial Irrigation District	$70,000
Coachella Valley County District	6,000
Palo Verde Levee District	5,000
City of Los Angeles, Calif	55,000
City of Pasadena, Calif	5,000
Total	141,000

Sincerely yours,

KENNETH MARKWELL,
Assistant Commissioner.

Senator ANDERSON. The committee has with us this morning Harold Conkling, consulting engineer, California State Colorado River Board.

Senator DOWNEY. Mr. Conkling, before proceeding with your statement, will you state in a general way what your background and experience is in water study matters?

STATEMENT OF HAROLD CONKLING, CONSULTING ENGINEER, CALIFORNIA STATE COLORADO RIVER BOARD

Mr. CONKLING. I have been in water study matters practically all my working life. I was with the United States Reclamation Bureau from 1911 to 1921, and made studies of water supply and plans of development on the Boise River and Snake River in Idaho, the Humboldt River in Nevada, the North Platte River, Colorado, Wyoming, and Nebraska; the Rio Grande River above El Paso, in Colorado, New Mexico, and Texas, and the Owens Valley-Mono Basin in California, and the Colorado River.

The latter study was an appendix to the Fall-Davis report known as Senate Document 142 of the Sixty-seventh Congress, second session. It was the technical data before the Commission at the time of the Colorado River compact.

Senator MCFARLAND. Mr. Conkling, may I just ask you one question. How long have you been employed by California?

Mr. CONKLING. I was in the employ of the State of California from 1921 to 1945, as a member of the administrative staff of the Division of Water Resources.

Senator MCFARLAND. And then from 1945——

Mr. CONKLING. Since 1945 on, I have been in private practice in Los Angeles, and was employed by the Colorado River Board of California in December of last year, 1948.

Senator MCFARLAND. When did you do this work on the North Platte?

Mr. CONKLING. That was done in 1918 and 1919. The work on the Rio Grande River was done the next year, I believe; the work on the Colorado River was done the next year.

Senator McFARLAND. 1920?

Mr. CONKLING. About that. I think it was finished in 1921, in late 1921. I left the service of the Reclamation Bureau in October 1921.

Senator McFARLAND. Thank you.

Mr. CONKLING. In California my work has been nominally in charge of the water rights of the State for a considerable period. But during that period I was also in charge of a great many investigations of underground water developments and plans, investigation throughout the State, except Central Valley. Many bulletins were published. I am the author of several articles published in the technical publications of the American Society of Civil Engineers.

Senator ANDERSON. About what period were they written?

Mr. CONKLING. The articles in the American Society of Engineers publications were written between 1935 and 1945, that is, they were published then. The publications of the State ran from about 1929 until 1940, or thereabouts.

I am the author of a book in Spanish. I was called in by the Peruvian Government and asked to investigate the development of ground water along the coast of Peru. The coast of Peru is an extremely desert region. It is quite highly developed from the standpoint of their small supply of water. With Mr. Baker, a consulting engineer also of Los Angeles, we are authors of a book entitled "Water Supply and Utilization," which is used as a textbook in several universities.

I would like to speak a little bit about this work on the Rio Grande. At the time that was undertaken the Reclamation Bureau was opposing developments upstream from the El Paso project, the one watered by Elephant Butte. Our investigation showed that if that area called the Middle Rio Grande were drained, the Elephant Butte project would have more water than it would in the then situation. At the same time the Middle Rio Grande could be developed. That project was later undertaken, but I understand the drainage was not perfect.

Senator DOWNEY. Mr. Conkling, you have here an itemized list of your experiences.

Mr. CONKLING. Yes.

Senator DOWNEY. I would suggest that that be inserted in the record as a statement of the witness' background and experience, Mr. Chairman, if that is satisfactory.

Senator McFARLAND. No objection on my part.

Senator ANDERSON. If there is no objection, it will be so inserted.

Senator DOWNEY. I think that abundantly qualifies you, Mr. Conkling.

(The statement is as follows:)

HIGHLIGHTS OF EXPERIENCE RECORD OF HAROLD CONKLING

1. Member: American Society of Civil Engineers, American Geophysical Union, and American Water Works Association.

2. Schooling: 4½ years college. No degree in civil engineering because took other courses which did not give credit for that degree. Had one-half year more to go.

3. 1911–21 with United States Reclamation Bureau; located in Idaho, Montana, and at headquarters in Denver.

(*a*) Water-supply studies and general plans of complete development for irrigation and hydroelectric power:

(1) Boise River and Snake River, Idaho.

(2) Humboldt River, Nev.

(3) North Platte River, Col., Wyo., and Nebr.
(4) Rio Grande River, Colo., N. Mex., and Tex.
(5) Owens Valley-Mono Basin.
(6) Colorado River: This study was published as an appendix in Senate Document 142, Sixty-seventh Congress, second session, known as the Fall-Davis report. Colorado River compact was consummated on the basis of that report.

(*b*) Flathead Project, Montana, economic study for revision of project. Construction of much of project.

(*c*) Preliminary studies and layout, Arrowrock Dam, Idaho, Jackson Lake Dam, Wyoming, and many other dams.

4. October 1921–May 1945, with State of California, Division of Water Resources.

(*a*) Engineer for Division:

(1) October 1921–June 1923, primarily on power developments on California streams.

(2) June 1923–October 1927, San Gabriel investigation.

(*b*) In charge of water rights of State, 1927 to May 1945; 1927–29, Chief of Division of Water Rights; 1929–45 after abolishment of Division as Deputy State Engineer.

(3) Applications to appropriate from surface streams received. Hearings, if protested. Sometimes requiring elaborate controls based on extensive investigation so that new diversions can be made without jeopardizing prior right.

(4) Adjudication of water rights by stream system. Either by reference from court or by direct initiation before Division of Water Resources.

(Latter legally permissible only on surface streams.) Thirty adjudications of stream systems completed.

(*c*) Other features:

(5) Snow surveys.

(6) Sacramento-San Joaquin supervision water development studies Statewide.

(*d*) In charge of following investigations and author of following published bulletins of Water Rights and Division of Water Resources:

No. 5. San Gabriel Investigation.
No. 6. San Gabriel Investigation.
No. 7. San Gabriel Investigation.
No. 31. Santa Ana River Basin.
No. 46. Ventura County Investigation.
No. 47. Mojave River Investigation.

(*e*) In charge of following investigations and supervised reports written by subordinates:

No. 19. Santa Ana Investigation.
No. 39. South Coastal Basin Investigation.[1]
Records of Ground Water Levels at Wells. An annual publication of data made each year beginning 1932.
No. 41. Pit River Investigation.
No. 42. Santa Clara County Investigation.
No. 45. South Coastal Basin Investigation.[1]
Geology and Ground Water Storage Capacity of Valley Fill.
No. —. South Coastal Basin Investigation.[1] A lengthy bulletin published in 1947, giving overdraft on or surplus of ground water in the 35 major ground-water basins into which South Coastal Basin is divided.

(*f*) Outlined objectives and supervised for State, special investigations by Federal cooperating agencies and State university on certain hydrological phenomena and other items important in water supply and economic studies. Financed 50–50 by State and Government. Following bulletins written by technicians of cooperating agencies published by State:

Bulletin No. 33: Rainfall Penetration and Consumptive Use of Water in Santa Ana River Valley and Coastal Plain.

Bulletin No. 40: South Coastal Basin Investigation.[1] Quality of Irrigation Waters.

Bulletin No. 40A: Detailed Analyses of Waters on Which Bulletin No. 40 was based.

Bulletin No. 43: South Coastal Basin Investigation.[1] Value and Cost of Water for Irrigation.

Bulletin No. 44: South Coastal Basin Investigation.[1] Water Losses Under

[1] "South Coastal Basin" is name given to area on coastal side of San Gabriel and San Bernardino Mountains in Los Angeles, San Bernardino, Riverside, and Organe Counties.

Natural Conditions from Wet Areas in Southern California.
Bulletin No. 50: Use of Water by Native Vegetation.

5. Articles in Technical Publications:

Transactions of American Society of Civil Engineers:
1937: Administrative Control of Underground Water—Physical and Legal Aspects.
1945: Utilization of Ground Water Storage in Stream System Development.

Engineering News Record, November 28, 1935: Underground Water Storage in California's South Coastal Basin.

6. Foreign language publication: Explotacion de Aguas Subterranean en la Costa del Peru.

7. Technical book: Water Supply and Utilization, Wiley & Son. (With D. M. Baker.)

8. Major engagements as consulting engineer while with State (on leave from State):

Texas v. *New Mexico:* Suit before Supreme Court of United States over waters of Rio Grande: In charge of engineering presentation of New Mexico's case.

Nebraska v. *Wyoming:* Suit before Supreme Court of United States over water of North Platte. Colorado was impleaded and United States Department of Justice intervened. In charge of engineering presentation of case of the United States during part of trial.

Groundwater Development of Coastal Peru, South America: Retained by Government of Peru and Sociedad Nacional Agraria of that country to study water supply development of coastal Peru (an extremely arid region about as long as from Canadian to Mexican border) and recommend as to development plans, drilling methods, safe yields of underground basins, formulation of law and administrative procedure. Foreign language publication previously noted printed in Spanish as a result and used to some extent in other South American countries also.

9. Major clients since leaving State service in May 1945:

City of Los Angeles, Department of Water and Power
County of San Bernardino, flood-control district
City of Sierra Madre
Santa Ynez River Water Conservation District
West Coast Basin Executive Committee, Los Angeles County
Fontana Water Co., San Bernardino County
United States Engineer Department, Central California
United States Department of Justice
Santa Ana River Water Association
Santa Margarita Mutual Water Co., San Diego County
State Division of Water Resources (State engineer)
Santa Clara Water Conservation District (Ventura County)
Newhall Land & Farming Co., Los Angeles County
Ventura County Flood Control District
Colorado River Board, State of California

Mr. CONKLING. I am now reading from the statement by myself as consulting engineer for the California State Colorado River Board, the statement before this Senate Committee on Insular and Interior Affairs, re. S. 75.

I have spent about 4 months with capable assistants in studying the water supply of the Maricopa and Pinal units of the Central Arizona project. I think I will have to depart from my statement for a moment in order to explain certain features of this project.

I have here a small map showing a portion of the project area. This map embraces the general Phoenix and Gila area. The northern part of this map, north of a line drawn east and west through the line common to Town 2 South and Town 3 South is called the Maricopa unit. South of that is called the Pinal Unit.

Senator DOWNEY. Mr. Conkling, if I may intervene, this is a map entitled "Maricopa and Pinal Units of the Proposed Central Arizona project"?

Mr. CONKLING. Yes, sir.

Senator DOWNEY. I would like to have one of them filed with the committee.

Senator KERR. I cannot hear the Senator.

Senator ANDERSON. He is suggesting that one copy of the map be filed with the committee.

Senator DOWNEY. I was just identifying it by its title, Senator.

(The map referred to appears in the complete statement of the witness at p. 547 hereof.)

Mr. CONKLING. Upstream on the Gila River is the upper Gila. To the south of the area covered by this map——

Senator KERR. Mr. Chairman, if I may interrupt. Off the record for a moment.

Senator ANDERSON. Certainly.

(Discussion off the record.)

Senator ANDERSON. Go ahead, Mr. Conkling.

Mr. CONKLING. Upstream on the Gila River is a unit called the Upper Gila Unit. To the southeast on the San Pedro River are two units called the San Pedro and Tucson units.

Senator ANDERSON. Let us go off the record, please.

(Further discussion off the record.)

Mr. CONKLING. As I started to say before, upstream on the Gila River is the Upper Gila Unit, and to the southeast and south are the San Pedro and Tucson units which are separated in the Reclamation Bureau's report. They have absolutely no connection with the lower units, that is, the Maricopa and Pinal units.

As soon as a dam is built at Buttes Site, which is approximately east of the line labeled Ashurst-Hayden Dam, the units upstream can go ahead independent of anything that happens in the Maricopa and Pinal units.

The work on the upper Gila unit is primarily for furnishing a supply up river in New Mexico. It does away with certain losses of water in the upper Gila River. The Tucson-San Pedro unit is a very small endeavor, in that it takes water from the San Pedro River by the Charleston Reservoir, and carries it over primarily to the city of Tucson.

I will come back to that map after a while, but there is one other thing I would like to note.

In its report, the Reclamation Bureau labels acreage which was irrigated in 1940–44, that is the average for the 5 years, in the Maricopa and Pinal units as a "rescue project." It consists of approximately 520,000 acres, of which approximately 396,000 are in the Maricopa unit and 124,000 in the Pinal unit.

Then in addition to that, the Reclamation Bureau proposed to bring over sufficient additional water to bring the total to 591,000 acres in the two units, of which 150,000 acres would be in the Pinal unit and 441,000 acres in the Maricopa unit.

I shall proceed now with my statement.

It is to these units, around Phoenix and to the south in the Gila River area, that the Bureau proposes to bring water from the Colorado River. The investigation now under discussion was directed toward an estimate of the deficiency and the possibility of salvaging flood wastes and waste due to evaporation and transpiration in the swampy portions of the general project area.

Salvage of flood waste requires large reservoir capacity. It was found that the economically usable reservoir capacity underground in this area, covered by this map, is at least 50 percent more than that of Lake Mead on the Colorado River. Lake Mead is the largest man-made conservation reservoir in the world. Its capacity is over 30,000,000 acre-feet. The underground reservoir available for the area under discussion has a capacity of 45,000,000 acre-feet within feasible pumping lift.

The Reclamation Bureau proposes to lift water 985 feet from the Colorado River, so evidently it believes it is feasible to pump water 985 feet for use in irrigation. If that criterion were applied to the underground reservoir with which we are dealing, it is quite possible that there are well over 300,000,000 acre-feet of water stored underground in this valley which can be drawn on when needed.

Underground reservoirs are a most important item in the utilization of the erratic supplies of southwestern United States. Every individual who pumps water is utilizing underground reservoirs. Not only in the valleys here under discussion, but generally in the Southwest, they are of immense capacity and capable of tiding over any conceivable period of shortage in surface water. The underground reservoir in the area under discussion is being drawn on now because of drought. In the Southwest such droughts alternate in a cyclic rhythm with periods of surplus in which surface and underground reservoirs are again filled to the brim. The underground reservoirs must be much more fully utilized if the local water is to be salvaged. This is being done elsewhere with success. The plan of development in the Central Valley project in California leans heavily on conserving water thus.

The reason water supply of the period 1897–1943 is herein analyzed is because that is the period which the Reclamation Bureau states is a period of average discharge. They also state that there is little probability there would be another period of this same length which would give less water.

It was also found that, with present development, average annual flood waste out of the area during the period 1897–1943 would be about 470,000 acre-feet per year or more. Waste from the swampy areas in the lower parts of the project area is estimated to be an annual average of 270,000 acre-feet, giving a total waste of 740,000 acre-feet. Even during the recent 1940–44 base period in which the Bureau states that importation of water was necessary to "rescue" the area, flood wastes out of the project area past Gillespie Dam averaged more than 200,000 acre-feet annually.

It was also found that there is no long-time average deficiency of water in the Maricopa unit of the Phoenix area for the 1940–44 acreage. A cyclic drought has endured in the region since 1921. The huge ground-water storage is there to tide over such a drought, and it is being drawn on. The 1940–44 acreage is mentioned because it is part of the "rescue" project proposed by the Bureau. Instead of deficiency, the estimated surplus of water is approximately sufficient even if no flood wastes are salvaged to supply the needs of the entire 441,000 acres in the Maricopa unit which in its 1947 report the Bureau proposes to irrigate. That includes the additional acreage which I mentioned a moment ago.

Furthermore, it was found possible to salvage enough of the wasted floodwater to complete a full water supply to the full 150,000 acres in the Pinal unit that the Reclamation Bureau proposes to irrigate in that unit as set out in its 1947 report.

Furthermore, the water which would be salvaged is of better quality than the Colorado River water so that the water-users would benefit from that standpoint, also. Less must be wasted for salt balance than the waste from the Colorado River water.

The Bureau estimates that about 17 percent of the water which it proposes to pump a vertical distance of 985 feet will be lost in transporting to the area of the project under discussion. This fact, together with the smaller waste for salt balance, indicates that 100 acre-feet of local water will irrigate the same number of acres as 130 acre-feet of Colorado River water at the point of diversion from the Colorado River.

Furthermore, Colorado River water is potentially usable at any place in the Colorado River Basin, while central Arizona water is usable only in Arizona and to a limited extent in Mexico. The Bureau's plan proposes to use only a small part of the local waste. Thus, the alternate plan herein proposed is important to the whole Colorado River Basin, because the Bureau's plan would allow most of the waste I have mentioned to continue.

The salvage of sufficient local water could be accomplished at about one-third the capital cost of the Bureau's project and for an even smaller proportion of the operating cost.

The plan can be stated briefly. It is proposed to salvage the loss in the swampy portions of the project area and use the water thus salvaged for irrigation. It is also proposed to salvage the flood wastes from the project, not at the lower levels but by regulation in the huge surface reservoirs already in existence on the streams tributary to the project area. The water thus regulated would be diverted for direct use in irrigation, or placed in the underground reservoir.

The data on which the plan is based are the data which the United States Geological Survey has gathered as to stream flow and groundwater conditions. It is based, also, on data in the report of the Bureau of Reclamation on the central Arizona project dated 1947. It is based also on data in the report of the United States engineers on the Gila River dated 1945.

The plan which will be proposed has no new elements in it. Everything proposed is an old story and is common practice in California. The plan is on a larger scale than any salvage project of the same nature which has actually been consummated, but not on a larger scale than is proposed in central California. When in 1920 our studies of the water supply of the Colorado River indicated that a bigger reservoir and a higher dam than any ever constructed before was the proper solution, the dam designers tackled the problem and solved it. The beautiful structure at Black Canyon and the water behind it are the result.

Now, this is no new plan for Arizona either. This has been considered by the Reclamation Bureau as far back as 1934. I quote from a statement by Mr. E. B. Debler in his report, dated December 1934, entitled, "Stream Flow of Lower Colorado River and Its Tributaries."

When I left the Reclamation Bureau Mr. Debler was my principal assistant. He still has good ideas.

The ultimate use that can be made of Gila River waters is difficult to estimate with any degree of precision. From table 4 it will be noted that annual flows into the Phoenix Valley under virgin conditions varied from 595,000 acre-feet to 7,945,000 acre-feet. Present surface storage capacity in use totals a little over 3,000,000 acre-feet and the ground water reservoir of the Phoenix Valley is in use in an amount of fully 1,000,000 acre-feet. Even though this capacity were—

I assume that means surface capacity—

it would not afford complete control over long periods of time. A greatly increased use of ground storage is anticipated and some reservoirs may be expected to be constructed on the Verde and Gila Rivers. The ultimate waste past the Gillespie Dam will probably average not to exceed 300,000 acre-feet annually and the flow reaching Yuma will probably average not to exceed 100,000 acre-feet annually. In both cases the remaining wastes will largely be concentrated in floods occurring at relatively long intervals. It is to be expected that nonbeneficial river losses will also be converted to more beneficial uses in crop production, as groundwater levels are held sufficiently low to reduce soil evaporation from nonproductive areas to a minimum.

Senator MALONE. Mr. Conkling, in regard to this great reservoir of ground-water in the Phoenix and Central Valley areas, has that even been utilized to the point where the draw-down was more than the intake, or in other words, using the ground in the replenishment of the underground reservoirs there?

Mr. CONKLING. Whenever there is a drought condition, or whenever pumpage is started, the water table goes down. It comes back up in succeeding periods of surplus. Now, in the Central Valley certain areas were, what we will call, cumulatively overdrawn. They were pumped in excess of the average supply.

I believe the Pinal unit here is being pumped in excess of the average supply, but the Maricopa unit is not. That is, with the acreage which the Bureau proposed to irrigate.

Senator MALONE. I might say, Mr. Chairman, I did not hear the introduction of Mr. Harold Conkling to the committee, but he has long been considered an outstanding authority on underground water in the West and one of his books has been used by the engineers there for 20 years. So these questions I am directing to him are being directed to an expert. At least I so consider him. I take my hat off to him when it comes to underground water.

Now, considering underground water—and he is an expert, as I have said—engineers have long found in the West that underground reservoirs are replenished in about the same way as surface reservoirs, except by percolation, and so forth, and that you can withdraw water faster from underground than it is replenished. When you reach that point of course your water table continues to drop over a period, and it finally gets down to below an economic lift. The engineers did not take that into consideration. I directed my question in order to get a full report on the water supply, as well as the immediate supply, that is, the replenishment of the underground sources, that is, the amount of water that could be used over the years and not just for a short while, that which has been accumulated, say, for over a thousand years.

Mr. CONKLING. I shall proceed, Senator.

Skipping along a little bit, I discover I have said parts of this material that is in the next page or two of my prepared statement. However, I would like to have that in the record.

My statement continues as follows:

I have tested this plan from every approach I could think of. I am sure that the conclusions are perhaps overly conservative. Probably more local water is available than the amount necessary to irrigate the entire acreage proposed by the Bureau in its plan for the two units under consideration, but the plan does not go further than that.

Now, at the bottom of page 5 of my statement, I say this:

The problem which you deal here with now is only one of many which you have before you, and I am speaking of the problem as a whole. Yet, it is an important one from two broad standpoints. the first of these is the desire to preserve the welfare of the State of Arizona because the supply of water available is limited and there is a very large area of fertile land.

The second is the fact that according to the Reclamation Bureau there is a demand in the Colorado River Basin for 25 percent more water than there is available. It is important that all supplies which cannot be used elsewhere in the basin be conserved, and I think that is the most important part of my investigation for there is surplus central Arizona water which cannot be used elsewhere than in central Arizona except to a limited extent in Mexico.

Now, I would like to go back to the map. You will note at the lower and western end is the Gillespie Dam. That was a dam constructed by an individual named Gillespie, and which waters the Gillespie area by a canal about 45 miles long. The area watered by it is approximately 14,000 acres.

The Gillespie Dam is built across a geological barrier through which, according to the United States Geological Survey, there is very little outflow from the area above.

The area above the dam out to the line marked "Base of mountain area," which you will see crossing from southeast to northwest, is an underground reservoir of tremendous capacity. The water in the underground reservoir is not stationary. It is moving from all points as from the outer part of a fan, toward the center part of a fan, which is, you might say, the area just above Gillespie Dam. The cross section of the alluvium area through which it moves becomes smaller and smaller, and it is forced to the surface. There is an area there labeled "phreatophytes," which is a common term in Arizona meaning water-loving vegetation, which is exhausting a lot of water. It is vegetation which must live where its roots can get hold of more water than the ordinary plant. That area, as depicted there, covers 48,000 acres. It is taken from maps made by the United States engineers, who flew the Gila River in 1937, and also flew the Salt River in 1947. I believe there was also a map made by the Salt River Valley Water Users Association.

This vegetation is consuming, according to the United States Geological Survey, in this area 300,000 acre-feet of water per year, on the average. That is enough water to irrigate approximately 100,000 acres of ordinary irrigated land in this general vicinity. That vegetation is there because the groundwater reservoirs are so full the water is flowing out of them. As it moves downstream the water flows out

of them just the same as it flows out of an overflowing reservoir, a surface reservoir, over the spillway.

There are a few other things I would like to have you note on the map.

Senator MALONE. Before you leave that, Mr. Conkling, is there any practical way that can be prevented, within economic feasibility? That is, the prevention of this waste.

Mr. CONKLING. That can be drained economically. There are many ways of doing it. I was coming to that, if you will let me go ahead.

Senator MALONE. Very well, I will not interrupt.

Mr. CONKLING. On this map you will notice on the Salt River and on the Verde River a series of reservoirs, Stewart Mountain Dam, Horse Mesa Dam, Mormon Flat Dam, Roosevelt Dam, Bartlett Dam, above that, Horseshoe Dam. Those have a capacity of over 2,160,000 acre-feet. And on the Agua Fria River to the west is the Carl Pleasant Dam, which has a capacity of 178,000 acre-feet, or did when built.

On the Gila River, almost at the right-hand edge of the drawing, is the San Carlos Reservoir which supplies the San Carlos project. There is proposed the Buttes Reservoir, which I noted a moment ago, on the Gila River above the Ashurst-Hayden Dam.

On this map also is shown the boundaries of areas which have rights in surface water. The old gilt-edged area of the whole valley is the Salt River Water Users Association. The Salt River Valley Water Users Association is labeled No. 2 and centers around Phoenix and Chandler.

Then there is the Maricopa water district, labeled "1" over to the left, which owns the Carl Pleasant Dam. South and west of the foregoing are areas labeled "3" which have access to surface water in the Gila River below the junction of Salt River.

Then to the south and west the area labeled "4" is the Coolidge project which is a half-Indian-half-white project.

There are other districts here not shown and which are organized for some reason or other, although they have no surface rights. Out to the east is the Queen Creek area, between the proposed Salt-Gila Aqueduct and the shaded line to the west.

Over between Agua Fria and the area labeled "No. 1," is the large pumping area which is organized into districts. Then to the north on the Agua Fria River and the north side of the area labeled "2," are various isolated individual pumpers.

Now, to sum up: I have entered into this study primarily because I am interested in water problems. The report I am to give you is based on physical facts; it has nothing to do with legalistic interpretations of the compact. The contest between Arizona and California does not need to be considered during the discussion. If we can divorce ourselves from that, the physical facts can be better considered on their merits.

The area under discussion has been divided into the Maricopa unit and the Pinal unit by the Reclamation Bureau, and that same division is used herein for the purpose of analysis. This portion of the central Arizona project occupies parts of Maricopa and Pinal Counties. The dividing line between the two units is the county line. From the east this runs westward along the line between townships 2 south and 3

south to the line between ranges 1E and 2E. It then goes northward to the next township line and then westward.

The Maricopa unit had 395,000 irrigated acres in 1940–44, and the Pinal unit had 124,000—a total of 519,000 acres. However, immediately south of the Pinal unit is a large body of irrigated land to which the Bureau does not propose to furnish water. It is understood that the area irrigated, outside of the old established districts, has increased since 1944. This increase has been almost wholly in lands irrigated by pumps.

In the established old districts having a surface water supply there were about 380,000 irrigated acres in 1940–44. In addition, about 15,000 acres outside these districts have been irrigated for sometime past from wells only. There are about 115,000 acres inside the project area—now, I am speaking about the Maricopa unit—but outside the older districts, which began exploitation of the ground water about 1936.

I want to call your attention also to Granite Reef Dam which is a very important point on the Salt River. It is where the Salt River Valley Water Users Association diverts. I also call attention to the Ashurst-Hayden Dam, which is the point where the Coolidge project diverts.

The valley is filled with alluvium to an unknown depth. From it obtrude occasional tops of mountains now almost submerged by alluvium. Some of these are shown on the map. Except very near the mountains, wells have not penetrated to the bottom. Most wells drilled in recent years are 500 to 600 feet deep, but some are 1,000 feet deep.

Senator DOWNEY. Mr. Conkling, do I understand from that the wells have gone down a thousand feet and have still been in the water-bearing strata?

Mr. CONKLING. That is correct.

Senator DOWNEY. Is that true over practically all of this area?

Mr. CONKLING. I do not know how much of the area it has covered. I think the wells have been drilled on the higher part where they had to go down a little more for water. I think the wells in the lower area above the swamp area are, of course, much shallower than that. They run 300, 400, 500, 600 feet deep.

Senator DOWNEY. Have any of these wells, so far as you know, penetrated beyond the water-bearing sands?

Mr. CONKLING. I am told by the United States Geological Survey that none have, except some over close to the mountains where they struck the mountains as they sloped out under the alluvium.

Senator DOWNEY. Do you later state the total area of this underground water basin?

Mr. CONKLING. I did state a moment ago that if they went down 1,000 feet there was 300,000,000 acre-feet there. I did not state the area. The total area, of course, is very large.

Senator DOWNEY. It is the whole area around the Gila?

Mr. CONKLING. It is the whole area on the west side of this mountain.

Senator DOWNEY. Below the basin of the Gila and down into the valley?

Mr. CONKLING. Yes.

Senator MALONE. Mr. Conkling, what would be the draw-down or water level which would be affected for pumping there at the present time? You said there were 1,000-foot wells. You did not mean you would pump the water that far?

Mr. CONKLING. No. In saying that 45,000,000 acre-feet capacity was available——

Senator MALONE. In other words, what would be the average lift over a short period of years?

Mr. CONKLING. In stating that, I took an average lift of about 200 feet, but a maximum lift of more than that. I mean, if the underground reservoirs are utilized as they should be the water table must be drawn down and then the emptied gravels must be refilled with the surplus water. That would give about 250 feet maximum lifts.

Senator MALONE. With that 250 maximum lift on the average, 300,000 acre-feet a year in your judgment would be continuously available over the years for pumping, is that what you meant?

Mr. CONKLING. I have not said that yet, Senator, I have not come to that yet. I said there were 45,000,000 acre-feet of capacity in that lift.

Senator MALONE. I understood it was 300,000 acre-feet, but if you are coming to it, do not let me interrupt your narration.

Mr. CONKLING. Yes, I am coming to it in a moment, and I think you will get the answer.

Here is a larger-scale map of the same one you have been looking at, on which are placed the pumping lift averages for each township in this whole area. They are taken from measurements made by the United States Geological Survey in the fall of 1934. This is the authentic data.

Wherever there have been enough measured wells in any township to give an average, that average is stated as an upright figure. Wherever there has been an isolated well, as in the upper reaches, the figure is given as a slanting figure. I find that the average lift in the Maricopa unit in the fall of 1947, after this long drought had been in existence, was 103 feet. That is the average static lift.

In the Pinal unit it was 78 feet. Water is there. The water users, potential or actual, are right on top of it. If the water table goes down, some wells may have to be deepened but water is available. There is no emergency in the water supply. The people in the upper areas encounter some difficulty because of the high lift required.

Senator ANDERSON. When you say the water table goes down, you mean the water is being drawn out more rapidly than it is being replenished?

Mr. CONKLING. Yes, that is right.

Senator ANDERSON. Therefore, there is a steady acceleration of that, is there not?

Mr. CONKLING. A steady decline. It will continue to decline until a balance is reached. So long as the drought continues it will continue to decline.

Senator ANDERSON. What happens in a year like this? I notice the water report coming in today which shows the Gila River had about 150 percent of normal in it this year.

Mr. CONKLING. That would do pretty well. How about Salt River, had you heard anything on that?

Senator ANDERSON. I think I can get that report.

Mr. CONKLING. I would like to refer to a rude sketch I have over here on the bulletin board where I have tried to show how a ground-water reservoir operates. This is just a rough drawing. The brown line is supposed to be the surface of the ground. Below that are two blue lines which are supposed to depict the water table. The water table is the name given to the surface of the saturated alluvium.

Below that is another blue line which is intended to show the water table at a different elevation.

All this water underground, as I said before, is seeking an outlet. In the Gila Basin and over in the Phoenix area it is finding an outlet in the lower area where the water-loving vegetation is kept alive. When the water level gets high, as it does during a period of surplus, then it flows out fast. When the slope is steep it flows out faster, intercepting the ground surface higher up, and the area of water-loving vegetation must increase because of this.

When the water level goes down it takes a flatter slope and intercepts the surface at a lower elevation, thus the area of water-loving vegetation decreases.

Automatically, if the water table should keep going down [indicating], until it has no slope, as shown here, none of it would flow out and the water-loving vegetation would die off.

Input and output must be in balance over any long period of time and this causes the water table to fluctuate up and down. The only way it can adjust the amount of escape is to change its level. It must fall during a period of deficiency and thus the locus of escape will move further downhill. When you start pumping from that ground-water basin you are really pumping water which, if no pumping had been done, would later escape from the basin unused. You are not overdrawing the basin until you have decreased the escape entirely.

Senator MALONE. Where does this water go when it escapes from the basin?

Mr. CONKLING. The United States Geological Survey states that that area of phreatophytes there, the water-loving vegetation, is evaporating into the air at the rate of 300,000 acre-feet a year.

Senator MALONE. There is no real escape, then, to any other area, it simply comes up high enough and has enough area of this vegetation to use up the surplus?

Mr. CONKLING. In addition to that the average annual waste of rising ground-water out of the ground-water basin, during the period 1940–44, was 81,000 acre-feet. That was used by the Gillespie area down below the Gillespie Dam.

Senator MALONE. Then it does go to the Gillespie Dam area, that part of it that escapes from the basin?

Mr. CONKLING. If the Geological Survey figure is correct, the escape of ground water during the 1940–44 period was 381,000 acre-feet, of which 81,000 went out as surface water and 300,000 went out as evaporation losses from the phreatophytic area.

Senator MALONE. If there were no retardation of the flow below that escape area, then where would it finally go? Would it become a part of the Colorado River water?

Mr. CONKLING. It would finally go down the river.

The water that comes into this area has lots of salt in it. When that gets to a certain concentration the water is no longer usable.

Senator ANDERSON. Before we go on, may I read you the water supply forecast for the western United States, issued by the United States Department of Commerce, Weather Bureau, as of April 1, 1949:

In general, March precipitation over the upper Colorado Basin above Cisco was near or above normal, although a definite pattern was not apparent. Over the Green, San Juan, Little Colorado and Gila Basins, precipitation for the month averaged near 60 percent of normal.

As a result, water supply forecasts for the upper Colorado Basin above Cisco are unchanged or slightly higher than those issued last month. Those for the Green, San Juan, Little Colorado, and Gila are somewhat lower.

The current outlook, assuming near normal precipitation for the balance of the seasons, is for near normal flows for most portions of the Colorado Basin except that above-normal flows are expected for some portions of the Green River Basin and much above-normal flows are assured for the Gila River Basin. Even with subsequent precipitation as low as the minimum of record, the Gila Basin will have flows near 150 percent of normal.

Now, what does that mean with reference to ground water in their projects?

Mr. CONKLING. It will relieve the draft on the ground water, because, first, more surface water will be available. It may be that the precipitation in the local area was such that there was considerable run-off from the unmeasured areas, and that may help out the situation, too. I do not know whether that will occur, but a flow such as indicated certainly will relieve the draft on the ground water.

Senator ANDERSON. Does it have any relationship to ground-water storage?

Mr. CONKLING. Not that particular fact, no.

Senator KERR. That will not, then, replenish the ground-water reservoir where heretofore it has been depleted?

Mr. CONKLING. I made a mistake a moment ago. It will to this extent: More surface water will be diverted and a part of the water thus diverted recharges the ground water. It will also relieve the water users from pumping the ground water, so that they will get an indirect recharge in that way. There will be indirect relief and also direct relief by this rise in water table which will occur in the areas where irrigation is taking place.

Senator DOWNEY. Mr. Conkling, I am not quite sure I understand. Do you mean to say you do not think a precipitation of 150 percent of normal would in itself tend to bring up the underground water level?

Mr. CONKLING. Yes, locally I think it would. I do not know that that occurred in the Phoenix area. I am unfamiliar with it.

But Senator Anderson was speaking about the watershed area which will furnish surface water entirely.

Senator ANDERSON. In other words, it relieves demands on the ground water, but does not replenish the ground water?

Mr. CONKLING. Yes, it replenishes it indirectly. The water user who uses the surface water will divert more water. More water users will divert more water and therefore their surplus will go underground.

Senator ANDERSON. It augments it by the natural accumulation it has from other sources, but does not in itself add any water to it? It just relieves the pressure on it?

Mr. CONKLING. It relieves the pressure on it and also recharges it to the extent of the surplus water that the irrigator diverts.

Senator MCFARLAND. Will it, in your opinion, reverse the downward trend of the water level there?

Mr. CONKLING. I would not hazard a guess, Senator. It depends on how they utilize their underground water and the surplus.

Senator DOWNEY. Mr. Conkling, let me ask this question: You state that according to the United States Geological Survey figures there are 300,000,000 feet of water down to a depth of 1,000 feet, and which, as was pointed out, has been accumulating over thousands of years, or whatever the period is. But what has been the source of that vast body of water? Isn't that fed in a general way from this precipitation about which Senator Anderson is speaking?

Mr. CONKLING. Yes, that is right. It is fed from local precipitation and from percolation of the streams as they cross it. However, the reason the streams are not going to percolate much this year is because large reservoirs have been built on the major streams. Thus the water is prevented from coming down across the valley floor. You will not get the percolation from them you would have under normal conditions.

Some small streams like the Hassayampa will discharge more water and give a little more recharge to the underground basin.

Senator DOWNEY. Mr. Conkling, have you yet stated the average pumping lift there? Did you state that while I was absent?

Mr. CONKLING. I stated the average pumping lift in the Maricopa unit as of the fall of 1947 was 103 feet. I would revise that just a trifle. The average static level of the water table was 103 feet below the ground surface. The pumping lift would be more than the static lift because of the draw-down when the pumps are operating.

In the Pinal unit it is 78 feet.

Senator DOWNEY. How much lower than that 100 feet of pumping lift does your plan go? Did you say down to 250 feet?

Mr. CONKLING. You would not need to use anywhere near like 45,000,000 acre-feet of water. You would use probably 8, 10, 11 million acre-feet of underground storage to salvage these surplus waters. The water table would lower and thus make the storage available. I did make a statement as to that. That would mean a maximum lift of about 250 feet. That is a maximum average lift of 250 feet. Of course, it would be higher in the upper part of the project and lower in the lower part.

The average lift, however, over a period of years would be around 200 feet.

Senator DOWNEY. What you were stating is that that underground capacity can be used to equate the flow of the stream over long periods of time?

Mr. CONKLING. That is true.

Senator DOWNEY. And that over a long period of time the USGS figures indicate a loss of about 470,000 acre-feet? Was that figure correct?

Mr. CONKLING. That is correct.

Senator DOWNEY. And another 250,000 or more loss from the phreatophytes?

Mr. CONKLING. That is right, a total of about 430,000 acre-feet of loss.

Senator DOWNEY. And over a long-time flow, over a long period of time, according to the United States Geological Survey there has been this waste, shown at Gillespie Dam, of close to a half-million acre-feet?

Mr. CONKLING. There would be this waste. There has been more than that, but with the present reservoirs constructed in the watershed just above this central Arizona Valley there would be about 470,000 acre-feet of waste. There has been, of course, a much greater loss than that.

Senator ANDERSON. Where did you testify to that? What page of your statement is that on? I missed that entirely.

Mr. CONKLING. On page 2, the central paragraph.

Senator ANDERSON. I missed the statement you made about Gillespie Dam.

Mr. CONKLING. This is Gillespie Dam here.

Senator ANDERSON. Yes; I understand that.

Senator MCFARLAND. You state they are now wasting 470,000 acre-feet of water at Gillespie Dam?

Mr. CONKLING. Not this year, or any particular year. This is a long-time average. Of course, this waste takes place in these years of very large run-off.

Senator MCFARLAND. Where is that water?

Mr. CONKLING. Where is it?

Senator MCFARLAND. Yes; where does it go?

Mr. CONKLING. It goes down into the ocean.

Senator MCFARLAND. How does it get there?

Mr. CONKLING. It goes down the Gila River.

Senator MCFARLAND. Did you ever take the measurements of the water going down there?

Mr. CONKLING. It has been measured by the United States Geological Survey.

Senator MCFARLAND. And they measured 470,000 acre-feet flowing down to the ocean?

Mr. CONKLING. No; this is the long-time average. This is a statistical figure. In 1941 there was a million acre-feet plus passed Gillespie Dam. That was in 1941, right in the middle of the so-called drought.

Senator MCFARLAND. How much was there in 1942?

Mr. CONKLING. Very little, practically none.

Senator MCFARLAND. How much in 1943?

Mr. CONKLING. Practically none.

Senator MCFARLAND. How much in 1944?

Mr. CONKLING. Practically none.

Senator MCFARLAND. How much in 1945?

Mr. CONKLING. I did not observe it, but I would say probably nothing.

Senator MCFARLAND. How much in 1940?

Mr. CONKLING. Practically none.

Senator MCFARLAND. 1939?

Mr. CONKLING. I have the figures as to that around here. It occurs only in years of floods. They do not have to be very large floods either. A lot of flood waste occurred between 1929 and 1939. That was actually observed.

Senator MCFARLAND. I would be interested in finding that out, Mr. Conkling. I would like to know where we can get it.

Mr. CONKLING. In the period 1930–39 there was an annual average of 138,000 acre-feet flowed out as flood waste past Gillespie Dam.

Senator MCFARLAND. When was that?

Mr. CONKLING. The average of 1930–39.

Senator MCFARLAND. Was any of that water used down below?

Mr. CONKLING. I do not know where it was used.

Senator MCFARLAND. Do you not know that the Welton-Mohawk areas have been irrigating down there?

Mr. CONKLING. I know they have been irrigating down there. It may have been used down there, but more than likely it was probably wasted on the way down by phreatophytes.

Senator MCFARLAND. Is 138,000 acre-feet of water going down the river? Do you have any measurements to show it?

Mr. CONKLING. No, this is past Gillespie Dam and that is measured.

Senator MCFARLAND. Is there any land irrigated immediately below Gillespie Dam?

Mr. CONKLING. Yes.

Senator MCFARLAND. All right, go ahead.

Senator DOWNEY. Mr. Conkling, can you put in the record the data from the USGS reports which you say give this 470,000 acre-feet?

Senator MCFARLAND. And please put in the record appropriate references to the places where the water was measured at what stations, and so forth. Maybe we can find some of that water.

Mr. CONKLING. The measurements at Gillespie Dam commenced in 1923, and we do not have anything back of that. But we do have a comparison of what happened in 1941—we can compare that with the discharges which occurred from the Salt and the Gila in the surplus period 1905–16.

Senator DOWNEY. Mr. Conkling, as I understand you, this figure of 470,000 acre-feet is the long-time average as to the amount of water the USGS believes has been escaping past Gillespie Dam; is that correct?

Mr. CONKLING. The USGS has made no estimate of that. They have actually measured the water past Gillespie Dam since 1923. The measurements are available. That is my own estimate based upon the USGS data.

Senator ANDERSON. Is it not also true that this 300,000,000 acre-foot estimate is your own estimate, and not a USGS estimate?

Mr. CONKLING. That is true That is based upon USGS data and their assumption as to voids in the underground basin. It is merely an arithmetical extension of the data that they have.

Senator ANDERSON. Where are you now reading from?

Mr. CONKLING. I had just discussed the salt problem. That was on page 10. I had pointed out that by lowering the water table the loss by phreatophytes would be made available to the irrigators.

I have here some additional information on discharges, by which an attempt was made to show graphically the cyclic character of the discharge of the Salt, Verde, and Gila Rivers.

First, looking at plate 2, we will note that it extends back to the year 1888; 1889 through 1891 was a period of surplus extending only 3 years. We do not know what happened on the river prior to that time. The average discharge at those stations, on the Salt and Verde, was 185.7 percent of the average of the period. (Pl. 2 appears in the complete statement of the witness at p. 551 hereof.)

From 1892 to 1904, a period of 13 years, there was a discharge which averaged 53.2 percent of the average of the record.

From 1905 to 1920, a period of 16 years, the average was 148.1 percent.

From 1921 to 1946, 26 years, the average is 83.9.

The difference between the average discharge between 1921–46, and the average discharge between 1905 and 1920, is approximately 1,000,000 acre-feet. Those amounts have been shown on here in black hachures; they show the periods above and below the average periods. You will note a line drawn through the 100 percent, a heavy line which shows the average discharge for 58 years.

Here is a point that should be noted particularly. The elevation of the water table in 1903 was taken in the Salt River Valley by the United States Geological Survey and published in Water Supply Paper 136. At that time the water table was—as you can tell by looking at the scale to the left—about 48 feet below the surface, on the average, of the valley. The next year was dry, so it should have been somewhat lower but it was not observed so far as known. If you look over at 1947, which is the end period of this wavering graph showing the water table, you will note that the water table in 1947 was only 6 feet lower than it was in 1903. In other words, there has been practically no change over a period of surplus and deficiency.

The water table rose from 1905 on, because a period of surplus began in 1905. In 1911 measurements were begun consistently, which the Salt River Valley Water Users Association published showing the elevation of the water table, on the average, throughout their holdings. It got up to a point only 20 feet below the surface of the ground.

Then when a period of deficiency came along, which was about 1921, the water table started down. In 1941, as you will notice, it rose quite considerably. There was one very wet year, 1941. The water table went up 13 feet, according to the Salt River Valley Users Association, because they had plenty of surface water and also because a million acre-feet wasted past Granite Reef Dam. Part of it percolated into the riverbed; also because other streams were flowing and also contributing. Possibly the rise is due in part to percolation from precipitation which is usually not given credit in considering desert regions, but on irrigated land in these years of considerable precipitation it might have a very great effect.

Senator McFARLAND. Is this the minimum water level in the valley?

Mr. CONKLING. No; that is the average for the Salt River Valley Water Users Association.

Senator McFARLAND. The average in 1920, you say, was 20 feet, or in 1919?

Mr. CONKLING. That is what they publish.

Senator McFARLAND. There is something wrong there someplace.

Mr. CONKLING. I took it from their graph.

Senator McFARLAND. You better look at it again.

Mr. CONKLING. I have it right here.

Senator ANDERSON. These figures are both above and below the reservoirs?

Mr. CONKLING. I can tell you where this is. Here is the Salt River Waters Users Association, and that is the elevation of the water table in that area.

Senator DOWNEY. That is all below the reservoirs, then?

Mr. CONKLING. Below the reservoirs; yes.

Senator McFARLAND. Is that in Maricopa County at all?

Mr. CONKLING. That is in the Salt River Valley Water Users Association.

Senator McFARLAND. Just in their area?

Mr. CONKLING. I do not believe I have that graph with me.

Senator McFARLAND. That is all right.

Mr. CONKLING. Do you have different figures there?

Senator McFARLAND. I do not have any figures, but I know from my own experience if you are taking Maricopa County as a whole, I would certainly question that very much.

Mr. CONKLING. No, no; it is not Maricopa County as a whole. I am sorry I do not have the graph. I took it from the figures of the water users association.

Senator ANDERSON. You may proceed, and if there is any question that can be straightened out——

Mr. CONKLING. On plate 3 is a similar graph of the Gila River above San Carlos Reservoir. It extends back, as you will notice, to about 1868. (Plate 3 appears in the complete statement of the witness at p. 551 hereof.)

Senator ANDERSON. Who gathered the data in 1868?

Mr. CONKLING. This is from the United States Army engineers' estimate of flow. They made a very careful investigation of it. They had records beginning in 1915, so they made an investigation of the flows back to this period, with the information they had gathered.

The important point about this is that it does show the same cyclic condition.

Senator ANDERSON. You are trying to say that somebody from the Army made a study of water tables at that point?

Mr. CONKLING. This was the discharge of the Gila River.

Senator ANDERSON. Well, either way.

Mr. CONKLING. No, they did not make measurements in 1868. They made their studies in 1947, and took the data which had accumulated since 1868 to work out the discharges of the Gila River prior to the actual records.

Senator McFARLAND. 1868 is about the date they started to irrigate so they would not have much data.

Senator DOWNEY. What value, if any, has the Bureau of Reclamation given to those figures, Mr. Conkling, do you know?

Mr. CONKLING. Are you speaking about the Gila?

Senator DOWNEY. The Gila, the study you have spoken about that the Army engineers made.

Mr. CONKLING. They accepted the figures. As to the yield of the San Carlos Reservoir and of the Buttes Reservoir, their report is based upon the Army's report. The Army's report antedated the Bureau's report and the Bureau accepted the Army's figures.

Senator ANDERSON. Off the record.

(Discussion off the record.)

Senator ANDERSON. You may proceed.

Mr. CONKLING. I will refer you to another graph that I have over here. The Bureau of Reclamation's water supply from Salt and Verde Rivers is practically based upon the discharge of those streams during this last period of drought. This is plate 4. It is plate 2 made a little differently. The base line on plate 2, as you have it there, is the 100 percent line. The base line on plate 4 is the average discharge

during the present drought. We have tried to show by this chart that if the Reclamation Bureau bases its water supply for the central Arizona project upon this period here beginning in 1921, which they practically have done, that they are neglecting the surplusses of the alternating periods entirely. The surplus is a very considerable amount of water. (Plate 4 appears in the complete statement of the witness at p. 551 hereof.)

Now going back to the statement:

What is especially noteworthy in the graphs we have been looking at is the fact that the region is in a drought which has prevailed for a long time. Yet the water in the ground-water reservoir is still at such high elevation that it is overflowing and supporting the heavy losses in the swampy areas.

Measurements at wells in other areas of the two units under discussion are not available as long a period as for the Salt River area. There is no doubt that the water table rose and fell in those areas, in the Maricopa unit outside of the Salt River Valley Water Users' Association, in the same rhythm, although with less amplitude. This same rise and fall of the ground water with the weather cycle is a matter of common knowledge at other places in the Southwest

What this graph shows is that ground-water reservoirs, as well as surface reservoirs, are replenished in periods of surplus and are depleted in periods of drought.

I am referring to plate 2 which shows the rise of the water table in the Salt River Valley Water Users' Association area during a period of surplus.

Senator DOWNEY. Mr. Conkling, I do not want to divert you but what do the records show as the minimum run-off for this area, that we know of, and what is the maximum run-off? Do you have those figures?

Mr. CONKLING. I will take the Bureau's figures on that. I do not accept the Bureau's figures as to maximum run-off, however, but we will use those figures in table B–10. This is entitled "Virgin Flow in the Gila River," table B–10 of the report on central Arizona project, appendices. The maximum estimated by the Bureau was 7,945,000 acre-feet in 1905. The minimum was in 1900, 595,000 acre-feet.

Senator DOWNEY. They put the average virgin flow at something slightly in excess of 2,000,000 acre-feet, do they not?

Mr. CONKLING. Two million and seventy-nine thousand, as given here.

Senator DOWNEY. That is for the whole area, is it not?

Mr. CONKLING. That is the natural inflow to the Phoenix area.

Senator DOWNEY. Were those figures you just gave, the maximum and minimum, for the same area or were they merely for the Gila?

Mr. CONKLING. They are for the Phoenix area, the same area. I just stated that what this graph shows is that ground-water reservoirs, as well as surface reservoirs, are replenished in periods of surplus and are depleted in periods of drought.

That is what has happened in the Maricopa and Pinal units of the central Arizona project. The underground reservoirs have been slightly depleted. The depletion will continue to accrue as long as the drought lasts, but by no possibility could the capacity of the underground reservoirs be more than scratched. When the surplus period comes, they will be recharged—the water table will rise.

Senator ANDERSON. If this information that I have from the Weather Bureau is correct, it would indicate a period of surplus this year?

Mr. CONKLING. This year.

Senator ANDERSON. Therefore, this year they ought to be improved to some degree, is that correct?

Mr. CONKLING. To some degree.

Senator MCFARLAND. Senator, I am sorry but I must say to you in frankness there will be no surplus this year, it will all be used up. There may be enough to irrigate the lands that are under irrigation for the first time in years, but there will be no surplus.

Senator ANDERSON. I am not trying to get into a controversy over that.

Senator MCFARLAND. I am just saying that is the practical situation as it exists. As a matter of fact, they have already sent out notices that they had better curtail a little again this year. There is not as much water as was anticipated.

Senator DOWNEY. Senator Anderson is referring to the surplus precipitation.

Senator ANDERSON. Yes. I am sure that regardless of the amount of water in the river that would not change my interest in what happens to the ground water.

Senator MCFARLAND. I thought you were referring to the water in the river.

Senator ANDERSON. No.

Mr. CONKLING. I state here there is still another natural cause for the recession of the water table which has nothing to do with a long-time shortage. The water table must recede when pumping from ground water begins, no matter whether the recharge of the ground-water reservoir is equal to the demand or not.

It is actually necessary for it to recede because the supply and the escape must be in balance. When a new escape is provided, the natural escape must decrease by the amount of the new escape. The pumping is a new escape. So the water table recedes because people have started pumping. The natural escape is decreasing. It has to do that.

That is a phenomenon which the water user, after he has learned something about ground water, knows will happen.

This occurs because ground water is not stationary. On the contrary, it is moving from the locus of recharge to the locus of escape. In a state of nature, recharge and escape are in balance over any complete cycle of drought and surplus. When pumping draft begins, a new avenue of escape from the ground water reservoir is provided. The amount of escape at the natural location must decrease by the amount of the new draft. Rate of movement of the ground water toward the natural locus of escape is in proportion to the steepness of slope of the water table toward that point.

The only way by which the rate of movement can decrease is by a flattening of the slope. The amount of water escaping at the natural locus is reduced as the slope flattens. Therefore the decrease in natural escape can be accomplished only by recession of the water-table elevation all the way from the locus of pumping to the locus of natural escape.

Senator DOWNEY. What is the difference in elevation between Phoenix and Gillespie Dam? How much is the fall?

Mr. CONKLING. About 300 feet.

Actually, also, an annual average of a million acre-feet approximately would have spilled past Granite Reef Dam in the period 1905–20, with the present developments for diversions from the river. Actually over a million acre-feet spilled in the single year 1941, which was 1 year of large surplus in a period of drought.

During periods of surplus like that of 1905–20 the owners of the reservoirs on the streams entering the two units need only a small part of the capacity of the reservoirs to give them a complete supply. The surplus capacity could be used to regulate the excess water and place it underground.

It is estimated that during a long-time average period water could be diverted from what would spill otherwise as follows in round number after Buttes Reservoir is constructed:

Salt and Verde Rivers, 410,000 acre-feet; that is the long time average annually. Agua Fria River, 40,000 acre-feet. Gila River, 90,000 acre-feet. Total average annual, 540,000 acre-feet.

Some of this would have percolated above Gillespie Dam. It appears conservative to say that net salvage would be about 77 percent or only 400,000 acre-feet. Probably it would be more.

In addition, the mere fact that less water was flowing in the streams would allow percolation of floods originating in streams not controlled by reservoirs. It is assumed that an annual average of 50,000 acre-feet would be conserved in this way, but for the sake of the computation this may be disregarded.

Without salvage of spilled floods but with salvage of waste from phreatophytes, it is estimated that there is an annual average surplus of about 200,000 acre-feet in the Maricopa unit for the 1940–44 acreage, that is, for the "rescue" project of the Reclamation Bureau. However, the surplus is in the area supplied by the Salt and Verde Rivers while other areas flanking it have a deficiency. Recession of the water table is greatest in the flanking areas. Due to this, even now water is moving underground from the Salt River Association areas to the flanking areas. This movement will increase in the next period of surplus, as it can be expected that the water table in the Salt River Association area will build up further and more rapidly than in the flanking areas.

More and more of the deficient areas will come to be supplied thus. Thus will come about a natural correction of the maldistribution. All that is necessary to bring this about is to continue drawing on the ground water and let nature take its course.

This would probably go a considerable way in taking care of the rescue project of the Bureau in the Maricopa unit, but other measures would have to be taken to distribute the water for the larger acreage which the Bureau proposes to water in that unit. Furthermore, other measures are necessary to supply water to the Pinal unit.

Estimates of supply, as compared to demand in the Pinal unit indicate that, after Buttes Reservoir is built and with control of spills past Ashurst Hayden Dam as has just been outlined for Salt and Verde and Agua Fria Rivers, there will still be an average annual deficiency of 53,000 acre-feet in the supply for the 124,000 acres

irrigated in 1940-44 and an additional deficiency of 83,000 acre-feet in the supply for 26,000 acres additional, which the Bureau proposes to water in its report of 1947. The total is 136,000 acre-feet.

This could be supplied from the excess in the Maricopa unit by a canal diverting from Salt River at the point proposed by the Reclamation Bureau and following the same route to Ashurst Hayden Dam on the Gila River. This would be diverted in the regimen needed for irrigation.

The Gillespie area of 14,000 acres would also be taken care of out of the surplus.

The surface reservoir capacity already constructed on the Salt and Verde especially and on the Agua Fria is very large. During periods of surplus, such as that of 1905-20, only a small part of the capacity is necessary for the owners of the reservoirs. The remainder could be utilized to equate the flood flows and regulate them for diversion to other parts of the Maricopa area and Pinal unit.

During such periods the needs of the higher lying parts of the project area could be supplied with surface water in the regimen of irrigation demand. The surplus over the consumptive use would percolate to the underground reservoir and replenish it.

Possibly some of the water thus diverted would have to be caused to percolate underground directly without use in order to replenish the underground reservoirs.

It is calculated that the average annual salvage of water which would otherwise spill from the Salt River at Granite Reef Dam and past the diversion dam on Agua Fria during the period 1905–20 would be 1,014,000 acre-feet, and that 730,000 of it would have to go underground requiring underground storage capacity of about 12,000,000 acre-feet. This would require that average elevation of the water table in the Maricopa unit would have to be 120 feet lower than that of the fall of 1947. Average pumping lift would be 143 feet.

Water would be salvaged from the Gila River for the Pinal unit in the same way as it would be salvaged in the Maricopa unit. About 4,400,000 acre-feet of underground storage would be required in the north half of the unit, and the total cyclic fluctuation required would be about 129 feet. Average lift about 113 feet.

It is necessary to discuss a detail of the Bureau's plan which was briefly mentioned previously.

The Bureau proposes to pump 1,200,000 acre-feet of water from the Colorado River 985 feet. According to the Bureau's estimates, 200,000 acre-feet of this will be lost on its way to the project. The Bureau states in the appendix of its report on pages C–113 and C–115 that, by bringing this water in, the water user will have to lift the water 70 feet less than he otherwise would. The water user's cost of lifting the water this 70 feet is estimated by the Bureau at $2.41. In addition, there would be an average lift of about 80 feet to the water user in the project area.

Compare the 985-foot lift from the Colorado River plus the 80-foot lift locally with the average lift of about 143 feet in the project area estimated for the plan herein proposed. The Bureau would lift water more than 7 times as high as would be neecssary with the plan of local salvage. A corresponding waste of kilowatt-hours would occur.

There are 13 local items in the Bureau's plan which do not involve importation of Colorado River water. Their estimated cost is $194,475,000. These could go ahead regardless of importation of Colorado River water, and a great deal could be accomplished thereby. Additional water could be made available in New Mexico, the Tucson project could be built, reservoirs could be constructed on the Verde and Gila, the power plants could be built, and the swamps above Gillespie Dam could be drained.

The additional cost for this alternate plan would probably be in the neighborhood of 50 to 100 million dollars instead of the 540 million of the Bureau's plan.

It would require considerable study. There is no emergency in the project area so there would be time for study. It is specially imperative that the situation be observed during a few years of a surplus period. The entire complexion of the matter will have been changed and matters can be viewed in a more rational light than now.

SUMMARY AND CONCLUSIONS

About 500,000 acre-feet of water can be salvaged from wastes of local water. That includes the loss in the swampy areas and the diversion from the surplus flows which would spill out past Gillespie Dam. This is sufficient to furnish a complete supplementary supply of good water to the 591,000 acres in the Pinal and Maricopa units of the central Arizona project to which the Bureau proposes to furnish a supply.

There is no emergency. The water supply, as proposed by the Bureau's central Arizona project, can be secured locally at a fraction of the cost of the Bureau's project.

More important than the cost, however, is the possibility of salvaging local water which now wastes into the ocean. It can be used only in Arizona and, to a limited extent, in Mexico. The Colorado River water is potentially usable anywhere in the Colorado River Basin. The deficient supplies of the basin need to be conserved to the utmost.

If Colorado River water is taken to central Arizona, there will be no urge to save the local supplies and they may remain unsalvaged forever.

Senator ANDERSON. Senator McFarland, do you have a question?

Senator MCFARLAND. Mr. Chairman, I notice it is 12 o'clock. I would like to ask some questions. I wonder if we could meet for a short time this afternoon?

Senator ANDERSON. Do you have other witnesses?

Senator DOWNEY. No.

Senator ANDERSON. We have available room G–23 this afternoon.

Senator MCFARLAND. It will not take too long but I could not complete it before we have a quorum call.

Senator ANDERSON. Are you sure we are going to get one? You may be able to do it in 15 or 20 minutes.

Senator MCFARLAND. It would be helpful to me to refer to some of the data.

Senator ANDERSON. Very well, 2:30 o'clock, room G–23.

(Whereupon, at 12 m., the hearing was recessed to 2:30 p. m. the same day in room G–23, Capitol.)

AFTERNOON SESSION

Senator ANDERSON. The hearing will be in session.

STATEMENT OF HAROLD CONKLING—Resumed

Senator MCFARLAND. Mr. Chairman, this testimony on the whole is very confusing to me as a layman. So many of these figures are taken out of what I would call thin air—estimates which make it very difficult to arrive at a conclusion. There are a few questions I would like to ask.

Mr. Conkling, in your summary you state that about 500,000 acre-feet of water can be salvaged from waste of local water. What additional works would have to be built in order to salvage that water?

Mr. CONKLING. There would have to be a drainage system built down in the lower area of the project where the phreatophytes are now growing and there would have to be additional canals taken out of the Salt River at Granite Reef, and there would have to be an additional canal taken out of Salt River southward, toward the Pinal unit.

Senator MCFARLAND. But there would be no additional dams?

Mr. CONKLING. I assume McDowell Dam would have to be put in.

Senator MCFARLAND. Just what is that 500,000 acre-feet made up of?

Mr. CONKLING. That is about 400,000—let me back up a little. When water is taken out at Granite Reef for use elsewhere, and the underground basin is used for a reservoir, to an extent, the phreatophytes down below will be killed. If you salvaged the loss by phreatophytes estimated at 200,000 acre-feet and 400,000 acre-feet that would be taken out of Granite Reef, you would have 600,000. But there is an overlap of approximately 100,000, I estimate, making 500,000. Then, of course, the same thing is true of the Gila River and of the Agua Fria River. The whole thing lumped together is 500,000 acre-feet.

Senator MCFARLAND. Will you tell me again just how you are going to take out these phreatophytes?

Mr. CONKLING. They can be taken out partially by lowering the water table and partially by drainage. I mean lowering the water table above and outside the phreatophytic area.

Senator MCFARLAND. Do you know what the salt content of that water is and where those phreatophytes are growing?

Mr. CONKLING. Yes; it is pretty poor; it is about 5.5 tons per acre-foot as it goes over Gillespie Dam.

Senator MCFARLAND. Do you consider that good water?

Mr. CONKLING. No, sir; that would be very poor water being used by the Gillespie area. However, if you were able to do away with around 200,000 acre-feet of phreatophytes which are evaporating pure H_2O water, then that water would become usable.

Senator MCFARLAND. Why do you say they are evaporating pure water when the water in that area has a high salt content?

Mr. CONKLING. All that can be evaporated is pure water. It is the same as distilling water.

Senator MCFARLAND. They are using this water with the high salt content, are they not?

Mr. CONKLING. That is right.

Senator MCFARLAND. So that is not pure water?

Mr. CONKLING. What they evaporate is pure water. The water lost through the phreatophytes is pure water. It is just the same as any still, any sort of a distilling process. You can evaporate sea water and you get pure water in the vapor that comes off, and that is what they are doing out there.

Senator MCFARLAND. Let me see if I follow your line of reasoning here. If you had water of a salt content of, say, 5,000 parts per million, and if that water was used, we will say, for Bermuda grass, just because Bermuda would use that water, you would not say it was good water?

Mr. CONKLING. I did not say it was good water. I said it was poor water.

Senator MCFARLAND. It would be poor water. And the fact that some plants might be able to use it would not make it any better water, would it? What process, in other words, would you use to get that 200,000 acre-feet of good water out of this bad water? These cedars do not make good water out of it just because they are able to use it. It would still be bad water if they did not use it. By what process are you going to make good water out of the bad water?

Mr. CONKLING. When you evaporate any water, the vapor that passes off is pure water and contains no salts.

Senator ANDERSON. He did not argue that point with you. He asked you what you were going to do with this 200,000 acre-feet.

Mr. CONKLING. I was going to get rid of the salt cedars.

Senator ANDERSON. Once you get rid of the salt cedars the same water flows down there, doesn't it?

Mr. CONKLING. The same water flows down there.

Senator ANDERSON. And that is heavy with salt?

Mr. CONKLING. That is heavy with salt.

Senator ANDERSON. What are you going to do to take the salt out of it?

Mr. CONKLING. There are two things that will happen. One is that the good water the salt cedars are now evaporating will remain underground, it will not be taken out. The reason for this heavy concentration of salt down there is largely due to the salt cedars. They are taking out pure water and leaving a concentrated salt solution below ground.

In addition to that you would drain this land and get the salt input and output restored to a balance.

Senator MCFARLAND. What allowance do you make for salt balance?

Mr. CONKLING. The same as the Reclamation Bureau does 5.5 tons per acre-foot of water.

Senator MCFARLAND. And you use the same water in making the allowance that they have there now?

Mr. CONKLING. This is just one phase of it. Of course, we are going to put more water underground further up the valley, and it will find its way down to this area where it is too salty now, to help out the situation there.

Senator MCFARLAND. As I understand your proposition, it is that you say, "Just keep pumping, boys, and you are going to be all right. There is nothing to fear. The water level is going down, but just keep pumping and that will purify it."

That is the effect of your last statement on page 18.

Mr. CONKLING. No.

Senator McFARLAND. Well, read it and see.

Mr. CONKLING. Please complete your question.

Senator McFARLAND. The more you pump the more salt content is left in the ground, is that not right?

Mr. CONKLING. Yes, the more you take out. That is exactly what I was saying about the phreatophytes.

Senator McFARLAND. So the pumping is not going to cure the salt balance situation, is it?

Mr. CONKLING. No, not in itself. What is going to cure the salt balance is recharging the ground water with fresh water from Salt River, much better water than the Colorado River water and much better water than the average of Salt River now. Because the water which would be recharged is that which comes at surplus periods. The water which the Salt River discharges is made salty to a considerable extent by certain springs above the Roosevelt Reservoir. Obviously, the amount of salt those springs discharge into the Salt River is approximately the same from year to year.

Now, if the run-off is 2,000,000 acre-feet, the concentration of salt from those springs is obviously only one-half of that which comes in a year when the total run-off is 1,000,000 acre-feet.

So the ground water would be recharged with purer water than water being used now. That would gradually bring about a change in the salt content down in the phreatophytic area.

Senator McFARLAND. Are you familiar with the salt content of some of the wells that are being pumped into the Salt River Valley at this time?

Mr. CONKLING. I am not familiar in detail. I know that they gradually increase in salt content.

Senator McFARLAND. And that they are increasing on account of the additional pumping?

Mr. CONKLING. They are increasing, obviously, at such times as this when the recharge is smaller than it should be, than it is on the average, and that condition could be cured by some special pumping which could be done down in the phreatophytic area.

Senator McFARLAND. Would it surprise you if I told you that some of those wells were now showing a salt content as high as 4,300 parts per million?

Mr. CONKLING. It would depend on where they were. If you can tell me where they are, then I could tell you whether I would be surprised.

Senator McFARLAND. Well, this high salt content is found in some of the wells they are pumping there. I cannot point them out to you; but if you will read some of the testimony in the case I tried there, you can find them pretty easily.

Mr. CONKLING. I would not be at all surprised if the wells down near Gillespie Dam are pumping water of that salt content.

Senator McFARLAND. Would you be surprised if that was gradually increasing with the increased pumping?

Mr. CONKLING. That is gradually increasing and will continue to increase until some different system of running the water supply in that area is adopted.

Senator McFARLAND. So they are going after this pumping. The one thing you recommend, they are doing, are they not?

Mr. CONKLING. The situation in this very salty area you speak about could be alleviated to a very large extent by destroying the phreatophytes and by pumping out the salty water over Gillespie Dam, and by draining and destroying the phreatophytes.

Senator MCFARLAND. Your estimate on the phreatophytes is that 200,000 acre-feet per year could be saved in that process?

Mr. CONKLING. I take that from the USGS and have estimated 200,000 acre-feet.

Senator MCFARLAND. Have they estimated, or have you estimated?

Mr. CONKLING. I have estimated it at 200,000.

Senator MCFARLAND. The rest of it has got to be done by some other method. One of the methods, as I understand it from you, is to just keep pumping, when, as a matter of fact, the record shows that with this "keep pumping" the water gets saltier and saltier. Let me see if I get your theory right on that. Your answer to that is that it is going to rain some time, and when it does rain that will recharge the storage areas and everything will be fine.

Mr. CONKLING. Let us locate the pumping. Suppose you do your pumping down near Gillespie Dam.

Senator MCFARLAND. I am talking about the whole valley.

Mr. CONKLING. Well, I am talking about this part of it. I have to subdivide it a little bit. If you pump down near Gillespie Dam and pump it out over Gillespie Dam, you obviously will unsalt this water that is down there because you will start what is in effect a natural process, which is this: Whenever the water supply gets larger, that is, whenever one of the surplus periods comes along there will be more water go underground, more water go down toward Gillespie Dam and the salt will naturally be flushed out there.

You can artificially produce the same result by going down in the area above Gillespie Dam and pumping the salty water out over the dam. It would rectify the situation very well.

Senator MCFARLAND. Where are these phreatophytes located?

Mr. CONKLING. The ones I was thinking about are from Gillespie Dam up almost to Phoenix, then up the Gila River up above Laveen toward Sacaton.

Senator MCFARLAND. You would pump the water out in the particular localities where they are located? That is where you would be doing a lot of pumping?

Mr. CONKLING. You are going to have to control your pumping according to the exigencies of the situation. You would pump the water where it would do the most good. The main idea would be to keep it away from the surface so that the phreatophytes could die.

Senator MCFARLAND. You say yourself some of that water would have such a high salt content it would have to be drained off.

Mr. CONKLING. It has that right now, it needs to be drained off. I discussed that matter with the people down in the Gillespie area. I do not know that you would call it that. Is it the Buckeye area? I asked them why they did not put in drainage or pump it out, and they said they could not afford it themselves; that the Salt River Valley Water Users Association, and those others who are in part responsible for it, would give them no help in the matter.

Senator MCFARLAND. You do not claim they need to pump more water than they are now pumping, do you?

Mr. CONKLING. I would say pump it out and run it down the river.

Senator MCFARLAND. They are just not doing it right, is that the proposition?

Mr. CONKLING. That is one of the things that are not being done right; that is one of many.

Senator MCFARLAND. If they would just do it right they might have even enough water to give California some more, according to your figures here.

Mr. CONKLING. The California controversy need not enter into a technical presentation. I am presenting this from a technical standpoint.

Senator MCFARLAND. I do not see very much technique in it when you come out with the theory here that you are going to save 200,000 acre-feet. I could follow you in your estimate on that, but your other theory is to just keep pumping, pump more, locate the wells in a different spot. That is the sum total of it. That 400,000 acre-feet is what you are going to gain by doing more pumping, as I understand it, and the 200,000 you are going to save by destruction of the salt cedars.

Mr. CONKLING. Not exactly that, Senator.

Senator MCFARLAND. Where are you going to get the 400,000?

Mr. CONKLING. Out of Salt River, out of Agua Fria, and the Gila River during this period of surplus, which I pointed out on the plan that you have. There was a period of surplus between 1905 and 1920, and in other periods of surplus.

Senator MCFARLAND. How do you arrive at that surplus from 1905 to 1920?

Mr. CONKLING. That is from the records on the Salt and Verde. If you want me to tell you what process was gone through, I would be very glad to do so.

Senator MCFARLAND. I will ask you if you know how much land was being irrigated there between 1905 and 1920.

Mr. CONKLING. I have an estimate of it. That is not a factor in the matter because in making this estimate a demand sufficient to supply all of the land being irrigated from the Salt and Verde Rivers by diversion at Granite Reef, as it is today, and not as it was in 1905–20. Then this demand was superimposed upon the run-off of the rivers at Granite Reef, the reconstructed run-off, that is, the virgin run-off. Then there was adopted a factor for evaporation from reservoirs and the whole run-off record, from 1889 to 1923 was run through.

Senator MCFARLAND. Why did you quit with that period?

Mr. CONKLING. Because that was the end of the surplus period. The surplus period began in 1905.

In such a computation you subtract from the run-off which would have occurred if there had been no reservoirs, the amount of water needed by the acreage which is now irrigated. The remainder either went into reservoirs, or spills. Obviously, then, if that situation prevailed you could take out more water and put it someplace else during that period, without in any way harming the prior users. In fact, they did not need as much reservoir capacity as they had.

After determining how much the demand of the prior users is each month and each year during that whole period, then another load was put upon the water supply. That is, it was assumed the surplus water would be taken out and used for irrigation on lands where

there is supposed to be a shortage, over around the Beardsley area and to the south. These and other lands could take practically all the surplus water, practically a million acre-feet a year, by irrigating the areas with a diversion of about six acre-feet of water per acre. That gave so much surplus and about three acre-feet per acre irrigated per year would go underground and recharge the groundwater during all those years. That is where the extra water would come from.

Senator MCFARLAND. Mr. Chairman, I just had a few more questions.

Senator ANDERSON. Off the record.

(Discussion off the record.)

Senator DOWNEY. I would like to ask the Senator this:

Is it his contention that the deeper the pumping is, as you decrease the underground supply, that the additional water brought up is more salt than it otherwise would have been?

Senator MCFARLAND. I cannot say so much about the depth, but the fact is, the more we pump, the more pumped water we use, the higher salty content the water has. As I stated, we had wells that were pumping about 4,300 parts per million. That is not considered usable water. They are mixing it with other water, because they haven't any better, and using a mixture. But when you get past 3,000 parts per million, it is not considered usable water.

Senator DOWNEY. We will certainly agree with that.

Senator MCFARLAND. So the situation presented here is not borne out by the facts.

I am informed they are getting this 4,000 parts per million right up in the Salt River Valley Water Association region. That is due to pumping.

I would ask you this, Mr. Conkling: How are you going to help the salt balance proposition by diverting more water from the Salt River and taking power water to the Gila? Will that increase or decrease the salt content in that valley?

Mr. CONKLING. Everything that I have proposed will help the salt situation in the valley.

Senator MCFARLAND. Taking the pure water out above Granite Reef, and taking it over to the other valley will help the salt proposition in the Salt River Valley?

Mr. CONKLING. That particular act will not help the situation in the Salt River Valley, but the taking of this other water——

Senator MCFARLAND. You said everything you proposed would. Do you want to back down on that?

Mr. CONKLING. All right, I will back up that far. That wouldn't do any particular good. It won't hurt it any, either.

Senator MCFARLAND. Oh, it won't hurt it any? You are going to stick to that?

Mr. CONKLING. Yes, I will stick to that. If not taken thus it will merely pour down into the ocean.

Senator MCFARLAND. I want that to be on the record, that it will not hurt it any.

Mr. CONKLING. The rest of the water, however, which would be diverted at Granite Reef Dam would be the highest quality water you could get out of Salt River. That would go underground and fill up the ground-water reservoir, and in itself, without anything else, would gradually help the salt situation.

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But you can help the salt situation much more quickly if you go down there and pump this pool of water lying underground above Gillespie Dam, which is impregnated with salt, and really use your underground reservoirs the way they should be used.

Senator McFARLAND. Do you know how much salt content the water has down in the Welton-Mohawk district?

Mr. CONKLING. No.

Senator McFARLAND. Would it surprise you if I told you it was up to 6,000 parts per million?

Mr. CONKLING. No, I do not know anything about it.

Senator McFARLAND. In other words, Mr. Conkling, you have not made much of an investigation here, have you?

Mr. CONKLING. Yes, sir.

Senator McFARLAND. Well, you do not seem to know very much about those wells.

Mr. CONKLING. I know the Welton-Mohawk Valley is going to be irrigated with Colorado River water, is it not?

Mr. McFARLAND. That was because the salt content was increasing all the time to where they could not use it, and yet they were pumping all they could, and going as deep as they could.

Mr. CONKLING. That does not affect the situation.

Senator McFARLAND. Coming back to the other question, inasmuch as we are going to use a little more time—the period from 1905 to 1920, do you know how many acres were under cultivation in that area at that time?

Mr. CONKLING. I have a record of it here some place, but it is not pertinent to my investigation.

Senator McFARLAND. It is not pertinent to it?

Mr. CONKLING. No, sir. I told you how that investigation was made, that I assumed the demand of the present acreage and it has no reference to what the acreage was in the past. I assumed the acreage irrigated now was in existence in 1905–20.

Senator McFARLAND. It would not make any difference to you in making up this record as to how much land was actually in cultivation in 1907 and 1908?

Mr. CONKLING. No, sir; I assumed that the actual acreage now irrigated was irrigated in 1907 and 1908.

Senator McFARLAND. I just do not want to cross-examine on that kind of testimony, Mr. Chairman.

That is all.

Senator ANDERSON. I do not have very clearly in my mind this 200,000-acre-foot gain. Take the spot at Gillespie Dam that you have there. You show some salt cedars up the river.

Mr. CONKLING. That is right.

Senator ANDERSON. I am trying to gain 200,000 acre-feet. Never mind the rest of it. How do we get that? I grant you that these salt cedars evaporate out that much water.

Mr. CONKLING. Yes.

Senator ANDERSON. How do you save that water by killing the trees? What happens to that water?

Mr. CONKLING. That could be pumped back up and used. If you kill those trees the quality of your water is much improved because, as I say, they are taking out pure water, and that water would then remain in there.

But you have to take other steps to improve the situation in order to make that water good water.

Senator ANDERSON. Where would you put your pumps?

Mr. CONKLING. You can do it in several ways. I assume the first thing you would do would be to channelize the river and make a better channel so as to create a drainage situation.

Senator ANDERSON. That would not take out or put in salt, would it, by channelizing the river?

Mr. CONKLING. Well, probably even by that small act you would kill some of the phreatophytes because you would lower the water table.

Senator ANDERSON. What is the character of the water that would go into the channel? Where would it go in?

Mr. CONKLING. It would be just like an ordinary drainage ditch. The water would come in from the sides.

Senator ANDERSON. Where are you going to start putting it into the channel, at what point?

Mr. CONKLING. You would not put it into the channel. It would naturally flow into the channel from the side, because the water table is so high. If you channelized the river it would be just like digging a drainage ditch down there.

Senator ANDERSON. In other words, it would flow out through the soil.

Mr. CONKLING. Into the ditch.

Senator ANDERSON. What would be the character of that water, would it carry salt?

Mr. CONKLING. Oh, yes; that would be very salty water.

Senator ANDERSON. Very salty water?

Mr. CONKLING. Yes.

Senator ANDERSON. That flows on down toward Gillespie Dam?

Mr. CONKLING. Yes.

Senator ANDERSON. And it is that water you expect to save?

Mr. CONKLING. Not that water, because any water saved that way would be of too salty a character. That would be merely one step in the whole thing.

Senator ANDERSON. Then the pumping and channelizing of the river would not actually save any of the 200,000 acre-feet?

Mr. CONKLING. I only got to the channelizing of the river so far. That is the first thing that would be done. Then you could take your choice about how you were going to do the rest, but I assume the most direct way would be to then drain this whole area with drains and pumps.

Senator ANDERSON. But that drainage again would be salt water?

Mr. CONKLING. That would, until you get it clarified.

Senator ANDERSON. How would you clarify it?

Mr. CONKLING. By merely taking it on out and dumping it over Gillespie Dam, for a time.

Senator ANDERSON. When you dump it over Gillespie Dam it would still be the same water?

Mr. CONKLING. It would be bad water, it would not be good water.

Senator ANDERSON. Who uses that water?

Mr. CONKLING. Some people down below that pump 25,000 acre-feet, down in the Gillespie area. Now, that water would gradually be clarified.

Senator ANDERSON. By what process?

Mr. CONKLING. Because you would be taking it out faster than it came in and the better water would be coming in from the north.

Senator ANDERSON. Where would the better water come from?

Mr. CONKLING. From this whole groundwater basin up here which is overflowing. The reason these phreatophytes are there is because of the fact that the groundwater basin up here is over-full. It is spilling out of the groundwater basin into the phreatophytic area and creating the phreatophytes.

Senator ANDERSON. That water spilling over is what character of water?

Mr. CONKLING. That is on the average, about—in the 1940–44 period—I assume it was about half the salt concentration of this water down in here near Gillespie Dam. It is a simple drainage problem which is not dissimilar to the work over there on the Rio Grande.

Senator ANDERSON. It is coming out up above in this Salt River Valley?

Mr. CONKLING. It is coming out of the Salt River Valley.

Senator ANDERSON. It would be clear water, it would not be very salty?

Mr. CONKLING. Not as salty as this.

Senator ANDERSON. How does this water become salty?

Mr. CONKLING. Because of the——

Senator ANDERSON. What does it pass through?

Mr. CONKLING. What happens primarily is this: The water comes out of the mountain ranges with a certain concentration of salt. Then it is used for irrigation. In the irrigation or any evaporation process, only the pure H_2O is evaporated, leaving the salt in the water which is not evaporated. If the water comes out of the mountains with a salt content of one ton per acre-foot, if you have 200,000 acre-feet, say, for illustration, and if 100,000 acre-feet of that is consumed, then the salt content of the remaining 100,000 acre-feet is doubled. The salt content of the water which is left increases with the distance as you move down river, throughout the whole Southwest.

The problem here is to get more good water to go into the underground around the rim of the basin than is normal, or than would happen without this project that I proposed. Then we would take it out at Gillespie Dam fast enough so that it does not have a chance to accumulate salt in this pool above Gillespie Dam. The problem is quite simple when stated that way. You are merely going to try to create a salt balance there which will give good water all the way down.

Senator ANDERSON. I do not see where you get the 200,000 acre-foot saving then, by these salt cedars.

Mr. CONKLING. Well, you will stop them from evaporating the water.

Senator ANDERSON. They are evaporating salt out of bad water that is not usable, so what good is it to save it?

Mr. CONKLING. Well——

Senator DOWNEY. Mr. Chairman, I do not think they utilize the salt. They just utilize the water. They can live in salty water like Bermuda grass, or some other things, but they do not utilize the salt. They dispose of the water and leave the salt there.

Mr. CONKLING. If you would stop that disposal of water in that area, then your salt concentration would get down to one-half of what it is now. The reason that salt concentration exists is because of these phreatophytes.

Senator DOWNEY. Mr. Conkling, let me ask you this question: How much water running out of the basin does the Bureau of Reclamation find it necessary to preserve a proper salt balance? How much extra water do you have to use to wash out the salt to keep a proper salt balance?

Mr. CONKLING. By bringing in Colorado River water and by bringing in too much Colorado River water, they say that 370,000 acre-feet has to go out of the basin to maintain the salt balance. The Colorado River water has almost twice as much salt content, practically twice as much salt content on the average as this water in the Maricopa unit. So you have to get rid of twice as much water to maintain the salt balance.

Senator DOWNEY. What is the figure that you fix as to the amount of water that would be required to drain out of the basin to maintain a proper salt balance?

Mr. CONKLING. I would have to figure that.

Senator DOWNEY. Is it about 150,000 acre-feet?

Mr. CONKLING. Well, I can give it to you in just a minute, if you will allow me to figure it.

Senator DOWNEY. Let me ask this: Whatever that quantity is, that "*X*" quantity, at least the water that would no longer be consumed by your salt cedar growth, if that were destroyed, would be available to help maintain your salt balance, is that right?

Mr. CONKLING. That is right.

Senator DOWNEY. Among other purposes?

Mr. CONKLING. That is right.

Senator DOWNEY. In other words, every year we would assume those salt cedars take six or seven acre-feet per acre, a total of something over 200,000 acre-feet of actual water that they eliminate out of that drainage basin, is that correct?

Mr. CONKLING. That is correct.

Senator DOWNEY. If they could be destroyed by one method or other, you would have that much water there available to do with what you wanted?

Mr. CONKLING. That is right.

Senator DOWNEY. Is it true that there are certain rather salty springs in Salt River which tend to give it an excess of salt?

Mr. CONKLING. The United States Geological Survey has made a report on that, which report states there are springs above Roosevelt Dam which discharge very salty water into the Salt River and maintain the salt content at a high rate. They have proposed an investigation of that to see whether it would be feasible to divert those springs elsewhere to keep them from getting into Salt River. It might be by pumping over some divide, or a pipe line down past the Phoenix area.

Senator ANDERSON. That would further deplete the river, would it not?

Mr. CONKLING. It would deplete it of something that is very obnoxious. It would help the river supply because it would do away

with part of the necessity of wasting water to maintain the salt balance. If you could get rid of half the salt in the Salt River, then you would have to waste only half as much water to maintain the salt balance.

Senator DOWNEY. Let me ask this question:

Under the plan you propose in years of drought you would expect the water level to be decreased or lowered by a certain amount, enough to make up whatever additional water you need to overcome the drought, is that correct?

Mr. CONKLING. That is true, yes. It would have to be drawn from underground storage.

Senator DOWNEY. Assume that in doing that you dropped your storage, we will say, from 100 feet to 110 feet in depth. Would that water which you pumped from the level of 100 to 110, instead of from level to 100, be any more salty?

Mr. CONKLING. No.

Senator DOWNEY. It would be just the same water, would it not?

Mr. CONKLING. The same water.

Senator DOWNEY. Is it not true that generally speaking it is a rather pure quality of water so far as salinity is concerned.

Mr. CONKLING. No, I will not say it is a pure quality of water. It is relatively pure for this country.

Senator DOWNEY. Is it relatively purer than the Colorado River supply on the whole?

Mr. CONKLING. Oh, yes.

Senator DOWNEY. I am not talking about any particular wells, but taking the basin supply as a whole, does it have less salinity than the Colorado River?

Mr. CONKLING. About half the salinity of the Colorado River, taking the Maricopa unit by itself.

Senator DOWNEY. Then if you were to replenish the irrigation supply during the particular year by pumping out of the underground a greater amount of water than you would in an average year, you would not thereby increase the amount of salinity in the water?

Mr. CONKLING. No.

Senator DOWNEY. Would your problem not be to pump enough additional water so that you would have enough of a stream to wash your salt down past Gillespie, and on down the river?

Mr. CONKLING. That is correct.

Senator DOWNEY. And if you pumped enough and had enough extra, whether it was 150,000 or 250,000 acre-feet of water you would maintain your salt balance, would you not?

Mr. CONKLING. That is correct. As a matter of fact, the water that would get into the underground through this plan would be much less saline than the water now getting into the area on the whole, because we would be taking these surplus waters, the floods which are much less concentrated in salt content and which are now going into the ocean. These would be put underground in the Maricopa Basin. That in itself would gradually help the underground situation in the Maricopa Basin, much more than by bringing in Colorado River water. You would have a better quality of water underground in the whole Maricopa Basin than you could possibly achieve by bringing in Colorado River water.

Senator DOWNEY. Now, just to let me sum up your theory as I have understod it from your testimony and conversation with me.

It is your contention, based upon data developed by the Army engineers, and by the USGS, that you do have cyclical periods of excess flow and drought in this great basin; is that correct?

Mr. CONKLING. That is correct; yes, sir.

Senator DOWNEY. And that over a long period of years you have assumed, because of the very excess flow going as high as 5,000,000 acre-feet in 1 year, there is an average annual loss that is not caught, either in irrigation or by surface storage, of about 500,000 acre-feet; is that correct? I think you used the figure of about 470,000.

Mr. CONKLING. That is the part that could be saved. The loss is much more than that.

Senator DOWNEY. That is the part that could be saved?

Mr. CONKLING. Yes.

Senator DOWNEY. You think that by pumping out during the meager drought years and lowering the underground reservoirs, you would have the result that those reservoirs would be equated and equalized during the period of excess flows?

Mr. CONKLING. Yes, it would be using groundwater in the same way as a surface reservoir of the magnitude of Hoover Dam or Lake Mead. It equates the surplus years over into the years of deficiency.

Senator DOWNEY. Mr. Chairman, I do think there is one major deficiency in this presentation so far. I think we should be prepared, when we return, to show the specific data that we maintain has been developed by governmental agencies, showing the excess and deficient flow over this long period, that we claim may be equated by drawing upon the underground reservoirs. We will be prepared to do that.

Senator MCFARLAND. Mr. Conkling, do you have the data he is talking about?

Mr. CONKLING. I do not have it here. It is in Los Angeles.

Senator MCFARLAND. How long would it take you to get it?

Mr. CONKLING. I don't know. It would take several days, I suppose. It may not be in good shape to present now, I do not know. It would have to be worked out and put in good form.

Senator MCFARLAND. These witnesses come here, Mr. Chairman, to present data for us to rebut. We can go on with this thing indefinitely. I will concede the witness does not have much data to back up what he says, but I would like to test his memory on one or two things to see if he has this much data.

What is the salt content of the Colorado River at the present time?

Senator DOWNEY. At what point, please, Senator?

Senator MCFARLAND. Well, we will say at Lake Mead.

Mr. CONKLING. I do not know. I adopted the 1.1 tons per acre-foot which the Reclamation Bureau says will be the salt content of the river.

Senator MCFARLAND. What is the salt content of the Salt River at, we will say, Granite Reef at this time?

Mr. CONKLING. The Reclamation Bureau adopts .65 of a ton per acre-foot.

Senator MCFARLAND. You do not know yourself what it is?

Mr. CONKLING. I used the Reclamation Bureau figures.

Senator McFARLAND. What salt content of the water did you figure when you were talking about making these diversions from the Salt River over to the Pinal County unit?

Mr. CONKLING. Whatever it is.

Senator McFARLAND. That is not an answer.

Mr. CONKLING. All right, let's call it 65, then, that is point 65. I assumed the diversion would be enough for consumptive use plus the necessary amount for salt balance.

Senator McFARLAND. On these diversions you are talking about in the surplus periods, have they diverted all the water they could during those periods and put it on the land?

Mr. CONKLING. Diversion sufficient for their purpose was allowed as a prior right.

Senator McFARLAND. You are talking about the storage of this water. You do not know what that is?

Mr. CONKLING. I don't know what that is?

Senator McFARLAND. How much was diverted during those years.

Mr. CONKLING. Yes, I know how much was diverted.

Senator McFARLAND. How much was diverted?

Mr. CONKLING. In the Salt River Valley so much was diverted that they had a salt drainage problem. They had a very difficult time due to diverting too much water.

Senator McFARLAND. In other words, your testimony now is that they did store all the water they could?

Mr. CONKLING. Underground?

Senator McFARLAND. Yes.

Mr. CONKLING. They put a lot of water underground and swamped themselves out. That is not the place where it is needed. It is needed some place else.

Senator McFARLAND. Where are you going to put it?

Mr. CONKLING. Over to the west.

Senator McFARLAND. What do you mean, over to the west?

Mr. CONKLING. Well, west of the Agua Fria area there.

Senator McFARLAND. You are going to take it down there and put it underground?

Mr. CONKLING. Yes.

Senator McFARLAND. Have you made any study of how much water could be conserved by these methods over on the California side?

Mr. CONKLING. Yes. Not in that exact sense, no, but that is automatically done over on the California side. Are you talking about the Coastal Plain?

Senator McFARLAND. Right over on the other side of the river there where you find the salt cedars.

Mr. CONKLING. I do not know anything about the situation in the Imperial Valley.

Senator McFARLAND. Would you advocate this conservation method for that part of the country over there?

Mr. CONKLING. No, I do not think it is feasible there.

Senator McFARLAND. You do not think it is?

Mr. CONKLING. No, they do not have a ground-water basin such as this, as I understand it.

Senator McFARLAND. Well, they have salt cedars over there, do they not?

Mr. CONKLING. I do not think the analogy follows.

Senator McFARLAND. They have salt cedars along the river before you get over to the Imperial Valley, have they not, from Blythe on down?

Mr. CONKLING. I have heard so, I have not studied that situation.

Senator DOWNEY. Mr. Chairman, if the Senator would allow me to make this statement:

The USGS report does indicate the possibility of saving 500,000 acre-feet of water from Boulder Dam down on the Arizona side, and 500,000 acre-feet from Boulder Dam down on the California side. That is the USGS suggestion, by the destruction of excess growth along the river.

I do think that as a part of this hearing this committee certainly as a constructive matter ought to give that their attenion and explore that. If we do believe it is possible as the USGS seems to indicate. I think we ought to take some action.

Senator ANDERSON. That would take care of part of the water going to Mexico, would it not?

Senator DOWNEY. It certainly would. It might be very helpful to the whole basin, if that could be done.

Senator McFARLAND. You spoke of the salt springs up there. Did you ever see them?

Mr. CONKLING. No, I never have. I got that entirely from the United States Geological Survey.

Senator McFARLAND. As a matter of fact, you took most of this testimony from the Geological Survey?

Mr. CONKLING. I used their records here.

Senator McFARLAND. You come to conclusions from data of the Geological Survey and the Reclamation Service?

Mr. CONKLING. Yes, pretty largely from data they made available.

Senator McFARLAND. Have you made any study of other areas on different tributaries of the Colorado River as to what could be saved on those tributaries?

Mr. CONKLING. No.

Senator McFARLAND. If this same process was used, it is possible that we might have more water than we need, is that so?

Mr. CONKLING. I doubt it, but I cannot answer the question.

Senator McFARLAND. Have you made any study as to how to save the million acre-feet being wasted in the Salton Sea, or approximately that amount each year?

Mr. CONKLING. No, I have not. I understand when the upper basin people want to use that water they will take it.

Senator McFARLAND. Take the 1,000,000 acre-feet, is that your understanding?

Mr. CONKLING. That is my understanding.

Senator McFARLAND. So you do not plan on using the present amount of water being used in the Imperial Irrigation District, in the future?

Mr. CONKLING. Now you are getting beyond my depth. I have studied the central Arizona project. I am willing to answer questions about anything I know very much about, but I have not been in touch with the Colorado River proper since 1921 or 1922.

Senator McFARLAND. That is all.

Senator DOWNEY. I think there are no further questions.

Senator ANDERSON. That is all, thank you.

Senator DOWNEY. We already have agreed to adjourn over until a week from Tuesday.

Senator ANDERSON. Yes.

Senator MCFARLAND. I think if the witness would mail to the committee within the next few days any data that he has, we would have something to rebut.

Senator DOWNEY. Mr. Chairman, I do not think that is possible. As I understand, there are a great many of these USGS reports from which certain conclusions have been drawn. We will get up a statement to put in the record in the best form we can.

(Data mentioned appear in the appendix to the witness' prepared statement commencing at p. 553 hereof.)

Senator MCFARLAND. I am sorry you bring a witness here who does not have data to support himself but just speaks out of a clear sky, and we have to wait until he goes home to see if he can find something else.

Senator DOWNEY. Senator, I had but little hope our witnesses would satisfy you.

Senator MCFARLAND. I would expect them to back up their testimony with some facts.

Senator ANDERSON. We will stand in recess until April 26th, at 10 a. m.

(Whereupon, at 3:35 p. m., the hearings in the above matters were adjourned until Tuesday, April 26, 1949, at 10 a. m.)

(The complete statement of the witness with maps, graphs, and appendix is as follows:)

WASHINGTON 5, D. C., *May 5, 1949.*

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
Senate Office Building, Washington, D. C.

DEAR SENATOR O'MAHONEY: Near the conclusion of Mr. Harold Conkling's testimony before your committee on April 14, it was requested by Senators Downey and McFarland that Mr. Conkling supply certain supporting data and analyses for the record. Accordingly Mr. Conkling has prepared detailed operating studies and other data which are compiled in an appendix enclosed herewith.

There is also enclosed a corrected copy of Mr. Conkling's statement, to which the appendix material is attached. In view of the fact that the presentation of Mr. Conkling's statement was interrupted by cross examination, it is respectfully requested that his statement be printed in full in the record together with the map and graphs included in this statement which were referred to in his testimony.

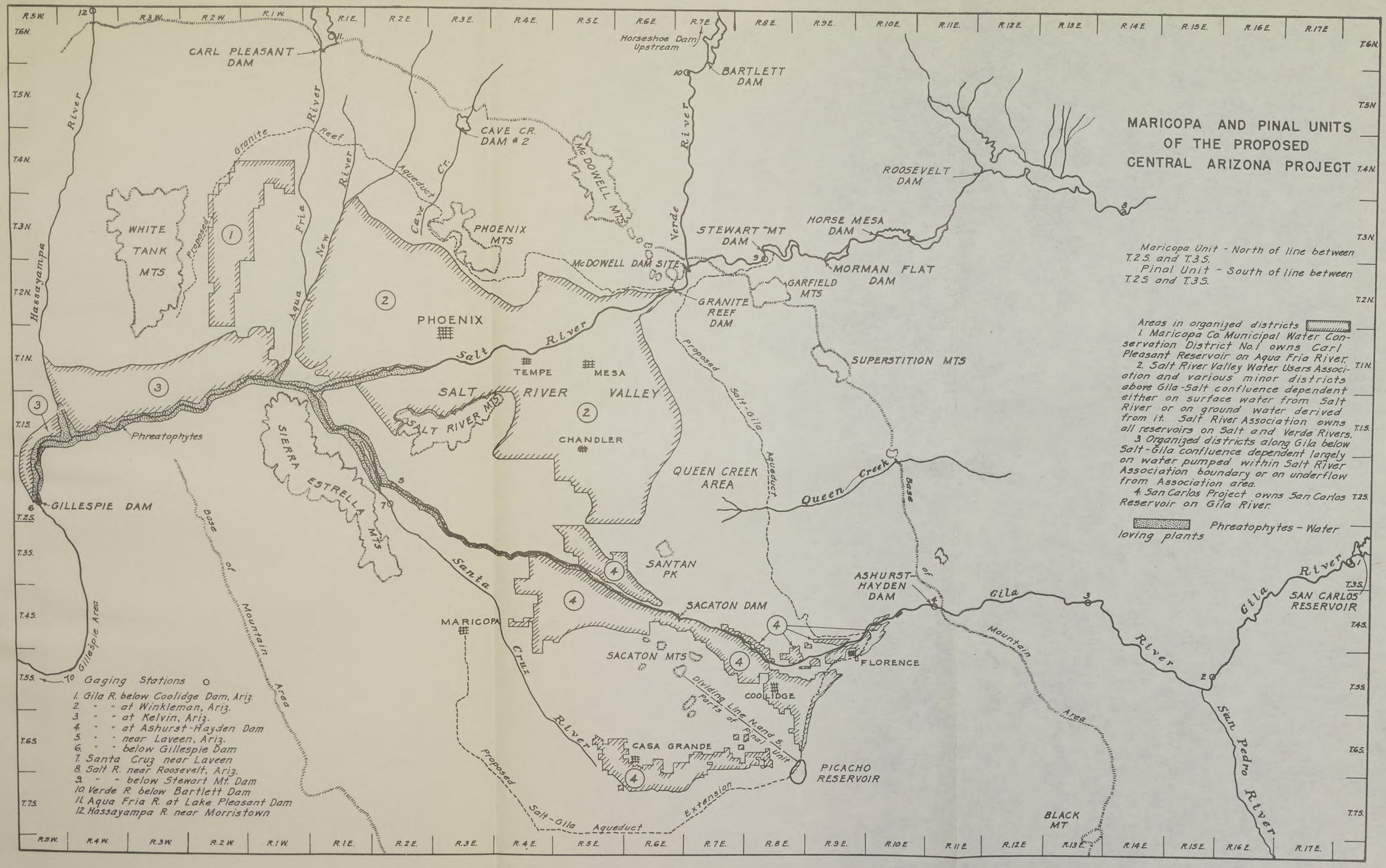
Very truly yours,

NORTHCUTT ELY.

STATEMENT OF HAROLD CONKLING, CONSULTING ENGINEER, CALIFORNIA STATE COLORADO RIVER BOARD BEFORE SENATE COMMITTEE ON INSULAR AND INTERIOR AFFAIRS RE S. 75

I have spent about 4 months with capable assistants in studying the water supply of the Maricopa and Pinal units of the central Arizona project. It is to these units, around Phoenix and to the south in the Gila River area, that the Bureau proposes to bring water from the Colorado River. The investigation was directed toward an estimate of the deficiency and the possibility of salvaging flood wastes and waste due to evaporation and transpiration in the swampy portions of the general project area.

Salvage of flood waste requires large reservoir capacity. It was found that the economically usable reservoir capacity underground in this area is at least 50 percent more than that of Lake Mead on the Colorado River. Lake Mead is the largest man-made conservation reservoir in the world. Its capacity is over 30,000,000 acre-feet. The underground reservoir available for the area under discussion has a capacity of 45,000,000 acre-feet within feasible pumping



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lift. The Reclamation Bureau proposes to lift water 985 feet from the Colorado River, so evidently it believes it is feasible to pump water 985 feet for use in irrigation. If that criterion were applied to the underground reservoir with which we are dealing, it is quite possible that there are well over 300,000,000 acre-feet of water stored underground in this valley which can be drawn on when needed.

Underground reservoirs are a most important item in the utilization of the erratic supplies of southwestern United States. Every individual who pumps water is utilizing underground reservoirs. Not only in the valleys here under discussion, but generally in the Southwest, they are of immense capacity and capable of tiding over any conceivable period of shortage in surface water. The underground reservoir in the area under discussion is being drawn on now because of drought. In the Southwest such droughts alternate in a cyclic rhythm with periods of surplus in which surface and underground reservoirs are again filled to the brim. The underground reservoirs must be much more fully utilized if the local water is to be salvaged. This is being done elsewhere with success. The plan of development in the Central Valley project of California leans heavily on conserving water thus.

It was also found that, with present development, average annual flood waste out of the area during the period 1897–1943 is about 470,000 acre-feet per year or more. Waste from the swampy areas in the lower parts of the project area is estimated to be an annual average of 270,000 acre-feet, giving a total waste of 740,000 acre-feet. Even during the recent 1940–44 base period used by the Bureau of Reclamation, flood wastes out of the project area past Gillespie Dam averaged more than 200,000 acre-feet annually.

It was also found that there is no long-time average deficiency of water in the Maricopa unit of the Phoenix area for the 1940–44 acreage. A cyclic drought has endured in the region since 1921. The huge ground-water storage is there to tide over such a drought, and it is being drawn on. The 1940–44 acreage is mentioned because it is part of the "rescue" project proposed by the Bureau. Instead of deficiency, the estimated surplus of water is approximately sufficient even if no flood waste are salvaged to supply the needs of the entire 441,000 acres in the Maricopa unit which in its 1947 report the Bureau proposes to irrigate. Furthermore, it was found possible to salvage enough of the wasted floodwater to complete a full water supply to the full 150,000 acres in the Pinal unit that the Reclamation Bureau proposes to irrigate in that unit as set out in its 1947 report.

Furthermore, the water which would be salvaged is of better quality than the Colorado River water so that the water users would benefit from that standpoint, also. Less must be wasted for salt balance. The Bureau estimates that about 17 percent of the water which it proposes to pump a vertical distance of 985 feet will be lost in transporting to the area of the project under discussion. This fact, together with the smaller waste for salt balance, indicates that 100 acre-feet of local water will irrigate the same number of acres as 130 acre-feet of Colorado River water at the point of diversion from the Colorado River.

Furthermore, Colorado River water is potentially usable at any place in the Colorado River Basin, while central Arizona water is usable only in Arizona and to a limited extent in Mexico. The Bureau's plan proposes to use only a small part of the local waste. Thus, the alternate plan herein proposed is important to the whole Colorado River Basin, because the Bureau's plan would allow most of the waste I have mentioned to continue.

The salvage of sufficient local water could be accomplished at about one-third the capital cost of the Bureau's project and for an even smaller proportion of the operating cost.

The plan can be stated briefly. It is proposed to salvage the loss in the swampy portions of the project area and use the water thus salvaged for irrigation. It is also proposed to salvage the flood wastes from the project, not at the lower levels but by regulation in the huge surface reservoirs already in existence on the streams tributary to the project area. The water thus regulated would be diverted for direct use in irrigation, or placed in the underground reservoir.

The data on which the plan is based are the data which the United States Geological Survey has gathered as to stream-flow and ground-water conditions. It is based, also, on data in the report of the Bureau of Reclamation on the central Arizona project dated 1947. It is based also on data in the report of the United States engineers on the Gila River dated 1945.

The plan which will be proposed has no new elements in it. Everything proposed is an old story and is common practice in California. The plan is on a

larger scale than any salvage project of the same nature which has actually been consummated, but not on a larger scale than is proposed in central California. When in 1920 our studies of the water supply of the Colorado River indicated that a bigger reservoir and a higher dam than any ever constructed before was the proper solution, the dam designers tackled the problem and solved it. The beautiful structure at Black Canyon and the water behind it are the result.

I have tested this plan from every approach I could think of. I am sure now that the conclusions are perhaps overly conservative. Probably more local water is available than the amount necessary to irrigate the entire acreage proposed by the Bureau in its plan for the two units under consideration, but the plan does not go further than that.

I think that you should know something of my background, training, and experience, and have prepared a brief statement of it which I shall submit to you. Briefly, the highlights are:

I was 11 years with the United States Reclamation Bureau, 1911–21, during which I studied development of the Rio Grande River above El Paso; the Colorado River; the Humboldt River in Nevada; the Boise and Snake Rivers in Idaho; the North Platte River in Colorado, Wyoming, and Nebraska; and Owens Valley-Mono Basin in California. During my last 2 or 3 years with the Bureau, Mr. Debler was my principal assistant. He is now a consulting engineer of Denver and is retained by the State of Arizona.

I left the Bureau in 1921 and got a job with the State Division of Water Resources of California. One learns about underground water if he works with water in California, because it is through utilization of it that the State's agricultural development has become so large. And this is the only area where such utilization is large. I was with the State working entirely on water-supply and underground-water developments until May 1945. I then left the State service and entered private practice.

The problem with which you deal here now is only one of many which you have before you. Yet it is an important one from two broad standpoints. The first of these is the desire to preserve the welfare of the State of Arizona because the supply of water available is limited and there is a large area of fertile land. The second is the fact that according to the Reclamation Bureau there is a demand in the Colorado River Basin for 25 percent more water than there is available. It is important that all supplies which cannot be used elsewhere in the basin be conserved.

I have entered into this study primarily because I am interested in water problems. The report I am to give you is based on physical facts recorded by the Federal agencies above noted or basic conclusions of those agencies. It has nothing to do with legalistic interpretations of the compact. The contest between Arizona and California does not need to be considered during the discussion. If we can divorce ourselves from that, the physical facts can be better considered on their merits.

The area under discussion has been divided into the Maricopa unit and the Pinal unit by the Reclamation Bureau, and that same division is used herein for the purpose of analysis. This portion of the central Arizona project occupies parts of Maricopa and Pinal Counties. The dividing line between the two units is the county line. From the east this runs westward along the line between townships 2 south and 3 south to the line between ranges 1 east and 2 east. It then goes northward to the next township line and then westward.

The Maricopa unit had 395,000 irrigated acres in 1940–44, and the Pinal unit had 124,000—a total of 519,000 acres. However, immediately south of the Pinal unit is a large body of irrigated land to which the Bureau does not propose to furnish water. It is understood that the area irrigated, outside of the old-established districts, has increased since 1944. This increase has been almost wholly in lands irrigated by pumps.

In the established old districts having a surface-water supply there were about 380,000 irrigated acres in 1940–44. In addition, about 15,000 acres outside these districts have been irrigated for some time past from wells only. So a part of the trouble comes from about 115,000 acres inside the project area, but outside the older districts which began exploitation of the ground water about 1936, plus other acres outside irrigated since 1944.

The Bureau terms its project a "rescue" project necessary to furnish a supply to the 519,000 acres irrigated in 1940–44. It, however, proposes to bring in sufficient additional water to irrigate 72,000 acres more, or a total of 591,000 acres. The latter is here called the project and the former the rescue project.

The frontispiece outlines the areas which have a surface-water supply. It also show the Gillespie Dam which is the western limit of the project for analyses of ground-water supply. Below that is the Gillespie area of about 14,000 acres watered by diversion at Gillespie Dam and a canal about 45 miles long.

The map also shows other principal features. It shows the reservoirs on Salt and Verde Rivers, Agua Fria River, and Gila River, which have capacity as follows:

	Acre-feet
Salt and Verde Rivers	2,162,000
Agua Fria River	178,000
Total	2,340,000
Gila River	1,200,000
Grand total	3,540,000

It shows Granite Reef Dam where diversion is made from Salt River to the Salt River Water Users' Association and Ashurst Hayden Dam where diversion is made from Gila River to the San Carlos project. It also shows the location of the Colorado River conduit. It also shows the approximate line of the toes of the mountains which bound the general area. It also shows the swampy areas in the western end of the project area.

The valley is filled with alluvium to an unknown depth. From it obtrude occasional tops of mountains now almost submerged by alluvium. Some of these are shown on the map. Except very near the mountains, wells have not penetrated to the bottom. Most wells drilled in recent years are 500 to 600 feet deep, but some are 1,000 feet deep.

Depth from the surface of the ground to the surface of the water underground is shown on the map. The average is 103 feet for the Maricopa unit and 78 feet for the Pinal unit. It is evident that although a drought has been in existence since about 1921 the content of the underground reservoir has only been slightly depleted. There are hundreds of feet of saturated alluvium beneath the water table, which is the term applied to the surface of the saturated alluvium, and many millions of acre-feet of water in its 15 percent void space.

The water in this underground reservoir comes from percolation of the streams entering the area, from precipitation on the valley floor, and from deep percolation from irrigated lands.

The water in the underground reservoir is not stationary. It is moving slowly toward a point where it can escape. The escape must equal the recharge over any long period of time.

It escapes much as the water of a surface reservoir escapes over the spillway when the reservoir is overfull. In this whole alluvial valley, the underground water is moving from all parts toward the focal point of escape which is the gap in the geological formation across which Gillespie Dam is built. Long before it gets to this point the cross-section of the alluvium through which the underflow must pass becomes too small for the converging flows which are moving toward it as from the outer portion of a fan. The water must come to the surface. It has thus created swampy areas where it is estimated by the United States Geological Survey that from 225,000 to 350,000 acre-feet of water are being evaporated by the growths of water-loving vegetation which occupy them.

This swampy area covers approximately 48,000 acres along the stream bottoms as shown on the map. This area is taken from aerial photographs made in 1937 and in 1947.

The ground surface is sloping upward in all directions from the swampy area. The water table—the surface of the saturated alluvium—is also sloping upward at a flatter slope so that, with distance from the swampy area, depth of the water table from the ground surface increases.

As before stated, the map shows the average depth from ground surface to water table in each township in the area. These are determined by measurements made by the United States Geological Survey in the fall of 1947 and illustrate the gradually increasing depth to water with distance from the swamps.

The important point that this map shows is that water is available to every water-user actual or potential. He has merely to tap it with a well.

Another important point can be deduced from this map. If the water table keeps on receding, the outflow into the swampy area will decrease. If the water

table went down far enough, the outflow would cease entirely. The the swampy areas would cease to exist, and that additional amount would be available to the water-users.

This would increase the pumping lift in the outer portions of the project area so much that water-users could not stand the expense. The lift would be 400–500 feet for them and gradually decrease with nearness to the swampy areas. The average would possibly be about 300 feet.

Another difficulty would be encountered. Water in the streams contains more or less salt. In the processes of irrigation, water is evaporated and the salt content increases. Some water must go out of the underground supply to carry out the salt, because at too great concentration it is detrimental to crops. Maintenance of salt balance is extremely important in these desert regions. An irrigated area needs what may be termed a sewage outflow to drain out the salts in the water just as a municipality needs a sewage outflow to drain away its waste products.

It should be understood that I am not advocating that the water level be pumped down as just discussed. The discussion does, however, bring to light what this claim of shortage is largely about. It is really not based upon lack of water. It is based on cost of pumping. It will be noted that if the water table were lowered 300 feet further in the Maricopa unit, at least 200,000 acre-feet of water would become automatically available. That is enough for 57,000 acres plus outflow for salt balance. The Bureau proposes to lift water 985 feet from the Colorado River in order to maintain the water table in these two units about 20 feet higher than the 1947 elevation. This lift is to be completely subsidized. The water-user is not to pay any part of it. This raises a question. If the water-user is to be subsidized, would it not be better to subsidize his comparatively small pumping costs from ground water rather than to subsidize the much higher lift proposed from the Colorado River?

However, as I shall show later, it will not be necessary, in order to utilize local supplies, to pump water from underground anywhere near 300 feet on the average. As a matter of fact, the average would be only about 143 feet.

Let us now turn to the diagrams on plates 2 and 3. They illustrate the cyclic character of stream discharge entering the Phoenix area. This varies in what may be termed "cycles" for want of a better term. That is, on balance, the discharge may be subnormal for a long period of years in succession, but in occasional years of the period, the discharge will be above normal. Alternating with these periods are long periods with opposite characteristics. Most of the years will have above-normal discharge, but in some years it will be below normal. The same "cyclic" condition is shown by records in southern California and by the cyclic rise and fall of the elevation of Salt Lake in Utah. It prevails throughout the Southwest.

On plates 2 and 3 are shown graphically the alternating cycles for the period of recorded run-off of the Salt and Verde Rivers combined above Roosevelt and Bartlett Reservoirs, respectively, and of the Gila above San Carlos Reservoir. The discharges at these points are unregulated flows. The percent variation from average should be the same as for the larger flows at the points of diversion for irrigation. However, the flows at those diversion points are regulated by reservoirs and are difficult to use for the purpose of these plates.

The cyclic variations as shown by these plates are as follows:

Gila River above San Carlos Reservoir, plate 6			Salt and Verde above Roosevelt and Bartlett Reservoirs, plate 5		
Period	Number of years	Percent of long-time average	Period	Number of years	Percent of long-time average
1868 to 1873 [1]	6	45.2	1889 to 1891 [2]	3	185.7
1874 to 1891	18	163.8	1892 to 1904	13	53.2
1892 to 1904	13	34.7	1905 to 1920	16	148.1
1905 to 1920	16	193.2	1921 to 1946 [3]	26	83.9
1921 to 1946 [3]	26	67.3			

[1] Beginning of estimate by Corps of Engineers, War Department.
[2] Beginning of record.
[3] Discharge of 1946, last record available.

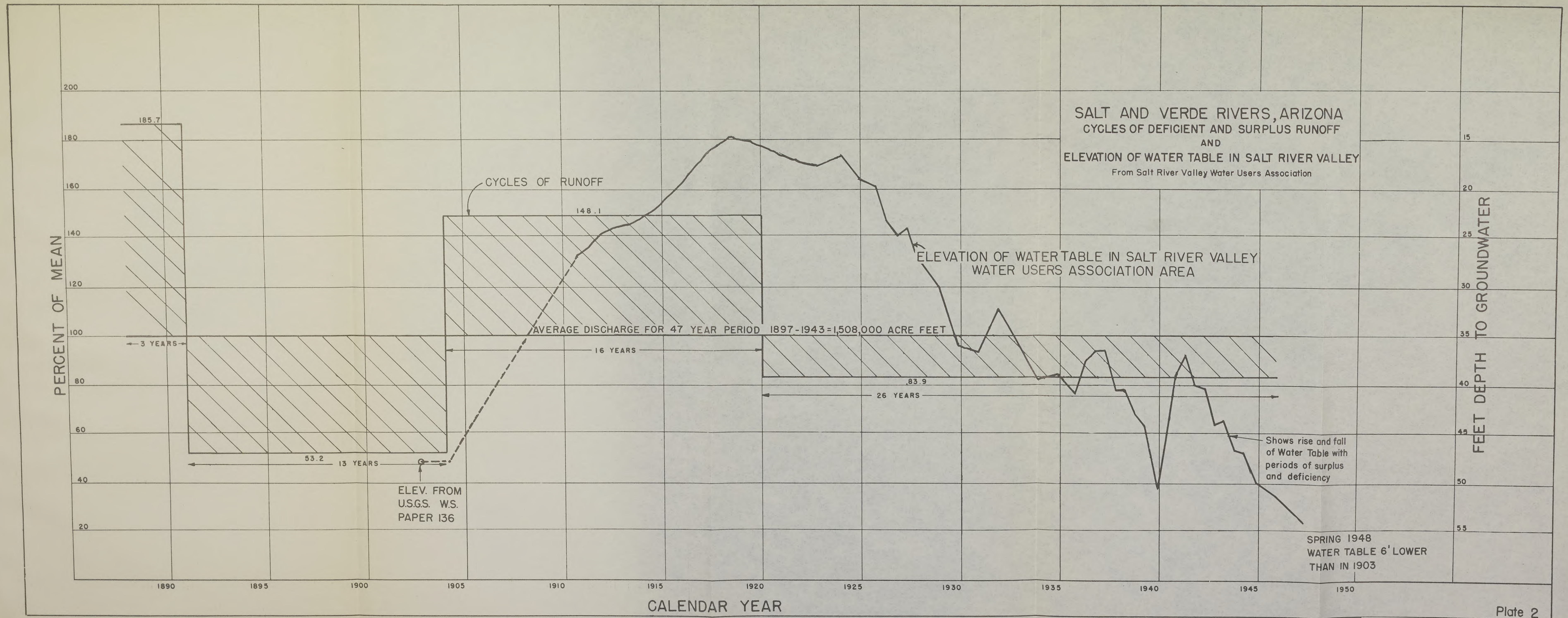
SALT AND VERDE RIVERS, ARIZONA
CYCLES OF DEFICIENT AND SURPLUS RUNOFF
AND
ELEVATION OF WATER TABLE IN SALT RIVER VALLEY
From Salt River Valley Water Users Association
PERCENT OF MEAN
FEET DEPTH TO GROUNDWATER
CALENDAR YEAR
185.7
CYCLES OF RUNOFF
148.1
ELEVATION OF WATER TABLE IN SALT RIVER VALLEY
WATER USERS ASSOCIATION AREA
AVERAGE DISCHARGE FOR 47 YEAR PERIOD 1897-1943=1,508,000 ACRE FEET
3 YEARS
16 YEARS
83.9
26 YEARS
53.2
13 YEARS
ELEV. FROM
U.S.G.S. W.S.
PAPER 136
Shows rise and fall
of Water Table with
periods of surplus
and deficiency
SPRING 1948
WATER TABLE 6' LOWER
THAN IN 1903
200
180
160
140
120
100
80
60
40
20
15
20
25
30
35
40
45
50
55
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950

Plate 2

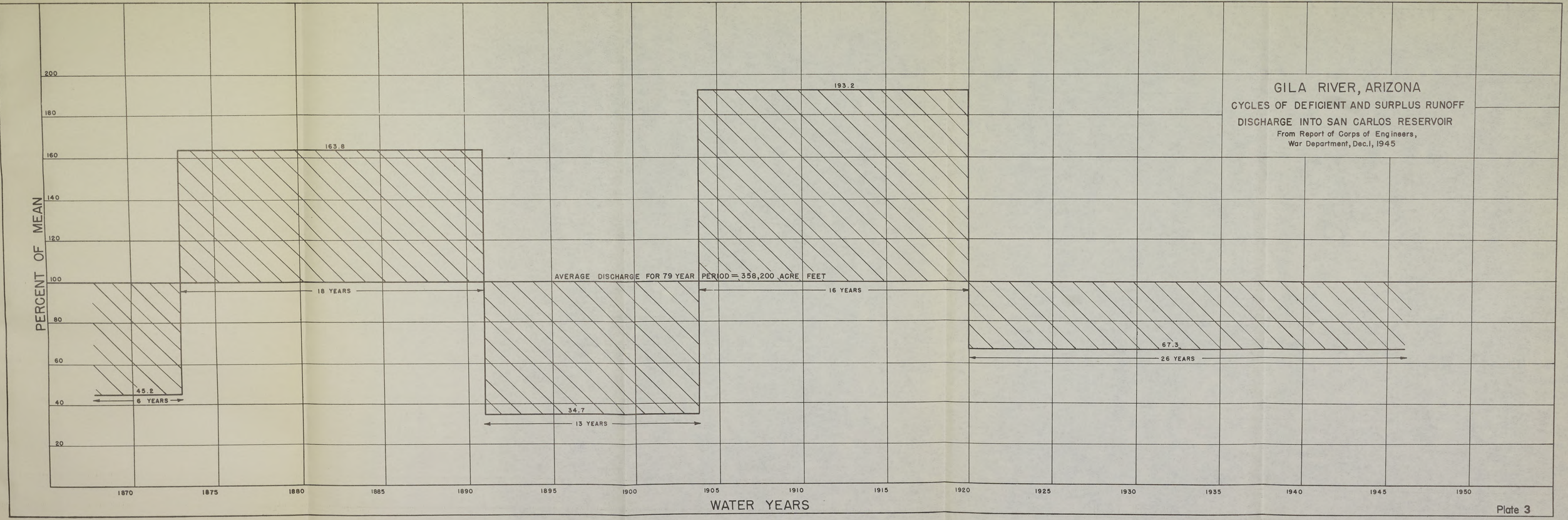

Plate 3

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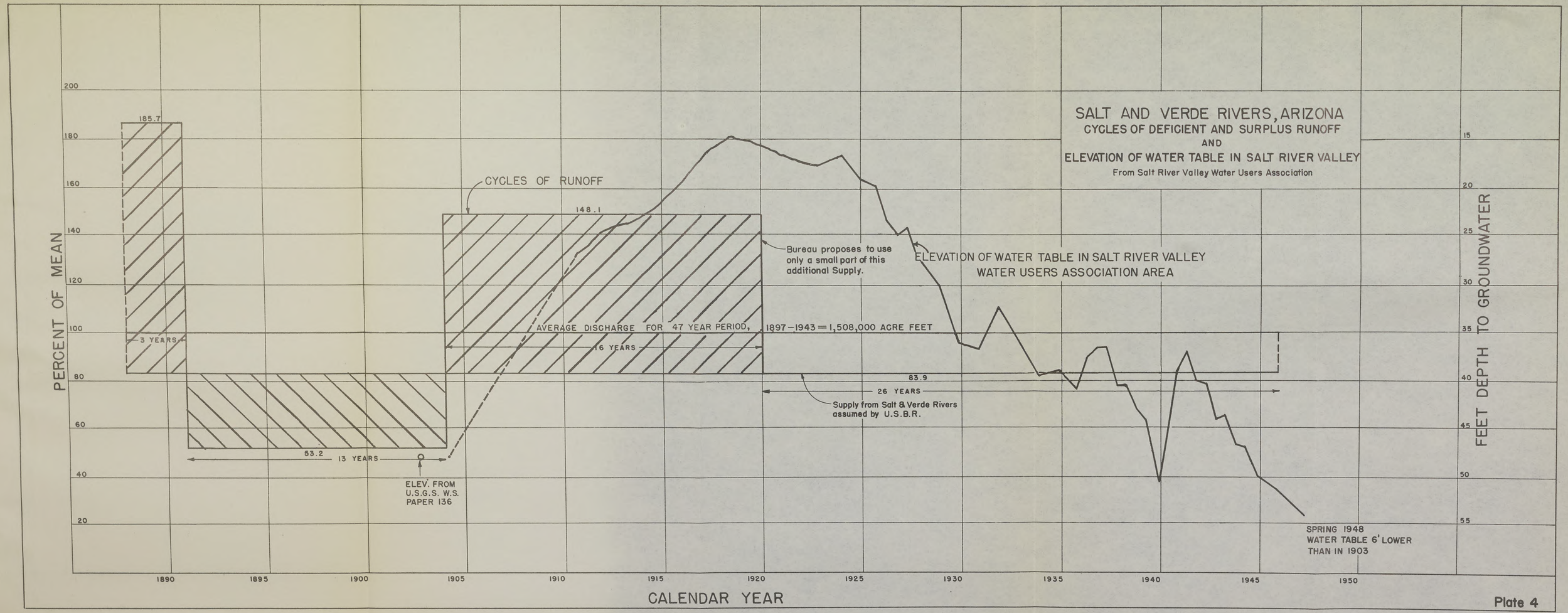

Plate 4

What is specially noteworthy is the fact that the region is in a drought which has prevailed for a long time. Yet the water in the ground-water reservoir is still at such high elevation that it is overflowing and supporting the heavy losses in the swampy areas.

Plate 2 also shows the rise and fall of the water table in the Salt River Valley Water-Users' Association area. In 1903 it was measured by the United States Geological Survey and stood about 48 feet below the ground surface. It probably lowered during the next year, inasmuch as that was one of severe drought.

By the end of 1947 it was 54 feet below the ground surface or only 6 feet lower than it was in 1903. In the interim it rose to a point only 20 feet below the ground surface. Much difficulty was caused by the saturated condition. Drainage was installed.

Measurements at wells in other areas of the two units under discussion are not available for as long a period as for the Salt River area. There is no doubt that the water table rose and fell in those areas in the same rhythm, although with less amplitude. This same rise and fall of the ground water with the weather cycle is a matter of common knowledg at other places in the southwest.

What this graph shows is that ground water reservoirs, as well as surface reservoirs, are replenished in periods of surplus and are depleted in periods of drought.

That is what has happened in the Maricopa and Pinal units of the central Arizona project. The underground reservoirs are being slightly depleted. The depletion will continue as long as the drought lasts, but by no possibility could the capacity of the underground reservoirs be more than scratched. When the surplus period comes, they will be recharged—the water table will rise.

There is still another natural cause for the recession of the water table which has nothing to do with a long-time shortage. The water table must recede when pumping from ground water begins, no matter whether the recharge of the ground-water reservoir is equal to the demand or not.

This occurs because ground water is not stationary. On the contrary, it is moving from the locus of recharge to the locus of escape. In a state of nature, recharge and escape are in balance over any complete cycle of drought and surplus. When pumping draft begins a new avenue of escape from the ground water reservoir is provided. The amount of escape at the natural location must decrease by the amount of the new draft. Rate of movement of the ground water toward the natural locus of escape is in proportion to the steepness of slope of the water table toward that point. The only way by which the rate of movement can decrease is by a flattening of the slope. The amount of water escaping at the natural locus is reduced as the slope flattens. Therefore the decrease in natural escape can be accomplished only by recession of the water-table elevation all the way from the locus of pumping to the locus of natural escape.

It will be noted from plates 2 and 3 that, on balance, drought conditions have existed since 1921. The Bureau bases its estimate of supply from the Salt and Verde Rivers on this drought condition and ignores the surplus periods. Actually the average annual discharge in the 16 years, 1905 to 1920, from the Bureau's estimate of supply, was almost a million acre-feet greater than the average annual discharge in the present drought period.

Actually, also, an annual average of a million acre-feet approximately would have spilled past Granite Reef Dam in the period 1905 to 1920. Actually over a million acre-feet spilled in the single year 1941, which was one year of large surplus in a period of drought.

During periods of surplus like that of 1905 to 1920 the owners of the reservoirs on the streams entering the two units need only a small part of the capacity of the reservoirs to give them a complete supply. The surplus capacity could be used to regulate the excess water and place it underground.

It is estimated that during a long time average period water could be diverted from what would spill otherwise as follows after Buttes Reservoir is constructed:

	Acre-feet
Salt and Verde Rivers	410,000
Agua Fria River	40,000
Gila River	90,000
Total	540,000

Some of this would have percolated above Gillespie Dam. It appears conservative to say that net salvage would be about 74 percent, or only 400,000 acre-feet. Probably it would be more.

In addition, the mere fact that less water was flowing in the streams would allow percolation of floods originating in streams not controlled by reservoirs. It is assumed that an annual average of 50,000 acre-feet would be conserved in this way, but for the sake of the computation this may be disregarded.

Without salvage of spilled floods but with salvage of waste from phreatophytes, it is estimated that there is an annual average surplus of about 200,000 acre-feet in the Maricopa unit for the 1940 to 1944 acreage, i.e., for the "rescue" project of the Reclamation Bureau. However, the surplus is in the area supplied by the Salt and Verde Rivers while other areas flanking it have a deficiency. Recession of the water table is greatest in the flanking areas. Due to this, even now water is moving underground from the Salt River Association areas to the flanking areas. This movement will increase in the next period of surplus, as it can be expected that the water table in the Salt River Association area will build up further and more rapidly than in the flanking areas. More and more of the deficient areas will come to be supplied thus. Thus will come about a natural correction of the maldistribution. All that is necessary to bring this about is to continue drawing on the ground water and let nature take its course.

This would probably go a considerable way in taking care of the rescue project of the Bureau in the Maricopa unit, but other measures would have to be taken to distribute the water for the larger acreage which the Bureau proposes to water in that unit. Furthermore, other measures are necessary to supply water to the Pinal unit.

Estimates of supply, as compared to demand in the Pinal unit indicate that, after Buttes Reservoir is built and with control of spills past Ashurst Hayden Dam as has just been outlined for Salt and Verde and Agua Fria Rivers, there will still be an average annual deficiency of 53,000 acre-feet in the supply for the 124,000 acres irrigated in 1940 to 1944 and an additional deficiency of 81,000 acre-feet in the supply for 26,000 acres additional, which the Bureau proposes to water in its report of 1947. The total is 134,000 acre-feet.

This could be supplied from the excess in the Maricopa unit by a canal diverting from Salt River at the point proposed by the Reclamation Bureau and following the same route to Ashurst Hayden Dam on the Gila River. This would be diverted in the regimen needed for irrigation.

The Gillespie area of 14,000 acres would also be taken care of out of the surplus.

The surface reservoir capacity already constructed on the Salt and Verde especially and on the Agua Fria is very large. During periods of surplus, such as that of 1905 to 1920, only a small part of the capacity is necessary for the owners of the reservoirs. The remainder could be utilized to equate the flood flows and regulate them for diversion to other parts of the Maricopa area. During such periods the needs of the higher lying parts of the project area could be supplied with surface water in the regimen of irrigation demand. The surplus over the consumptive use would percolate to the underground reservoir and replenish it.

Possibly some of the water thus diverted would have to be caused to percolate underground directly without use in order to replenish the underground reservoirs.

It is calculated that the average annual salvage of water which would otherwise spill from the Salt River at Granite Reef Dam and past the diversion dam on Agua Fria during the period 1905 to 1920 would be 1,010,000 acre-feet, and that 730,000 of it would have to go underground requiring underground storage capacity of about 12,000,000 acre-feet. The remainder could be used for irrigation direct. This would require that average elevation of the water table in the Maricopa unit would have to be 120 feet lower than that of the fall of 1947. Average pumping lift would be 143 feet.

Water would be salvaged from the Gila River for the Pinal unit in the same way as it would be salvaged in the Maricopa unit. About 4,400,000 acre-feet of underground storage would be required, and the total cyclic fluctuation required would be about 129 feet. Average lift about 113 feet.

It is necessary to discuss a detail of the Bureau's plan which was briefly mentioned previously.

The Bureau proposes to pump 1,200,000 acre-feet of water from the Colorado River 985 feet. According to the Bureau's estimates, 200,000 acre-feet of this will be lost on its way to the project. The Bureau states in the appendix of its report on pages C–113 and C–115 that, by bringing this water in, the water user will have to lift the water 70 feet less than he otherwise would. The water

user's cost of lifting the water this 70 feet is estimated by the Bureau at $2.41. In addition, there would be an average lift of about 80 feet in the project area.

Compare the 985-foot lift from the Colorado River plus the 80-foot lift locally with the average lift of about 143 feet in the project area estimated for the plan herein proposed. The Bureau would lift the water over seven times as high as would be necessary with the plan of local salvage. A corresponding waste of kilowatt-hours would occur.

There are 13 local items in the Bureau's plan which do not involve importation of Colorado River water. Their estimated cost is $194,475,000. These could go ahead regardless of importation of Colorado River water, and a great deal could be accomplished thereby. Additional water could be made available in New Mexico, the Tucson project could be built, reservoirs could be constructed on the Verde and Gila, the power plants could be built, and the swamps above Gillespie Dam could be drained.

The additional cost for this alternate plan would probably be in the neighborhood of 50 to 100 million dollars instead of the 540 million of the Bureau's plan.

It would require considerable study. There is no emergency in the project area so there would be time for study. It is specially imperative that the situation be observed during a few years of a surplus period. The entire complexion of the matter will have been changed and matters can be viewed in a more rational light than now.

SUMMARY AND CONCLUSIONS

About 500,000 acre-feet of water can be salvaged from wastes of local water. This is sufficient to furnish a complete supplementary supply of good water to the 591,000 acres in the Pinal and Maricopa units of the central Arizona project to which the Bureau proposes to furnish a supply.

There is no emergency. The water supply, as proposed by the Bureau's central Arizona project, can be secured locally at a fraction of the cost of the Bureau's project.

More important than the cost, however, is the possibility of salvaging local water which now wastes into the ocean. It can be used only in Arizona, and to a limited extent, in Mexico. The Colorado River water is potentially usable anywhere in the Colorado River Basin. The deficient supplies of the basin need to be conserved to the utmost.

If Colorado River water is taken to central Arizona, there will be no urge to save the local supplies and they may remain unsalvaged forever.

APPENDIX

AUTHORITIES ON WHICH CONCLUSIONS OF TESTIMONY ARE BASED

United States Geological Survey

Water Resources Branch, Division of Surface Water.

Reports giving records of stream discharge at all gaging stations in Gila River Basin:

Annual reports: No. 11, part 2, page 100; No. 12, part 2, page 311; No. 18, part 4, page 297; No. 19, part 4, page 420; No. 20, part 4, page 59; No. 21, part 4, page 382; No. 22, part 4, page 397.

Bulletins: No. 131, page 51.

Water supply papers: 33, 38, 39, 50, 52, 66, 75, 81, 85, 100, 133, 175, 211, 249, 269, 289, 309, 329, 359, 389, 409, 439, 459, 479, 509, 529, 549, 569, 589, 609, 629, 649, 669, 689, 704, 734, 749, 764, 789, 809, 829, 859, 879, 899, 929, 959, 979, 1009, 1039, 1049, 1059.

United States Geological Survey

Water Resources Branch, Division of Ground Water.

Water Supply Paper No. 136. Underground Waters of Salt River Valley. W. T. Lee. 1903.

Grand Water Resources of the Santa Cruz Basin, Ariz., 1943.

Geology and Ground Water Resources of the Salt River Valley Area, February 1947. Mimeographed.

Geology and Ground Water Resources of Paradise Valley, Maricopa County, Ariz. January 1947. Mimeographed.

Further Investigations of the Ground Water Resources of the Santa Cruz Basin, Ariz. 1947. Mimeographed.

90762—49——36

Annual Reports, Pumpage and Ground Water Levels in Arizona, 1946, 1947, Mimeographed.

United States Indian Service

Depth to water at wells, San Carlos project, 1934–48.
Crops raised and crop values.
Surface water diverted and water pumped.

War Department, United States Engineer Office, Los Angeles, Calif.

Interim report.
Flood control, Gila River and tributaries above Salt River, Ariz. and N. Mex., December 1, 1945.
Enclosures 7, 8, 10: Estimates of long-term seasonal precipitation and run-off of Gila River; safe draft on San Carlos Reservoir; reservoir yield studies.

United States Bureau of Reclamation.

Stream Flow of Lower Colorado River and its Tributaries, 1934. E. B. Debler, J. R. Riter, and A. F. Johnson.
Report on central Arizona project, December 1947.
Appendixes to report on central Arizona project.

SAFE YIELD OF MARICOPA UNIT GROUND WATER RESERVOIRS

The portion of the Maricopa unit above Gillespie Dam is regarded as one ground-water reservoir and the Pinal unit above the western end of the San Carlos project as another.

On page G–15 of the volume of the Bureau's Report on central Arizona project, containing appendixes, the United States Geological Survey outlines a method of estimating the safe yield for the Maricopa unit including the Gillespie area below Gillespie Dam.

The Maricopa unit as a whole is not a ground-water unit because the geological barrier on which the dam rests divides the Maricopa unit into two parts. If the portion above Gillespie Dam is taken separately an approximation of its safe yield can be obtained.

Safe yield of ground-water Reservoir, Maricopa Unit, above Gillespie Dam

The formula of United States Geological Survey is as follows:

Safe yield = total water pumped
plus
water leaving basin as surface flow or underflow
plus
evaporation and transpiration on bottom lands
minus
water that must leave basin as surface flow and underflow to carry out excess salts
plus
change in storage in acre feet = 849,000 + 200,000 — 108,400 —34,000 = 907,000

The values in the foregoing are the averages for the period 1940–44 which the Bureau assumes to be an average period. All the items are yields from the ground-water reservoir. The result means that 58,000 acre-feet net could be taken from the ground-water reservoir in addition to the draft which was placed on it and which should have been placed on it for salt balance.

Inasmuch as the period 1940–44 was one in which run-off in the Maricopa unit was approximately the long-time average, another item must be considered. During the period the contents of the reservoirs on the Salt and Verde Rivers increased an annual average of 148,000 acre-feet. This much more water was available. Thus the supply in this average period was 148,000+58,000=206,000 acre-feet more than the demand.

Second method of estimating safe yield

This method involves comparison of the surface flow entering the unit during the period 1940–44 with the estimated consumptive use of the irrigated acreage in the unit above Gillespie Dam plus outflow for salt balance.

Total supply from surface flow except return flow (table B–2)

		Acre-feet
Total diversions	1,236,100	
Diversion of return flow and spills	101,900	1,134,200
Demand:		
Total acres	394,970	
Acres below Gillespie Dam	14,380	
Total	380,590	
Consumptive use (Bureau's unit value accepted for sake of the computation): 380,590 acres @ 3.2	1,219,900	
Required for salt balance:		
Required (table B–5)	108,000	
Actual outflow at Gillespie Dam carrying 5.5 tons per acre-foot	81,000	
Net required	27,000	1,244,900
Apparent deficiency		110,700

In addition to the supply at the diversion points there were additional supplies consisting of the average annual 148,000 acre-feet increase in reservoir content and the considerable percolation from all the streams which enter the basin. The latter can be given consideration by adding the amounts lost by phreatophytes and subtracting the decrease in storage in the underground reservoir.

The final value is obtained thus:

$$148{,}000+(-111{,}000)+200{,}000+(-34{,}000)=203{,}000.$$

This is the surplus in the 1940–44 period calculated by this method.

This is the situation even though over 1,000,000 acre-feet of flood water wasted out of the Maricopa unit during the period.

Estimate of flood flows past Gillespie Dam based on inflow into Phoenix area given in Bureau's table B–10 and on recorded waste past Gillespie Dam

[Thousands of acre-feet]

	Years in period	Total discharge into area	Average annual discharge into area	Average flood waste past Gillespie Dam	Total
Period:					
1897 to 1904 [1]	8			0	0
1905 to 1920 [2]	16	51,104	3,194	1,140	18,240
1921 to 1929 [3]	9	17,167	1,907	200	1,800
1930 to 1939 [4]	10	17,187	1,719	138	1,380
1940 to 1943 [5]	4	10,550	2,637	214	856
Total	47				22,276
Average					[6] 474

[1] Discharge was so small that flood discharge would be negligible at Gillespie.

[2] The period 1905–20 was a surplus "cycle" in which discharge into the area was large. In a period of similar discharge and with present reservoir development on Salt and Verde Rivers, including Horseshoe enlargement, the estimated average annual spill past Granite Reef would be 1,053,000 acre-feet. Other streams would also contribute.

Waste past Granite Reef Dam in 1941 was 1,004,000 acre-feet, and past Gillespie Dam was 1,039,000 acre-feet. Agua Fria contributed very little to the waste as only 10,000 acre-feet spilled from Carl Pleasant Reservoir.

In a series of wet years like 1905–20, floods from other sources than the major streams would be larger than in a single wet year. Also spill from Carl Pleasant Reservoir would be considerable. It would seem that average annual spill past Gillespie Dam would be at least 10 percent more than in 1941, or 1,140,000 acre-feet.

[3] 1921–29 discharge into area averaged 188,000 acre-feet more than average in 1930–39. San Carlos Reservoir on the Gila and Mormon Flat, Horse Mesa, Stewart Mountain, Bartlett and Horseshoe were either not in existence until after the period or were built during the period. It is assumed a little less than 40 percent of the additional 188,000 acre-feet was flood flow which would have appeared at Gillespie Dam, had present reservoir and irrigation development been in existence during the period.

[4] The value here is the average flow past Gillespie Dam during period. Inspection of daily record at Kelvin, Laveen, and Gillespie Dam indicates these flows were minor floods which in part would have percolated had the water table been lower above Gillespie Dam. Coolidge reservoir was fully functioning by 1930, so this period is one in which all major reservoirs were retaining all water reaching them.

[5] This practically all occurred in 1941.

[6] Rounded to 470.

Summary of reservoir operation study, Salt and Verde Rivers, for maximum conservation and utilization of underground reservoirs, 1897–1943

[Units 1,000 acre-feet]

Calendar year	Discharge at Granite Reef (1)	Historical change in reservoir content (2)	Historical losses (3)	Virgin discharge, Granite Reef (4)	Total irrigation demand (5)	Gross irrigation diversion (6)	Net consumptive use of surface water (7)	Contribution to ground water from irrigation (8)	Spreading diversion (9)	Total net contribution to ground water (10)	Reservoir losses (11)	Reservoir content, end of year (12)	Spill (13)
1897–1904	4,683			4,683	13,888	4,683	3,874	809		809	0	0	0
1905	5,530			5,530	1,736	1,736	1,270	466	980	1,446	69	2,162	583
1906	2,384			2,384	1,736	1,736	1,270	466	818	1,284	74	1,502	416
1907	2,010			2,010	1,736	1,736	1,270	466	526	992	74	1,176	
1908	1,817			1,817	1,736	1,736	1,270	466	526	992	71	660	
1909	1,724			1,724	1,736	1,736	1,270	466	315	781	48	285	
1910	894	+22	1	917	1,736	979	806	173	210	383	13	0	
1911	1,674	+423	34	2,131	1,736	1,647	1,222	425	110	535	51	323	
1912	1,051	−60	39	1,030	1,736	1,178	963	215	154	369	21	0	
1913	1,062	−215	30	877	1,736	877	721	156		156		0	
1914	1,091	+222	25	1,338	1,736	1,210	989	221		221	15	113	
1915	1,794	+624	60	2,478	1,736	1,648	1,223	425	319	744	65	560	
1916	5,142	+83	64	5,289	1,736	1,736	1,270	466	1,055	1,521	75	1,754	1,229
1917	3,015	−270	62	2,807	1,736	1,736	1,270	466	818	1,284	69	1,099	839
1918	1,500	−539	45	1,006	1,736	1,736	1,270	466	304	770	55	10	
1919	1,401	+746	42	2,189	1,736	1,736	1,270	466	264	730	60	139	
1920	2,503	−101	64	2,466	1,736	1,736	1,270	466	514	980	70	285	
1921	1,214	−306	47	955	1,736	940	772	168	130	298	9	161	
1922	1,585	−79	51	1,557	1,736	1,210	989	221		221	28	480	
1923	1,488	+236	16	1,740	1,736	1,210	989	221		221	45	965	
1924	1,304	−422	72	954	1,736	1,736	1,270	466		466	51	132	
1925	874	−218	25	681	1,736	812	669	143		143	1	0	
1926	1,078	+210	34	1,322	1,736	1,210	989	221		221	1	111	
1927	1,501	+359	55	1,915	1,736	1,648	1,223	425		425	48	330	
1928	1,095	−502	38	631	1,736	955	784	171		171	6	0	
1929	1,099	−104	18	1,013	1,736	1,013	830	183		183	0	0	
1930	775	+50	20	845	1,736	845	695	150		150	0	0	
1931	957	+365	26	1,348	1,736	1,210	989	221		221	1	137	
1932	1,481	+483	78	2,042	1,736	1,692	1,246	446		446	55	432	
1933	909	−279	66	696	1,736	1,123	919	204		204	5	0	
1934				360	1,736	360	305	55		55	0	0	
1935				1,504	1,736	1,210	989	221		221	10	284	
1936				1,097	1,736	1,210	989	221		221	20	151	
1937				2,089	1,736	1,648	1,223	425		425	60	532	
1938				959	1,736	1,471	1,128	343		343	20	0	

1939	----------	----------	----------	737	1,736	737	608	129	----------	129	0	0	----------
1940	----------	----------	----------	1,058	1,736	677	640	117	----------	117	4	377	----------
1941	----------	----------	----------	3,480	1,736	1,720	1,261	459	797	1,256	72	1,268	----------
1942	----------	----------	----------	880	1,736	1,489	1,138	351	608	959	51	726	----------
1943	----------	----------	----------	974	1,736	974	799	175	----------	175	0	0	----------
1907–1943	----------	----------	----------	69,512	----------	56,682	43,862	12,820	8,448	21,268	1,317	----------	3,067
Average	----------	----------	----------	1,479	1,736	1,206	933	273	190	453	28	----------	65

NOTES ON OPERATION STUDY FOR MAXIMUM CONSERVATION

The useful reservoir capacities are as follows:

	Acre-feet
Roosevelt	1,398,000
Horse Mesa	245,000
Mormon Flat	58,000
Stewart Mountain	70,000
Horseshoe	212,000
Bartlett	179,000
McDowell	

All are present capacities according to USGS water supply paper with the exception of Horseshoe. The capacity used for Horseshoe is with the proposed enlargement.

	Demand for irrigation used in tabulation [1]		Total columns one and two	Areas to the north, west, and east, outside of areas watered from Granite Reef Dam	Total columns three and four
	Old water users diverting at Granite Reef	Pinal unit			
	(1)	(2)	(3)	(4)	(5)
January	32.9	4.6	37.5	16.3	53.8
February	55.3	7.6	62.9	27.4	90.3
March	89.3	12.3	101.6	44.2	145.8
April	106.3	14.7	121.0	52.6	173.6
May	112.7	15.6	128.3	55.8	184.1
June	124.4	17.2	141.6	61.5	203.1
July	126.5	17.5	144.0	62.6	206.6
August	109.5	15.2	124.7	54.2	178.9
September	119.1	16.5	135.6	58.9	194.5
October	86.1	11.9	98.0	42.6	140.6
November	59.5	8.2	67.7	29.4	97.1
December	41.4	5.7	47.1	20.5	67.6
Total	1,063.0	147.0	1,210.0	526.0	1,736.0

[1] 1,000 acre-feet.

NOTES ON MAIN TABLE

Column (1): Streamflow of Lower Colorado River, by E. B. Debler, December 1934, USBR report, table 45.

Column (2): USGS WSP 918, p. 406.

Column (3): Report on Central Arizona Project 1947, USBR, p. 104, column labeled evaporation loss plus net storage increase minus change in storage given in column (2).

Column (4): Column (1) ÷ (2) + (3) = column (4).

Column (5): Total irrigation demand (see table above).

Column (6): Surface delivery depends on surface water available and reservoir content.

Column (7): Net use assumed to be 3.2 acre-feet per acre.

Column (8): Gross diversion column (6) — net use column (7) contribution to groundwater areas to which water is diverted at Granite Reef Dam.

	Acres
Salt River Water Users Association Indian lands and R. W. C. D.	266,860
West side of above	69,520
East side of above	18,180
Total	354,560

Capacity of canal to West side, 3,000 second-feet.

Capacity of canal to East side, 1,100 second-feet.

Capacity of canal to Pinal unit, 400 second-feet.

Many variations from the plan outlined here are possible. For instance, more water could be delivered to the 266,860 acres and more to the east side with less to the west side.

ADDITIONAL NOTES

It is assumed that McDowell Reservoir is constructed to a capacity of 578,000 acre-feet as a conservation reservoir instead of a flood-control reservoir as proposed by the Bureau. Capacity above 142,000 acre-feet would be rarely utilized and would be emptied as soon as possible.

In calculations of salvage of spills, McDowell Reservoir is not considered. However, the net loss by evaporation from area of water surface is treated as a demand.

The flows from the Salt and Verde are not in the same proportion each year. McDowell Reservoir is to be constructed because it is below the fork of the Verde and Salt and would regulate the excess flow that might come from either stream.

Also the floods of the streams are flashy. Computations on a monthly basis cannot give full consideration to this. Spills under such circumstances are larger than computed when discharges and demands are considered on a monthly basis. McDowell Reservoir would take care of this.

Its construction to 578,000 acre-feet capacity would salvage water in addition to that given in the above table but this additional salvage is neglected.

It is probable that more refined calculations would show that 578,000 acre-feet is not necessary.

In studies of virgin flow by the United States Reclamation Bureau streamflow of Lower Colorado River and Tributaries by E. B. Debler, J. A. Riter, and A. F. Johnson, 1934, the net reservoir loss was assumed at 4.0 feet in depth. This same value was assumed for this study.

The above table represents only one method of salvaging the spilled water. Better methods will be found by more mature study.

It is assumed that 3 feet in depth per day will percolate in spreading grounds in the Agua Fria River bottom lands.

Evaporation in the spreading grounds would, on the average, be less than four-tenths of 1 percent, so it would be negligible.

Summary of reservoir operation study, Salt and Verde Rivers, with 1,000,000 acre-feet annual diversion at Granite Reef Dam

Calendar year	Discharge at Granite Reef [1] (1)	Historical change in reservoir content [1] (2)	Historical losses [1] (3)	Virgin discharge, Granite Reef [1] (4)	Total irrigation demand (5)	Gross irrigation diversion (6)	Net consumptive use of surface water (7)	Contribution to ground water from irrigation (8)	Spreading diversion (9)	Total net contribution to ground water (10)	Reservoir losses (11)	Reservoir content, end of year (12)	Spill (13)
1897–1904					8,000	4,683	4,000	683		683	0	0	0
1905					1,000	1,000	854	146		146	76	2,162	2,295
1906					1,000	1,000	854	146		146	85	2,162	1,298
1907					1,000	1,000	854	146		146	83	1,924	1,165
1908					1,000	1,000	854	146		146	85	2,162	493
1909					1,000	1,000	854	146		146	84	1,971	831
1910					1,000	1,000	854	146		146	80	1,785	0
1911					1,000	1,000	854	146		146	82	1,786	1,048
1912					1,000	1,000	854	146		146	75	1,741	0
1913					1,000	1,000	854	146		146	72	1,546	0
1914					1,000	1,000	854	146		146	85	1,799	0
1915					1,000	1,000	854	146		146	85	1,879	1,313
1916					1,000	1,000	854	146		146	85	2,162	3,915
1917					1,000	1,000	854	146		146	82	1,780	2,104
1918					1,000	1,000	854	146		146	70	1,716	0
1919					1,000	1,000	854	146		146	85	2,162	658
1920					1,000	1,000	854	146		146	85	1,821	1,721
1921					1,000	1,000	854	146		146	70	1,706	0
1922					1,000	1,000	854	146		146	72	2,162	29
1923					1,000	1,000	854	146		146	85	2,162	650
1924					1,000	1,000	854	146		146	70	1,678	368
1925					1,000	1,000	854	146		146	50	1,309	0
1926					1,000	1,000	854	146		146	50	1,581	0
1927					1,000	1,000	854	146		146	80	1,869	547
1928					1,000	1,000	854	146		146	50	1,450	0
1929					1,000	1,000	854	146		146	50	1,413	0
1930					1,000	1,000	854	146		146	50	1,208	0
1931					1,000	1,000	854	146		146	50	1,506	0
1932					1,000	1,000	854	146		146	70	1,723	755
1933					1,000	1,000	854	146		146	50	1,369	0
1934					1,000	1,000	854	146		146	40	689	0
1935					1,000	1,000	854	146		146	50	1,143	0
1936					1,000	1,000	854	146		146	50	1,190	0
1937					1,000	1,000	854	146		146	85	1,686	508

1938	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	60	1,585	0
1939	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	60	1,262	0
1940	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	70	1,250	0
1941	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	85	2,086	1,558
1942	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	65	2,162	0
1943	----------	----------	----------	----------	1,000	1,000	854	146	----------	146	60	1,594	0
1897–1943	----------	----------	----------	----------	----------	43,683	37,305	6,378	----------	0	2,721	----------	21,477
Average	----------	----------	----------	----------	69,512	930	794	136	----------	0	58	34	457
	----------	----------	----------	----------	1,479	1,000							

[1] Same as previous study, p. 556.

NOTE.—This is approximately same demand as proposed by Bureau, which assumed diversion to be 960,000 acre-feet. The useful reservoir capacities are as follows: Hoosevelt, 1,398,000; Horse Mess, 245,000; Morman Flat, 58,000; Stewart Mountain, 70,000; Horse-shoe, 212,000; Bartlett, 179,000; McDowell, none. All are present capacities according to USGS water supply papers with the exception of Horseshoe. The capacity used for Horseshoe is with the proposed enlargement.

Estimate of water supply available to Maricopa unit of central Arizona project[1]

[Acre-feet; average 1897–1943]

1. Additional diversion at Granite Reef:		
Bureau's report	980,000	
By operating surface reservoirs as proposed in tabulation p. A-8	1,386,000	
		406,000
2. Additional diversion from Agua Fria		37,000
Total additional diversion		443,000
3. Surplus with Bureau's diversion for 1940–44 acre above Gillespie Dam p. A–14. (Increase in surface reservoir content not included.)		58,000
Total surplus		501,000
4. Additional acreage in Maricopa unit:		
Bureau's ultimate project	46,000	
Gillespie area	14,000	
Total	60,000	
60,000 acres at 3.5 acre-feet (includes consumptive use and salt balance)		210,000
Exportation to Pinal unit		147,000
Total added demand		357,000
Remaining surplus in Maricopa unit		144,000

Note on item 2:	*Acre-feet*
Estimated average annual discharge Agua Fria (1897–1943)	95,000
Estimated average annual discharge Salt and Verde (Table B–10) USRB)	1,508,000

[1] See preceding tabulation showing operation of reservoirs tributary to the unit.

Agua Fria discharge is $\frac{95,000}{1,508,000}$ = 6.3 percent of Salt and Verde.

Average annual spill of Salt and Verde Rivers past Granite Reef in operation to salvage water otherwise wasted = 65,00 acre-feet, which is 4.3 percent total discharge of the two streams.

Assume same percent applies to Agua Fria.

0.043 × 95,000 = 4,100 acre-feet (say 4,000).

95,000 — 4,000 = 91,000 acre-feet.

Bureau assumes Agua Fria will yield an annual average of 54,000 acre-feet.

91,000 — 54,000 = 37,000 acre-feet = estimated yield in excess of that used by Bureau.

Maricopa unit—Estimate of underground storage capacity required for salvaging surplus water of Agua Fria, Salt and Verde Rivers

1905–20:	*1,000 acre-feet*
Total diversion for irrigation (from p. A–9)	1,556
Diversion to Pinal unit	147
Net diversion Maricopa unit	1,409
To rights at Granite Reef	1,063
Total to lands east, west and south of Salt River Valley Water Users Association in Maricopa unit	346
Diversion to Salt River Valley Water Users Association in excess of 1,000,000 acre-feet	63
Total additional diversion	409
Diverted for spreading	432
Total diversion from Granite Reef in excess of 1,000,000 acre-feet	841

1905–20—Continued		1,000 acre-feet
Diverted from Agua Fria (estimated as follows:)		
1905–20:		
Average annual discharge Salt and Verde		2,250
Spill	192	
Reservoir loss	52	
		244
Total diversion		2,006
Estimate discharge Agua Fria, 190. Diversion from Agua Fria on same basis as for Salt and Verde 190 by 2,006—divided by 2,250, equals		169
Total diversion spreading and irrigation except Old Granite Reef rights		1,010
Consumptive use outside Old Granite Reef rights, 87,700 acres at 3.2		280
Net to ground water		730

Area within boundary of Maricopa unit, 654,000 acres: 730,000 acre-feet per year for 16 years, 11,700,000 acre-feet.

$\frac{11,700,000}{654,000} \times 0.15 = 120$ feet difference in elevation of water table between top and bottom of underground storage capacity. (Voids in alluvium=15 percent).

Average lift would be 143 feet assuming that at end of 1920 flood season water table would be 20 feet higher than fall, 1947.

Pinal unit—estimate of underground storage capacity required for salvaging surplus water of Gila River

Average annual spill of Gila River water past Ashurst-Hayden Dam (point of diversion to San Carlos project) after Buttes Reservoir is constructed to 400,000 acre-feet capacity, is estimated at 124,000 acre-feet (War Department United States engineer office report on flood control Gila River and tributaries above Salt River).

Records of run-off not available prior to 1915 and detail cannot be worked out as for Salt and Verde Rivers.

Assume that 75 percent of 124,000=93,000 acre-feet can be salvaged by spreading and irrigation operations like those proposed for Salt and Verde and Agua Fria Rivers.

Assuming that all of the excess would occur in a period like 1905–20, an average annual diversion during the 16 years would be 273,000 acre-feet and the total would be 4,371,000 acre-feet.

Assuming that this storage would be concentrated under 225,000 acres, the vertical distance between top and bottom of the storage would be as follows:

$\frac{4,371,000}{225,000} = \frac{19.4}{0.15} = 129$ feet

Assuming that at end of flood season 1920 the water table would be 20 feet higher than fall 1947, it would be 109 feet lower at beginning of flood season of 1905. Average lift would be 112 feet.

Pinal unit, estimate of water supply

Local supply:		Long-time average acre-feet
1. Diversion from Gila River at Ashurst-Hayden Dam		291,000
2. Underground water supplies retained in unit by lowering the water table sufficiently:		
Eloy area	25,000	
Casa Grande-Florence area	5,000	
		30,000
3. Salvage of waste past Buttes Reservoir		93,000
Total local supply		414,000

		Long-time average acre-feet
Demand:		
4. Waste for salt balance	70,000	
5. Consumptive use 1940–44 acreage at 3.2	397,000	
		467,000
Deficiency for 1940–44 acreage		53,000
6. Requirement for 26,000 acres additional to make total 150,000 acres consumptive use 3.2 plus requirement on salt balance		94,000
		147,000
Importation required from Maricopa unit		147,000

NOTE.—Item 1: Report of War Department, U. S. Engineer Office, 1945, enclosure 9, Buttes Reservoir assumed construction to 400,000 acre-feet. Item 2: U. S. Geological Survey, Ground Water Resources of Santa Cruz Basin, 1943.

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

TUESDAY, APRIL 26, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Clinton P. Anderson presiding.

Present: Senators Anderson, McFarland, Miller, Kerr, and Ecton.

Senator ANDERSON. The committee will be in order.

Inasmuch as some of the Senators have asked that the Reclamation Service give an explanation of the project, I want to call on Mr. Larson at this time to give his explanation before Arizona presents its rebuttal.

Mr. Larson.

STATEMENT OF V. E. LARSON, BUREAU OF RECLAMATION

Mr. LARSON. My name is V. E. Larson, assistant regional planning engineer for region III of the Bureau of Reclamation in immediate charge of investigations of the central Arizona project for the Bureau.

I will briefly outline the results of the investigations of the central Arizona project by the Bureau of Reclamation.

GENERAL

The potential central Arizona project, when viewed in the light of all the facilities required to make it an effective development, embraces an area that extends to all boundaries of the State of Arizona as can be observed from a glance at the general location map. In two cases, however, the project features extend beyond these borders into the States of Utah and New Mexico.

Relative to the prime purpose of the project—irrigation—the area embraced, as generally discussed, consists of approximately 672,000 acres of highly fertile and productive farm land on the flood plains and in the valleys of the Gila River system extending upstream from the vicinity of Gila Bend. These lands are represented by the shaded portions of the agricultural area map included in the report. This area represents 80 percent of the land irrigated in Arizona. Due to the existence of favorable temperatures, diversified cropping is practiced throughout the year.

Events responsible for the advancement of this investigation to its current status stem from the decline of irrigation water supplies as

related to a growing agricultural economy in the project area. For the past 25 years, a number of plans have been advanced by various groups for the diversion of Colorado River water to central Arizona. The Bureau of Reclamation initiated preliminary investigations of a potential diversion route late in 1940.

In February 1944, the Arizona State Legislature, mindful of the growing water shortage in central Arizona, appropriated $200,000 to be used in cooperation with the Bureau of Reclamation to make surveys, investigations and compilations of the water resources of the State and their potential development. A like sum for the same purpose was allocated by the Bureau, from its investigation funds, and a formal agreement on procedure was executed July 31, 1944.

The purpose of these specific investigations has been to develop the best means by which Colorado River water could be diverted to central Arizona to alleviate a mounting and critical shortage of water. The Colorado River is the only remaining source of water within the State capable of meeting this shortage. Concurrently with this concentrated study, other investigations have been conducted relating to improvement in the utilization of existing water supplies in the project area.

On the basis of previously accumulated data, the Bureau, in 1944, selected three plans for diversion of water from the Colorado River which merited further investigation. On the general location map they are designated as the Marble Canyon, Bridge Canyon, and Parker routes.

Investigations by the Bureau of Reclamation indicate that under present conditions the Parker route is the most economical, therefore, this route was adopted and made a part of the plan of development as presented in the report on the central Arizona project, copies of which have been made available to this committee. This report has come to the Congress through proper channels in accordance with the Flood Control Act of 1944.

The investigation of any multiple-purpose Reclamation project involves the analysis of four fundamental elements. They are:

(*a*) Need for the project;
(*b*) Available water supply;
(*c*) Plan of development to serve the needs; and
(*d*) Economic feasibility of the project.

My testimony will treat these elements in that order.

Need for the project:

Farming in the project area is impossible without irrigation. Rainfall in the vicinity of Phoenix averages but 8 inches annually. In addition to rainfall, the optimum irrigated requirement is an average delivery to the farm of 4 acre-feet of water per acre per year.

The first canal built by white men in the area was constructed in 1867. Other canals were completed later, although it was not until the enactment of the Reclamation Act in 1902 by the Congress, and the completion thereunder in 1911 of Roosevelt Dam on the Salt River, that the present-day agricultural economy was established. Closely following developments on the Salt River were similar developments in various locations on the middle and upper Gila River system. Practically all of the surface run-off in the area is now regulated and utilized for irrigation.

Some years ago a drainage problem developed in the lower reaches of the project area. It was found that this drainage problem could be corrected by drilling wells and pumping water from the ground-water basin. This pumped water was satisfactory for irrigation and during the ensuing period pumped water has represented an increasing percentage of the annual irrigation supply. The stage has been reached where agricultural development has expanded beyond the water supply now available and people of the area are looking to the last source of supply, the Colorado River. For the past 25 years representatives of the State of Arizona, local organizations and individuals have made investigations looking to diversion of Colorado River water into the area at such time as that source of supply was needed. That requirement has now been reached. In fact, without Colorado River water about one-third of the productive capacity of the agricultural development will be lost which will result in large scale abandonment and migration. Agriculture is the basic support for the existing economic structure in the State of Arizona. The possibility of losing a third of this support naturally presents a grave problem to the State.

The need of additional water for irrigation in the central Arizona project area is fourfold. Additional water is needed: (1) to relieve the overdraft on the ground-water basins; (2) to provide a supplemental supply to lands now in production, but not adequately irrigated; (3) to permit the drainage of excess salts out of the area and maintain a salt balance; and (4) to provide water for land irrigated in the past but now idle for the lack of water.

For the period of 1940 to 1944, the pumping overdraft is estimated from available information to have averaged about 468,000 acre-feet a year. This period is representative of the long-time water supply conditions in the area; therefore, it is believed that this estimate of overdraft is within reasonable limits.

Many acres of land now in cultivation receive a deficient supply of water. This results in a reduction of the crop yield and in some cases has resulted in crop failures. When the delivery of water is less than optimum, the productive capacity of the land is reduced.

When irrigation water is applied to the land a large part is consumed in plant growth, transpiration, and evaporation, leaving practically all its mineral salts concentrated in the water percolating to the ground-water supply. With each successive reuse by pumping, the salt content is further concentrated with mineral salts toward the point where the water is toxic to vegetation. Such areas will spread through the ground-water basin unless the progress in salt concentration is stopped. Surface waters diverted to the area each year are estimated to contain 846,000 tons of mineral salt. Local experience indicates that water containing concentrations in excess of 5½ tons salt in an acre-foot of water is detrimental to crops. To maintain a favorable salt balance it then becomes necessary to release from the area an annual flow of 154,000 acre-feet of salt-charged water.

The maximum acreage that has ever been irrigated in the central Arizona project area, up to 1945, is about 672,000 acres. Because of water shortages in the area a portion of that acreage lies idle. The average acreage irrigated during the period 1940–44 was about 566,000 or 106,000 acres below the maximum. Additional water is required

if this acreage or a portion thereof is to be returned to a productive status.

MUNICIPAL WATER SUPPLY

The growth of the city of Tucson and adjacent residential areas has developed a critical problem of domestic water supply. The ground-water basin now serving this city is overdrawn and supplemental supplies from other sources must be developed. It is estimated that a diversion of 12,000 acre-feet a year would be required to furnish the city of Tucson with an adequate municipal water supply.

ELECTRICAL ENERGY REQUIREMENTS

There is an urgent and measurable need for additional electrical energy in Arizona, southern California, southern Utah, and southern Nevada. This area has experienced a critical power shortage during recent years and appropriate indices indicate a rapidly expanding demand in the future. The situation is illustrated by the chart labeled "Estimated Energy Requirements and Supply," also attached to this statement.

Present power developments in this power-market area range from large hydroelectric and fuel burning plants to small power plants in isolated camps and towns. Hoover and Parker plants in the Colorado River constitute a large source of low-cost power for southern California, southern Nevada, and Arizona. When generating units, in the area, now under construction or authorized have been completed, the total installed capacity available to the power market area will exceed 3,000,000 kilowatts.

The population of the power market area is in excess of 4,500,000 and the average annual per capita consumption is 2,400 kilowatt-hours. Total annual power consumption has grown from 1.5 billion kilowatt-hours in 1920 to an annual usage of almost 14,000,000,000 kilowatt-hours in 1947.

At the present time approximately 58 percent of the electrical energy consumed in the referenced area is supplied by fuel-burning plants. The fuel consists mainly of oil and natural gas. The availability in the area of these natural resources is limited and the need of greater conservation is a reality. Utilization of hydropower potentialities where economically feasible would result in a considerable saving of these national resources.

AVAILABLE WATER SUPPLY

General: The central Arizona project contemplates further use of the waters of the Verde, the Gila, and the San Pedro Rivers, together with importation of water from the Colorado River.

COLORADO RIVER WATER

In the determination of the amount of water available for diversion to the central Arizona project from the Colorado River, consideration must be given to the over-all amount of water available in the stream. The Colorado River compact apportioned water to the Colorado River between the upper and lower basins, designating Lee Ferry, on the

Colorado River, 1 mile below the mouth of the Paria River, as the point of division. The apportionment of Colorado River waters by the Colorado River compact is from the virgin or undepleted flow of the stream, that is, from the stream as would be in the absence of any development. The following table presents for the period 1897–1943, inclusive, the estimated average annual virgin flow at Lee Ferry and other points downstream to the international boundary.

Average annual flows for 1897 to 1943, inclusive, under virgin conditions

		Acre-feet
Flow at Lee Ferry		16,270,000
Gain, Lee Ferry to Hoover Dam		1,060,000
Flow at Hoover Dam		17,330,000
Tributary inflow, Hoover Dam to international boundary:		
Williams River and minor washes	150,000	
Gila River at mouth	1,270,000	
Subtotal	1,420,000	
Less natural mainstreams channel losses	1,030,000	
Gain, Hoover Dam to international boundary		390,000
Colorado River at international boundary		17,720,000

Potential projects in the upper basin could, apparently, fully utilize the 7,500,000 acre-feet apportioned to the upper basin by the Colorado River compact. It is also quite possible that the upper basin could utilize that part of the surplus flows which could be apportioned to the upper basin under provisions of article III (f) of the compact. Conservatism in making any determination of the availability of water under ultimate conditions requires that it be assumed that the average annual flow of the Colorado River at Lee Ferry will be decreased by 7,500,000 acre-feet plus any water apportioned to the upper basin under article III (f) of the compact. The following tabulation has been prepared to present an analysis of the present apportionment of the waters of the Colorado River:

	Acre-feet
Virgin flow, Colorado River at international boundary	17,720,000
Apportioned to upper basin by article III (a) of Colorado River compact	7,500,000
Apportioned to lower basin by article III (a) of compact	7,500,000
Apportioned or allocated to lower basin by article III (b) of compact	1,000,000
Estimated delivery to Mexico pursuant to treaty	1,500,000
Total apportioned and/or allocated water	17,500,000
Indicated surplus waters	200,000

In the absence of a compact as to the division of water among the various States involved, the determination of Colorado River water available for diversion to the central Arizona project herein presented is based upon interpretations by responsible officials of the State of Arizona. This presentation is not intended to be prejudicial to the claims of the States challenging Arizona's interpretations. The Bureau of Reclamation recognizes these differences of opinion, but, as has been stated in our report, the Bureau cannot authoritatively resolve these differences.

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Arizona contends that 8,500,000 acre-feet of water are apportioned to the lower basin in the Colorado River compact of which California may use not to exceed 4,400,000 acre-feet of water under its Limitation Act of March 4, 1929. Nevada has a contract for the use of 300,000 acre-feet of apportioned water, which is adequate for her potential developments. That would leave 3,800,000 acre-feet of apportioned water for use by Arizona.

Arizona officials recognize the rights of Utah and New Mexico to the use of waters in the lower basin, such use to be deducted from that portion allocated to Arizona. It is estimated that ultimate development by New Mexico will deplete the Little Colorado River by 13,000 acre-feet and the Gila River by 16,000 acre-feet. Under ultimate development, it is estimated that Utah will deplete the Virgin River by 94,000 acre-feet and Kanab Creek by 7,000 acre-feet. Ultimate depletions in the lower basin by these States are thus 29,000 by New Mexico and 101,000 by Utah or a total of 130,000 acre-feet.

As provided in article III (f) of the compact, further equitable apportionment of the unapportioned water of the Colorado River will be made after October 1, 1963. The unapportioned water is estimated as 220,000 acre-feet a year. It is assumed that one-fourth of the unapportioned water or 55,000 acre-feet will be made available to Arizona.

On the basis of these assumptions, Arizona's share of the Colorado River under ultimate conditions is summarized as follows:

	Acre-feet
Water from articles III (a) and III (b)	3,800,000
Less uses by New Mexico and Utah in lower basin	130,000
Net water available from articles III (a) and III (b)	3,670,000
One-fourth share of surplus water	55,000
Total available for Arizona	3,725,000

Of this 3,725,000 acre-feet of water, the central Arizona project can utilize the part that remains after deducting the amount now being utilized, the amount that will be utilized in the future by other projects elsewhere in the State, and main stream reservoir losses chargeable to Arizona.

Evaporation losses from the surfaces of the reservoirs required for the complete utilization of the water resources of the Colorado River will represent a material depletion in the flow of the river. It is estimated that under ultimate conditions about 900,000 acre-feet of water will be lost annually to evaporation from main stream reservoir surfaces in the lower basin. This amount is in addition to the quantities lost from the same areas prior to the creation of any reservoirs. Inasmuch as these losses represent a depletion of the water supply of the lower basin as a whole, Arizona assumes that these losses would be apportioned between the various States of the lower basin on an equitable basis. It is the contention of Arizona that a just method of apportionment would be to charge California, Nevada, and Arizona with these main stream reservoir losses in the ratio that these States receive water from the Colorado River exclusive of uses of tributaries in the lower basin.

On this basis, with main stream reservoir losses of 900,000 acre-feet, Arizona would be charged with 313,000 acre-feet a year.

In addition to present depletions by Arizona, there are potential irrigation projects other than the central Arizona project which would

utilize a part of Arizona's share of the Colorado River water. These potential developments and contemplated expansion of projects now in a construction stage are recognized as potential units in a basin-wide plan of development.

Under ultimate development, it will be necessary to release water from the central Arizona project area to carry out excess salts and maintain a salt balance. The net effect of such release would increase the annual return to the Colorado River about 123,000 acre-feet.

The following table has been prepared to summarize the present and future depletions and reservoir losses chargeable to the State of Arizona and to aid in computing the amount of water available for the central Arizona project:

			Acre-feet
Total available for Arizona			3,725,000
Less:			
Main stream reservoir losses (present and future)		313,000	
Present depletions:			
Gila River Basin	1,135,000		
Little Colorado River Basin	59,000		
Virgin River and Kanab Creek	5,000		
Williams River Basin	3,000		
Colorado River below Parker Dam	206,000		
Subtotal		1,408,000	
Future depletions:			
Gila River Basin	20,000		
Little Colorado River Basin	10,000		
Virgin River	12,000		
Colorado River below Parker Dam	851,000		
Unassigned water	34,000		
Subtotal		927,000	
			2,648,000
Potential depletion by central Arizona project			1,077,000
Plus increase in return to Colorado River through Gila River by reason of central Arizona project development			123,000
Available for diversion to central Arizona project			1,200,000

ADDITIONAL GILA BASIN WATER

The enlargement of Horseshoe Reservoir on the Verde River from its present capacity of 68,000 acre-feet to a capacity of 298,000 acre-feet would impound floodwaters which cannot now be put to beneficial use. The enlarged capacity would provide an additional average yield from the Verve Reservoir system of 42,000 acre-feet a year.

The construction of Buttes Dam on the Gila River would impound flood-water and tributary inflow below Coolidge Dam which cannot now be put to beneficial use in the middle Gila area. Buttes Reservoir would provide an additional average yield of 64,000 acre-feet annually for use in the middle Gila area.

Developments could be provided in the upper Gila area which would permit more efficient irrigation practices. The net effect of these developments would be to provide 19,000 acre-feet of supplemental water for this area.

A dam could be constructed at the Charleston site on the San Pedro River to provide regulation of the stream. Stored water would provide a supplemental irrigation supply for the area and a municipal water supply for the city of Tucson. It is estimated that this develop-

ment would conserve 7,000, acre-feet of water which otherwise would be lost in the river channel.

TOTAL NEW WATER

The following water table has been prepared to summarize the new water developed under the central Arizona project:

		Acre-feet
Colorado River	1,200,000	
Less aqueduct losses	250,000	
		950,000
Developed on Verde River by Horseshoe Dam enlargement		42,000
Developed on Gila River:		
Buttes Dam	64,000	
Developed in upper Gila area	19,000	
		83,000
Developed on San Pedro River by Charleston Dam		7,000
Total new water developed		1,082,000

On the basis of the above analysis 1,082,000 acre-feet of new or additional water would be available for utilization in the potential central Arizona project.

PLAN OF DEVELOPMENT TO SERVE THE NEEDS—PROJECT FEATURES

Primarily the central Arizona project would provide Colorado River water to the central part of the State. This would be accomplished by pumping from Lake Havasu behind Parker Dam, into a canal which would extend to the existing Granite Reef Dam located about 3 miles below the junction of the Verde and Salt Rivers. In order to effect full development for the area, a number of works would be constructed in the States of Arizona, Utah, and New Mexico.

For convenience in discussion, the central Arizona project has been segregated into 17 units, or features, listed as follows:

1. Bluff Dam.
2. Coconino Dam.
3. Bridge Canyon Dam and power plant.
4. Havasu pumping plants.
5. Granite Reef aqueduct.
6. McDowell pumping plant and canal.
7. McDowell Dam and power plant.
8. Horseshoe Dam enlargement and power plant.
9. Salt-Gila aqueduct.
10. Buttes Dam and power plant.
11. Charleston Dam.
12. Tucson aqueduct.
13. Safford Valley improvements.
14. Hooker Dam.
15. Irrigation distribution system.
16. Drainage system for salinity control.
17. Power transmission system.

The necessity for all of these features may not be apparent at first; let us therefore consider their relationship.

Approximately 1.5 billion kilowatt-hours of energy will be required annually for project pumping.

There is no surplus energy presently available in the area, and certainly no prospect of private development involving output of this magnitude. Accordingly, Bridge Canyon Dam and power plant would be constructed on the Colorado River, 117½ miles upstream from Hoover Dam. Roughly one-third of the power developed at this site would be utilized to operate the pumping plants needed to raise the water from Havasu Lake for delivery to central Arizona. The remainder would be sold to the power market at a rate sufficient to provide revenue to repay the costs of this power development and a portion of the costs of the irrigation developments needed under the central Arizona project.

Located in a deep canyon, the Bridge Canyon Reservoir would have a comparatively small capacity, totaling 3,720,000 acre-feet. Silt inflow to this reservoir would amount to about 127,000 acre-feet a year. Unless preventive measures were taken, this silt would infringe on the active storage capacity of the reservoir. In addition, the capacity of Bridge Canyon Reservoir would be so limited that it appears desirable to provide upstream river regulation to permit maximum utilization of this site. Studies of stream flow at the Bridge Canyon site, when considered in conjunction with design costs, indicate that upstream flood-control storage would be highly desirable in order to reduce the costs of spillway construction at the Bridge Canyon Dam.

For the foregoing reasons, two upstream reservoirs have been considered as essential adjuncts to the Bridge Canyon Dam. The farthest upstream of these is Bluff Dam, on the San Juan River. This dam would be located about 12 miles downstream from Bluff, Utah. It would be tripurpose, in that it would provide flood control, silt retention, and regulation of stream flow. The San Juan River now contributes about 23 percent of the total silt load of the Colorado River at the Bridge Canyon Dam site.

A dam at the Coconino site on the Little Colorado River would be constructed about 49 miles upstream from the mouth of that stream as a second adjunct to the Bridge Canyon development. This structure would impound 22 percent of the silt load of the Colorado River at the Bridge Canyon Dam site, and in addition, would provide flood-control storage capacity.

As previously stated, part of the power generated at the Bridge Canyon development would provide energy to operate the Havasu pumping plants. These pumping plants would be located along the extreme western 20 miles of the Granite Reef aqueduct. Four in number, they would raise the water, by a series of lifts, a total of 985 feet.

Granite Reef aqueduct would consist of approximately 241 miles of open concrete-lined canal, leading from Lake Havasu to Granite Reef Dam. The westernmost 25 miles of the aqueduct would traverse extremely rugged terrain. The remainder of the canal would be located in typical desert country, skirting occasional small mountain ranges. Major siphon crossings would be required at Cunningham Wash, Centennial Wash, and the Hassayampa, Agua Fria, and New Rivers. The aqueduct would terminate in the pool above the existing Granite Reef diversion dam. Diversions would be made from the aqueduct as needed to supply requirements on lands located in the western portion of the project area.

The achievement of maximum efficiency necessitates operation of the Havasu pumping plants and Granite Reef aqueduct at a contin-

uous rate in order that a minimum design capacity may be adopted. For this reason, these features would be designed to operate at a capacity of 1,800 cubic feet per second at all times except for 1 month each year, at which time diversion could be entirely discontinued to allow for maintenance and repairs to the canal and pumping plants. Under such a system, deliveries to the project area would exceed irrigation demands during the winter months. During this period the excess water delivered to Granite Reef Dam would be raised 88 feet by the McDowell pumping plant, and delivered by the McDowell pump canal to the proposed McDowell Reservoir for storage until required.

McDowell Reservoir would be created by the construction of a dam just below the confluence of the Salt and Verde Rivers. As previously described it would be used to impound water of the Colorado River delivered during the winter months when irrigation demands are light. Other uses would be the regulation of releases from upstream dams and the provision of flood control storage for the protection of downstream developments. A power plant would be installed to utilize the available head.

As a part of the central Arizona project, the existing Horseshoe Dam on the Verde River would be increased to 40 feet in height, to provide a normal storage capacity of 298,000 acre-feet, in place of the 68,000 acre-feet now existing. A power plant installed at this dam would utilize Verde River water for energy production.

By an exchange of Colorado River water for Salt River water it would be possible to divert Salt River water from Sahuaro Lake behind Stewart Mountain Dam. The water thus diverted would flow by gravity through the potential Salt-Gila aqueduct to lands in the flood plain of the middle Gila and lower Santa Cruz Rivers. The aqueduct would have an overall length of about 74 miles, most of which would be open concrete-lined canal, and would terminate in the existing Picacho Reservoir, south of Coolidge. Deliveries through this aqueduct would not only meet the supplemental water requirements of the area served, but would provide additional water as a basis for exchange which would permit increased diversions by upstream users.

The following three developments were investigated and reported on by the United States engineer office of Los Angeles, Calif., in their Report on Survey, Flood Control, Gila River and Tributaries above Salt River, December 1945. Data pertaining to these developments have been used with the consent and cooperation of that office. These developments have been incorporated in this project because they would serve a definite purpose in the over-all plan of development.

Construction of the Buttes Dam and power plant on the Gila River, approximately 62 miles below Coolidge Dam, would conserve a large part of the flood flows which enter the Gila River below Coolidge Dam. By utilizing the power head available at the Buttes site, energy would be provided for local irrigation pumping and commercial load. In addition, the Buttes Reservoir would provide control of floods for the protection of downstream lands. It would also impound silt which is contained in large quantities in the waters which are not diverted to the irrigated lands during the summer months, and which presents a serious problem to farmers of the area.

With water from the Salt River provided to lands in the middle Gila area as a basis for exchange, construction of a dam at the Charles-

ton site on the San Pedro River could be accomplished without infringement on the rights of downstream water users. This dam would be located about one-half mile north of Charleston, Ariz. It would provide flood control for the protection of downstream developments. In addition, it would regulate the erratic flows of the San Pedro River, and facilitate diversions to land now irrigated along the river.

In addition, the Charleston Dam would serve as a diversion structure for the Tucson aqueduct. The Tucson aqueduct would consist of approximately 70 miles of closed conduit through which water would be conveyed to the city of Tucson. As a part of the aqueduct, a pumping plant would be installed to lift the water 300 feet for delivery to the aqueduct.

As a part of the central Arizona project, certain developments above San Carlos Reservoir would be required to meet the needs of the upstream irrigated areas. Numerous plans of development have been proposed for these upper lands. In general, there appear to be four areas in need of additional development: Namely, the Safford Valley, the Duncan-Virden Valley, the Red Rock Valley, and the Cliff Valley.

The principal function of the Safford Valley improvements would be to conserve and utilize the existing water supply to best advantage, and to consolidate the existing distribution system. A permanent diversion structure at the upper end of the Safford Valley to supply a high line canal would be included as a part of this development. This canal would extend along the south side of the valley, and a branch canal would cross the Gila River near Safford to serve the north side. Ground water in the area would be further developed to supplement the available surface water.

Construction of a dam at the Hooker site about 7 miles northeast of Cliff, N. Mex., is considered as a potential development to serve requirements of areas along the upper reaches of the Gila River. A dam at this site would provide partial flood control and silt retention for the benefit of downstream irrigators. It would also regulate the flood flows of the river, for use at a time when the normal flow of the river would be insufficient to meet irrigation requirements. Lands in the Cliff Valley, the Red Rock Valley, the Duncan-Virden Valley, and the Safford Valley, would all be benefited by this regulation.

Some of the districts included under the central Arizona project maintain their own distribution systems. However, many of those areas which are irrigated by pump water do not. In addition, some areas irrigated by surface water have inadequate distribution facilities. Under the central Arizona project, additions to the irrigation distribution system would be required for the delivery of water.

Despite water shortages throughout the major part of the central Arizona project, some of the lower-lying lands are faced with the problem of waterlogging. The central Arizona project would include a drainage system for salinity control. Open gravity drains would be used where possible. Other drainage as required would be accomplished by pumping from wells.

Under this project a power transmission system would be needed to convey power from Bridge Canyon power plant to the Havasu pumping plants, and from the various power plants throughout the project to the power market areas.

In discussing these various features, the primary purposes of each have been outlined. In addition to those enumerated, each of the fea-

tures would have secondary purposes or provide incidental benefits which, considered in the aggregate, are of considerable importance. Possibly the most important of these is the recreational value of the various dams and reservoirs. Bridge Canyon Dam and Reservoir would afford a scenic attraction comparable to Hoover Dam and Lake Mead.

The importance of this may be more fully realized when it is recalled that 354,500 visitors were conducted through the powerhouse at Hoover Dam during 1946, 424,175 in 1947, and 407,980 in 1948 During this period more than 1,000,000 persons visited the Lake Mead recreational area each year. Thousands of visitors could enjoy the recreational facilities which would be provided by the Bridge Canyon Reservoir. In an arid country, such as that in which the central Arizona project is located, the importance of lakes for recreational uses is of far greater significance than commonly realized by residents of more humid climates.

Fish and wildlife propagation would be another important purpose served by each of the reservoirs to be created under the central Arizona project.

How the development would serve the needs:

HOW THE DEVELOPMENT WOULD SERVE THE NEEDS

Water for irrigation and municipal requirements could be provided under the proposed plan of development. As previously outlined the needs consist of replacement of the present overdraft on the ground-water basins, a supplemental supply for lands now in production, provision for drainage of excess salts out of the area to maintain a salt balance, increasing the water supply for the city of Tucson, and provision for the irrigation of land formerly irrigated but now idle for the lack of water.

As previously outlined in my testimony, it is estimated that 1,082,000 acre-feet of water could be made available under the proposed plan. Utilization of this water is outlined in the following table:

	Acre feet
New surface water at district headgates	1,082,000
Supplemental water needed for lands now irrigated and to replace the necessary reduction in pumping and provide release for salt balance	652,000
Required for municipal water supply	12,000
Water remaining available for lands formerly irrigated but now idle for lack of water	418,000

In addition to providing 12,000 acre-feet of water for municipal requirements the project would provide supplemental water for 640,000 acres of the 672,000 acres irrigated at sometime prior to 1945. Without the project 414,000 acres could be served an adequate water supply. This would indicate a loss of about one-third of the productive capacity of the irrigated area. Actually, the impending loss would be greater because continuation of the existing circumstances will result in less and less economical farming; those with substantial reserves will hang on, and one by one those individuals with the least reserves will be squeezed out until stability has been reached. That stable point will be one at which a bare profit can be made out of the irrigation enterprises—competition will keep it so.

The losses and distress to the individual enterprisers during the adjustment period will be tremendous. The correlative interests—the loading agencies, the local and State governments, and the Nation—will suffer revenue and economic losses. Business houses will lose accounts, some will be forced out of business; mortgages will be foreclosed; farms will be taken over for taxes; and local, county, State, and Federal tax revenues will shrink.

Power-development features of the project would contribute substantially to the increasing needs for electrical energy in the area. These features include one major power plant on the Colorado River at Bridge Canyon and small plants on the Salt, Verde, and Gila Rivers at McDowell, Horseshoe, and Buttes Dams, respectively. The potential Bridge Canyon power plant would be a logical step toward the ultimate development of the power resources of the lower Colorado River Basin. Under this development it has been assumed that provisions would be made for coordinated and integrated operation of all Government power plants in the lower Colorado River. These plants would be those at Bridge Canyon, Hoover, Davis, and Parker Dams. Coordinated operation would result in the production of greater amounts of firm energy and a more effective utilization of water than if the power plants were operated independently of each other.

The power market for the energy thus developed would consist of the State of Arizona, southern California, southern Utah, and southern Nevada. This area corresponds roughly to power-supply areas 47 and 48 as designated by the Federal Power Commission.

Reservoir-operation studies for power production have been made by the Bureau of Reclamation on the basis of full coordination and integration of the Government plants on the lower Colorado River. It has been assumed that Davis power plant would be completed and that the full designed capacity would be installed in Hoover power plant at the time that Bridge Canyon power plant was completed. In all studies, the amount of water available for power generation has been that incidental to river regulation, flood control, and irrigation releases and storage.

Coordinated operation of all power plants produces the largest possible amount of firm power. Under this system the plants with small reservoirs would generate a greater percentage of the total power produced during periods of high run-off, than they would in low run-off periods. Concurrently the plants with large reservoir capacity could reduce their output and store all possible water for use in low run-off periods. With this system of operation it is possible to produce a higher total system firm energy than under independent operation.

In the studies of reservoir operation for power, river flows for the year 1923 to 1942, inclusive, were used. These years represent a period of run-off for the Colorado River in which the average yearly flow is about 90 percent of the estimated long-time yearly average. The period 1931 to 1940, inclusive, is taken as a period of low flow of the river and is assumed as the critical period for the reservoir-operation studies. These studies were computed for initial conditions of project development. Additional studies were made to determine the firm energy production under ultimate development.

Virgin stream flows were depleted for conditions estimated as representative of the above conditions of project development and were then used in the reservoir-operation studies.

In order to present the studies of the various power plants under different conditions of operation, and yet on comparable bases, certain fundamental concepts were adhered to in all studies. These concepts were: (1) All reservoirs were full or at required flood-control levels at the start and finish of all reservoir-operation studies; (2) irrigation demands governed the amount of water available for power; (3) under coordinated operation the firm-power production credited to Hoover Power Plant was equal to the amount which that plant could produce under independent operation; (4) minimum reservoir content of Lake Mead was held at the same level as would be experienced under independent operation; (5) all power plants under coordinated operation produced their average yearly credited amounts of firm power over the 10-year critical period; and (6) for comparative purposes Hoover and Bridge Canyon Power Plants were operated both independently and integrated in order to show the national benefits under coordinated operation.

The potential output of the Colorado River Plants under the coordinated operation previously mentioned and at initial conditions is 10,725,000,000 kilowat-hours of firm energy annually. Of this amount Bridge Canyon is credited with 4,675,000,000 kilowatt-hours, Hoover with 4,500,000,000 kilowatt-hours, and Davis and Parker with a combined total of 1,550,000,000 kilowatt-hours. The other power plants of the central Arizona project are credited with an annual production of 98,000,000 kilowatt-hours of firm energy annually.

The following table shows the generation of central Arizona project for the three stages of development studies.

This table outlines the installed capacity and the firm-energy output of the plans under consideration. It shows the firm energy produced under initial conditions, what we call average conditions, and ultimate conditions of the development.

It shows the replacement necessary at Stewart Mountain Dam as a result of diverting water above that structure.

It shows the required amount of power required by the pumps and the net energy production available for commercial sale.

(The chart referred to is as follows:)

Summary of power plants

Power plants	Installed capacity	Average gross power head (feet)	Annual firm energy (in million kilowatt-hours)		
			Initial conditions	Average conditions	Ultimate conditions
Bridge Canyon	750,000	612	4,675	4,395	4,114
McDowell	4,100	54	23	21	19
Horseshoe	10,000	141	40	40	40
Buttes	6,000	144	35	35	35
Total	770,100		4,773	4,491	4,208
Stewart Mountain replacements			25	28	31
Total			4,748	4,463	4,177
Pumping requirements, Havasu and McDowell			1,154	1,393	1,633
Net energy production			3,594	3,070	2,544

Other needs of the area would be served by multiple-purpose features of the project through incidental benefits, such as flood control, silt retention, salinity control, recreation, and fish and wildlife propagation. Although these benefits are considered incidental to the primary purpose of the project, they are significant.

ECONOMIC FEASIBILITY OF THE PROJECT

The last major element to be considered in the investigation of a project is—economic feasibility. Will the project pay out? Will the returns equal the cost? Do the benefits exceed the cost?

Estimated construction costs are presented in table A–5 entitled "Summary of Costs." Annual costs are presented in table B–5, entitled "Summary of Annual Costs." Cost estimates by the Bureau of Reclamation were completed on the basis of construction-cost levels prevailing in July 1947. Estimates and costs for Buttes and Charleston Dams, Tucson aqueduct, and Safford Valley improvements were prepared by the United States engineer office, Los Angeles, Calif. These estimates were based on prices prevailing in 1939 and were adjusted by the Bureau of Reclamation to reflect construction-cost levels prevailing in July 1947. All costs include allowances for engineering and contingencies.

It will be recognized that the Bureau's report anticipated somewhat different provisions as to repayment requirements than are presented in the bill under consideration by this committee. The discussions which follow reflect the provisions of the bill now under consideration. Tables A–5 and B–5 show the allocation of construction costs and annual costs respectively that have been made to the several items for which allocable costs would be authorized in the bill. The studies allocate construction and annual costs to irrigation, power, municipal water supply, flood control, silt control, recreation, fish and wildlife conservation and propagation, and salinity control. The first three items are considered reimbursable, the last five are considered nonreimbursable. Costs allocated to irrigation and municipal water supply are considered repayable without interest. The construction costs allocated to power are considered as interest-bearing. An interest rate of 3 percent has been applied and the interest component has been used to assist in repayment of the irrigation obligation which is beyond the ability of the water users to repay.

Annual costs of the project shown on table B–5 include operation and maintenance and replacement reserve. Other annual costs include the annual payments on the reimbursable portion of the construction cost.

Allocation of construction costs to the various functions were computed by two methods: the alternate justifiable expenditure method and the proportionate-use method. The method chosen for use on any one feature was that which was most suitable.

Direct returns would accrue to the project from the sale of irrigation water, municipal water, and electric energy. The estimated average annual returns from these items would be (1) from irrigation water, $3,147,900; (2) from municipal water, $527,900; (3) from power, $12,635,000. These returns are sufficient to repay the full reimbursable project construction cost, annual operation and maintenance expenses, and establish the necessary replacement reserve.

A charge to the farmer of $3.30 an acre-foot at the district headgates which corresponds to a charge of $4.75 at the farm headgate was used as the basis for computing annual returns from the sale of irrigation water. This price is predicated upon repayment ability studies made of the project area, based on 1939 to 1944 average values of crops at the farm.

A study of municipal water rates in various cities in the West indicates that the city of Tucson could pay for its municipal water at the rate of 15 cents per 1,000 gallons at the intake of its distribution system.

Senator ANDERSON. Do you know what the Tucson costs are now for the present water supply?

Mr. LARSON. I do not know. I believe they would be just a little bit less than that at the present time.

The rate at which electrical energy would be sold was determined on the basis of providing revenues adequate to assure full payment of all reimbursable costs after the revenues from irrigation and municipal water had been credited to the account. The rate determined is 4.65 mills per kilowatt-hour at the load centers.

As outlined above the project would pay out—the returns would equal the costs in accordance with the repayment provisions of the bill under consideration.

Benefits accrue not only to direct beneficiaries, such as the initial purchasers of irrigation water, municipal water, and electrical energy, but there are innumerable indirect beneficiaries whose income and livelihood are dependent upon or substantially affected by the creation of raw materials on the irrigated lands and the production of electric energy. Nor are the benefits limited to those arising out of irrigation and municipal water, and out of the use of electric energy. The central Arizona project would be a multiple-purpose development which would also furnish public benefits from flood control, silt control, fish and wildlife conservation, salinity control, and recreation. The following analysis compares total or national benefits with total or national costs.

Benefits from the project have been divided into two categories. The first comprises those tangible benefits upon which monetary values have been placed. The second includes intangible benefits, which cannot be evaluated in monetary terms, and a few tangible benefits not evaluated.

Tangible benefits from irrigation are estimated to have an average annual value of $25,268,000. In arriving at this estimate two general types of tangible irrigation benefits from the project have been evaluated. The first is composed of benefits accruing directly to farmers and indirectly to others from the production of a larger volume of agricultural products than would be produced without additional irrigation water. The second is comprised of benefits accruing directly to farmers from the reduced pump lift that would result from elimination of the overdraft of ground water.

The sum of tangible benefits accruing to direct and indirect beneficiaries that would result from the production of additional farm products will average $23,579,000 annually. These benefits are calculated as the increase in the gross value of crops at the farm, based on a price level equivalent to that occurring during the years 1939-44 which

is substantially less than occurred during the past few years. The benefits from savings in the cost of pumping irrigation water will average $1,689,000 annually, which represents the difference between the deteriorated conditions that will occur if supplemental water is not forthcoming, and the improved conditions that would accompany the furnishing of additional water.

The $25,268,000 of annual irrigation benefits is considered as a measure of the net effects of producing, processing, and handling in commercial channels the greater volume of agricultural products emanating from the project area. It is therefore assumed to represent the net benefits from irrigation. These include such benefits as the stimulation of business activities associated directly and indirectly with this larger volume of production. As an example, the farmers grow more lettuce; the truckers, packers, and railways handle more lettuce; and the business activity of restaurants, retail stores, personal services, and many others improve. All make greater net returns because of the greater volume of lettuce. The converse will occur with a decreased volume of agricultural products. Maintenance and even expansion of public facilities without increasing State and local tax rates would be possible with increased supplemental water, in contrast to the prospective retrenchment that would accompany the reduced agricultural production without it. All benefits of this type are included in the irrigation benefits which are used in the benefit-cost ratio.

Power benefits resulting from consummation of the central Arizona project would pyramid into a volume far above the sale value of the actual energy produced. A monetary value of benefits has not been determined but, in lieu thereof, the computed sales value of the power has been used as a conservative estimate of the minimum benefit. Average annual power benefits are therefore assumed as being measured by the sale of electrical energy at a unit price of 4.65 mills per kilowatt-hour. The annual return would aggregate $12,635,000. In computing these returns, the accumulative effect of upstream depletions resulting in a corresponding gradual reduction in power output, has been reflected.

Municipal water supply benefits, like those of power, are so widely distributed that they cannot be fully evaluated. In lieu of a more accurate determination they have been considered as being equal to the estimated revenue derived from the sale of water. Such consideration reflects utmost conservatism. Municpal water supply returns are computed at $528,000 annually. This amount was derived from the application of a unit sales price of 15 cents per 1,000 gallons to 10,800 acre-feet of water delivered annually to the municipal distribution system of Tucson.

Silt control benefits are estimated to have an annual value of $1,350,000 during the project repayment period. This total includes the value of protecting the Bounder Canyon project, the value of this protection being based on the replacement cost of a proportionate part of Lake Mead storage. It also includes the benefits associated with Buttes and Hooker Reservoirs. These benefits from the latter two reservoirs were derived from data furnished by the United States engineer office, Los Angeles, Calif.

Recreation benefits have been estimated by the National Park Service on the basis of travel value per car, the recreational value per

visitor, periodic value of visitors, and a general value which represents a gross profit to local business. The annual benefit is estimated at $1,482,000 annually.

Fish and wildlife benefits of $145,000 have been estimated by the Fish and Wildlife Service. This net annual benefit represents the minimum that may be expected from operation of the project as presently contemplated. The estimated annual value cover fish, large and small game, fur bearing animals, and water fowl.

Flood-control benefits are computed at $316,000 annually. Five of the features included in the central Arizona project would provide flood control. Such benefits at Buttes, Charleston, and Hooker Dams, and the Safford Valley improvements were evaluated by the United States engineer office on the basis of 1939 levels. The benefits determined by that office were subsequently adjusted by the Bureau of Reclamation to reflect the higher price levels that, it is believed, will occur during the repayment period. Flood-control benefits at McDowell Dam were determined on the basis of preliminary studies made by the Bureau of Reclamation.

Benefits accruing because of the salinity control provided by the project drainage system have been estimated to amount to $256,000 annually. This benefit results from the use of the drainage system for the release of water from the project area which contains accumulations of various salts in harmful quantities.

In evaluating annual costs for determining a benefit-cost ratio, all construction costs are assumed to be amortized with interest as a measure of the actual national cost, regardless of the legal aspects of reimbursability or interest-free allocations. Annual amortization costs have been computed on the basis of retiring all project construction costs over a 70-year period at an assumed national interest charge of 2 percent on the unpaid balance of the debt. This annual charge has been computed to be $19,691,600.

Operation and maintenance costs have been estimated for each of the various features included in the potential project development. The total of these costs would average $4,551,200 annually, during the repayment period.

Reserve for replacement is provided in accordance with the estimated requirements for the various features of the project development. It is estimated that payments totaling $2,212,400 annually would be required to provide the necessary reserve.

The relationship between project benefits and costs is outlined in the following table:

Comparison of benefits and costs

AVERAGE ANNUAL BENEFITS	
Irrigation	$25,268,000
Power	12,635,000
Silt control	1,350,000
Recreation	1,482,000
Municipal water supply	528,000
Flood control	316,000
Fish and wildlife conservation	145,000
Salinity control	256,000
Total	41,980,000

AVERAGE ANNUAL COSTS

Operation and maintenance	$4,551,200
Reserve for replacement	2,212,400
Amortization of all project construction costs at 2 percent	19,691,600
Total	26,455,200

Ratio of annual benefits to annual costs equals 1.59 to 1.

Intangible benefits of the project are many but are of such complexity that they have not been evaluated in monetary terms.

The serious consequences that would result from a retrenchment in the economy of the area, including a probable enforced migration of many rural and urban families would be averted. Instead, much additional employment would result, both during construction and as a result of operating the project and project lands. The increased production of electric energy would encourage industrial expansion far beyond the borders of the project and even beyond the boundaries of Arizona.

Increased productive capacity and the wider use of electric energy for domestic use would improve living standards. Such benefits and many similar ones add to the desirability of the development.

SUMMARY

On the basis of the investigations completed on the central Arizona project by the Bureau of Reclamation, the analysis of the four fundamental elements can be summarized as follows:

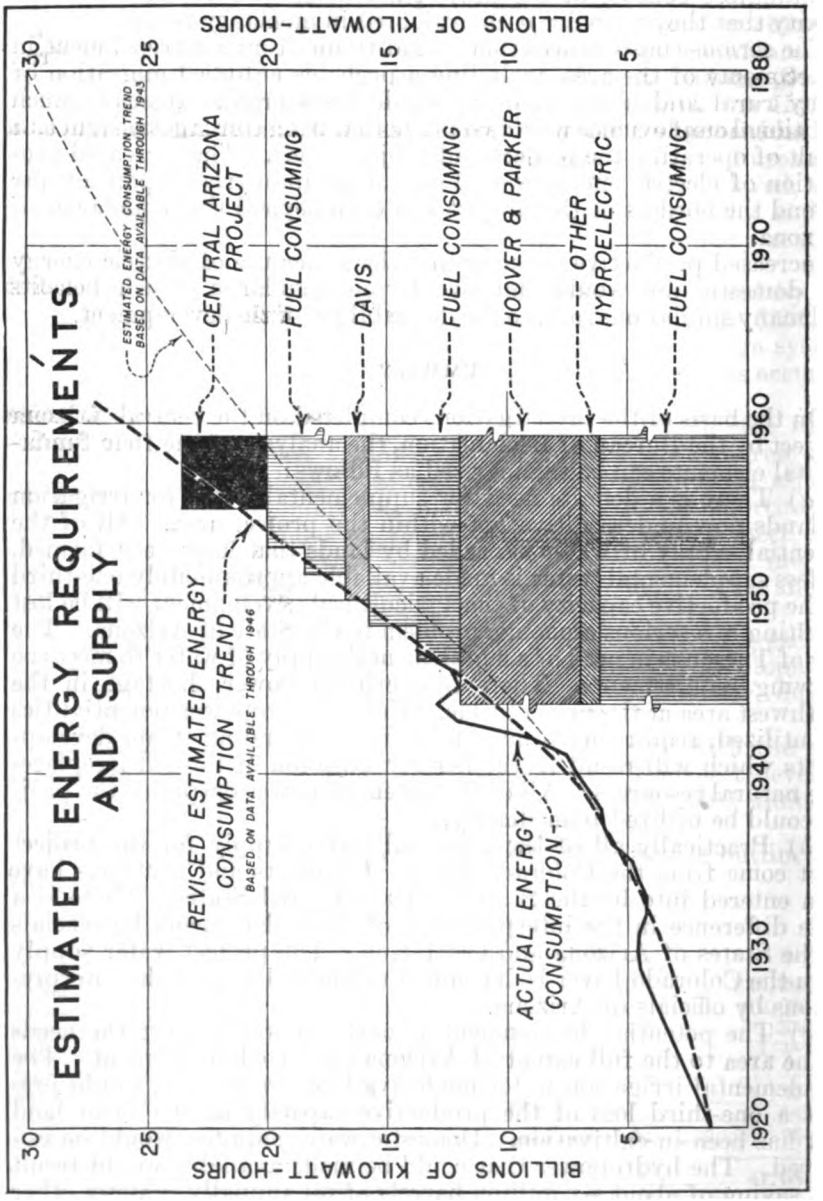
(*a*) There is a definite need for supplemental water for irrigation of lands now under cultivation within the project area. All of the potential supply of water is needed by lands that have been farmed. Unless supplemental water is made available approximately one-third of the productive capacity of the agricultural development will be lost resulting in a serious economic problem to the State of Arizona. The city of Tucson is in need of a supplemental supply of water to meet the growing requirements. There is a critical power shortage in the southwest area at the present time. Unless hydropower potentialities are utilized, requirements must be met by expanding steam developments which will result in further consumption of limited irreplaceable natural resources. All of the potential power output of the project could be utilized immediately.

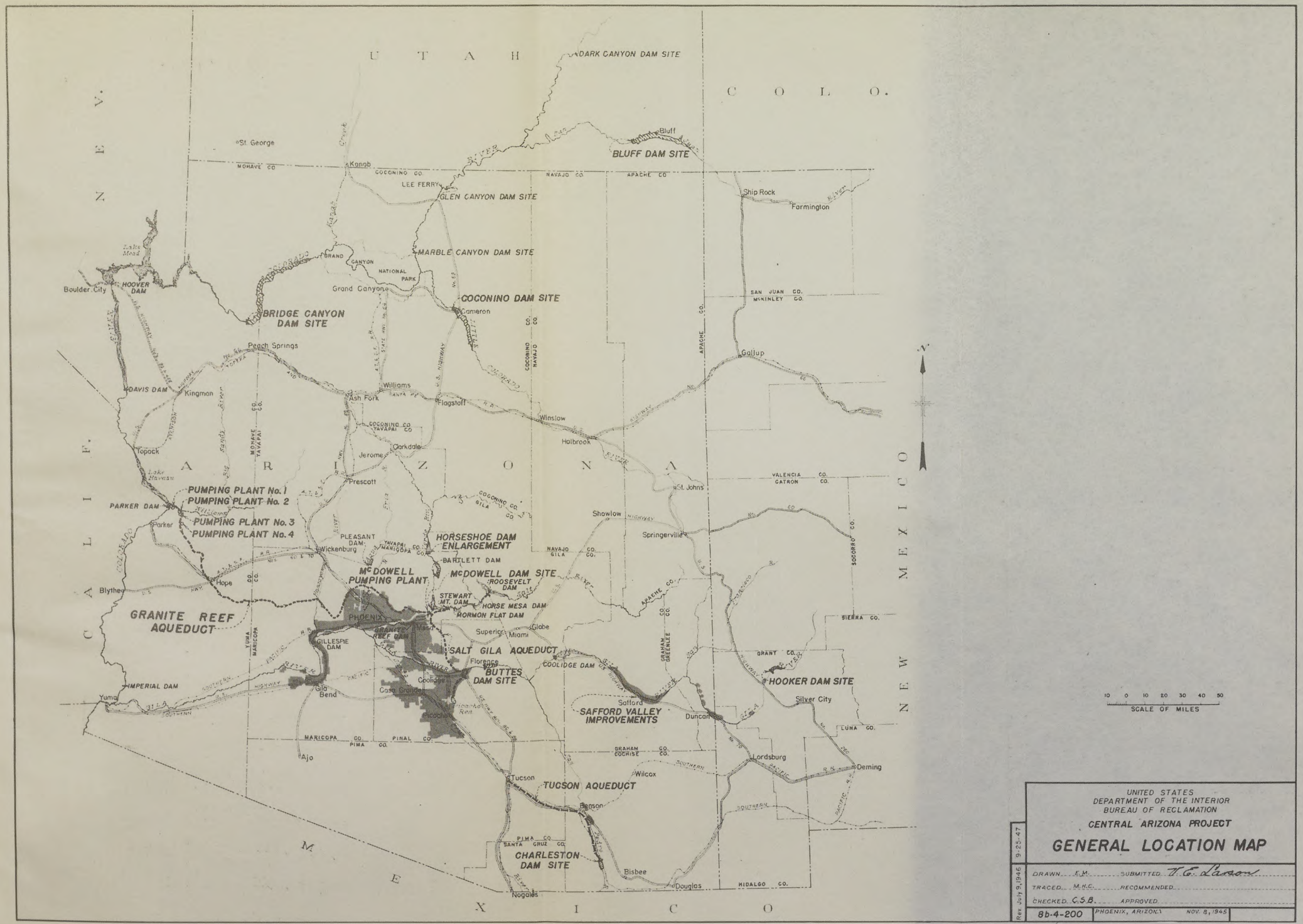
(*b*) Practically all of the potential water supply for the project must come from the Colorado River. Compacts and contracts have been entered into by the States and the United States. There is a wide difference in the interpretation of these documents by officials of the States of Arizona and California. The project water supply from the Colorado River is dependent on the validity of the interpretations by officials of Arizona.

(*c*) The potential development as outlined would serve the needs of the area to the full extent of Arizona's asserted entitlement. The supplemental irrigation water made available in Arizona would prevent a one-third loss of the productive capacity of the farm land that has been in cultivation. Domestic water supplies would be improved. The hydropower that could be made available would result in a saving of about six million barrels of oil annually. Many other needs would be served or supplemented by the potential development.

(*d*) Under provisions of the bill now under consideration the project would pay out. The benefits exceed the costs by a ratio of more than 1.59. Experience and history have proven that the strengthening of a weak unit of our national economy adds to the strength of the whole, both in normal times and in emergencies; the central Arizona project has been designed for such purpose.

(The charts referred to are as follows:)





UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL ARIZONA PROJECT

GENERAL LOCATION MAP

9-23-47

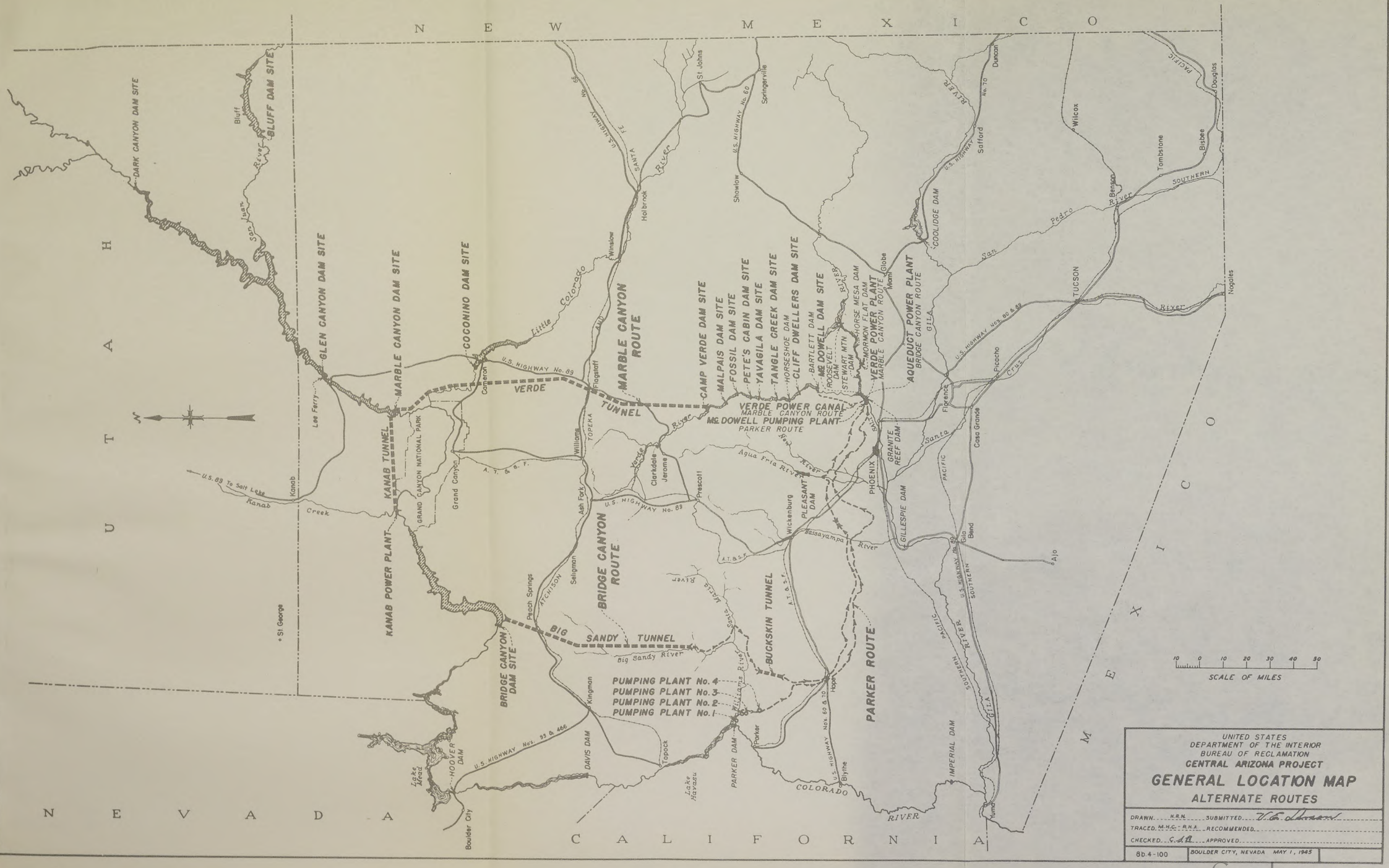
Rev. July 9, 1946

DRAWN E.M. SUBMITTED H.G. Larson

TRACED M.H.C. RECOMMENDED

CHECKED C.S.B. APPROVED

8b-4-200 PHOENIX, ARIZONA NOV. 8, 1945



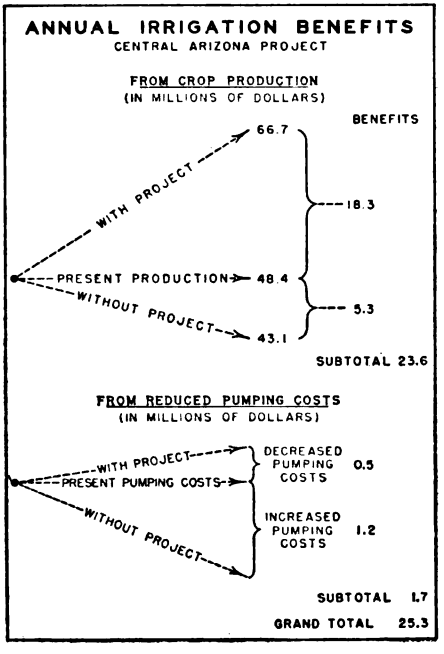


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TABLE A-5.—*Central Arizona project—summary of costs—allocations based on project repayment period of 70 years*

[Costs based on unit prices as of July 1947. 1,200,000 acre-foot diversion]

Feature	Construction costs								
	Total	Allocation							
		Power, interest-bearing	Irrigation, interest-free	Municipal, interest-free	Flood control, nonreimbursable	Silt control, nonreimbursable	Recreation, nonreimbursable	Fish and wildlife, nonreimbursable	Salinity control, nonreimbursable
Bluff Dam and Reservoir	$29,628,000	$13,884,000	$6,954,000			$8,517,000	$82,000	$191,000	
Coconino Dam and Reservoir	7,487,000	1,952,000	977,000			4,386,000	129,000	43,000	
Bridge Canyon Dam and Reservoir	191,339,000	100,207,000	50,189,000			9,140,000	31,298,000	1,105,000	
Bridge Canyon power plant	73,419,000	54,657,000	18,762,000						
Havasu pumping plants	25,973,000		25,973,000						
Granite reef aqueduct	131,716,000		131,574,000					142,000	
McDowell pumping plant and canal	3,346,000		3,346,000						
McDowell Dam and Reservoir	16,326,000	4,296,000	8,600,000		$2,900,000		391,000	139,000	
McDowell power plant	1,012,000	753,000	259,000						
Horseshoe Dam (enlarging) and Reservoir	7,078,000	2,081,000	4,166,000				618,000	213,000	
Horseshoe power plant	2,628,000	1,956,000	672,000						
Salt-Gila aqueduct	34,585,000		34,567,000					18,000	
Buttes Dam and Reservoir	29,037,000	5,952,000	11,530,000	$5,523,000	1,739,000	3,942,000	49,000	302,000	
Buttes power plant	1,159,000	863,000	296,000						
Charleston Dam and Reservoir	9,270,000		2,906,000	4,998,000	743,000		127,000	496,000	
Tucson aqueduct	6,401,000			6,401,000					
Safford Valley improvements	4,090,000		3,682,000		408,000				
Hooker Dam and Reservoir	15,484,000		14,490,000		398,000	238,000	249,000	109,000	
Irrigation distribution system	54,086,000		54,086,000						
Drainage system for salinity control	9,973,000		4,987,000						$4,986,000
Power transmission system	83,771,000	62,363,000	21,408,000						
Total	738,408,000	248,964,000	399,424,000	16,922,000	6,188,000	26,223,000	32,943,000	2,758,000	4,986,000

TABLE B–5.—*Central Arizona project—Summary of annual costs—Allocations based on project repayment period of 70 years*

[Costs based on unit prices as of July 1947. 1,200,000 acre-foot diversion]

Feature	Operation and maintenance								
	Total	Allocation							
		Power	Irrigation	Municipal	Flood control	Silt control	Recreation	Fish and wildlife	Salinity control
Bluff Dam and Reservoir	$21,400	$10,100	$5,000			$6,100	$100	$100	
Coconino Dam and Reservoir	15,900	4,200	2,100			9,300	200	100	
Bridge Canyon Dam and Reservoir	24,100	12,600	6,300			1,100	4,000	100	
Bridge Canyon power plant	1,155,100	859,900	295,200						
Havasu pumping plants	318,600		318,600						
Granite reef aqueduct	370,900		370,500					400	
McDowell pumping plant and canal	30,600		30,600						
McDowell Dam and Reservoir	500,300	158,800	317,800		$4,100		14,500	5,100	
McDowell power plant	35,400	26,400	9,000						
Horseshoe Dam (enlarging) and Reservoir	6,500	1,900	3,800				600	200	
Horseshoe power plant	57,000	42,400	14,600						
Salt-Gila aqueduct	72,100		72,100						
Buttes Dam and Reservoir	17,800	3,600	7,100	$3,400	1,100	2,400		200	
Buttes power plant	41,600	31,600	10,600						
Charleston Dam and Reservoir	6,800		2,100	3,700	500		100	400	
Tucson aqueduct	37,700			37,700					
Safford Valley improvements	47,800		43,000		4,800				
Hooker Dam and Reservoir	10,700		10,000		300	100	200	100	
Irrigation distribution system	268,900		268,900						
Drainage system for salinity control	151,600		75,800						$75,800
Power transmission system	1,360,400	1,012,700	347,700						
Total	4,551,200	2,163,600	2,210,800	44,800	10,800	19,000	19,700	6,700	75,800

Feature	Replacement reserve								
	Total	Allocation							
		Power	Irrigation	Municipal	Flood control	Silt control	Recreation	Fish and wildlife	Salinity control
Bluff Dam and Reservoir	$6,900	$3,300	$1,600			$2,000			
Coconino Dam and Reservoir	2,400	600	300			1,400	$100		
Bridge Canyon Dam and Reservoir	77,000	40,200	20,100			3,600	12,600	$500	
Bridge Canyon power plant	898,100	668,600	229,500						
Havasu pumping plants	214,500		214,500						
Granite reef aqueduct	24,100		24,100						
McDowell pumping plant and canal	14,800		14,800						
McDowell Dam and Reservoir	22,400	6,900	13,900		$800		600	200	
McDowell power plant	9,400	7,000	2,400						
Horseshoe Dam (enlarging) and Reservoir	2,200	600	1,300				200	100	
Horseshoe power plant	21,400	15,900	5,500						
Salt-Gila aqueduct	6,300		6,300						
Buttes Dam and Reservoir									
Buttes power plant	10,900	8,100	2,800						
Charleston Dam and Reservoir									
Tucson aqueduct	4,100			$4,100					
Safford Valley improvements									
Hooker Dam and Reservoir									
Irrigation distribution system	28,600		28,600						
Drainage system for salinity control	17,700		8,900						$8,800
Power transmission system	851,600	634,000	217,600						
Total	2,212,400	1,385,200	792,200	4,100	800	7,000	13,500	800	8,800

Senator ANDERSON. Senator McFarland, do you have anything in particular to say?

Senator MCFARLAND. I understand, Mr. Chairman, the Reclamation Service has prepared comments in regard to the evidence presented by California, their comments on the report.

I do not have any questions with regard to this statement.

Senator ANDERSON. In the absence of Senator Downey, I wonder if you would like to have the chair and ask some questions.

Mr. ELY. Thank you, Mr. Chairman, there are several. I do not know the proper procedure for submitting them. I think Senator Downey will be available tomorrow and perhaps when he is here he would prefer to ask his own questions of Mr. Larson, if he will return then.

I do appreciate your courtesy very much.

Senator ANDERSON. You will be here tomorrow?

Mr. LARSON. Yes, sir.

Senator ANDERSON. Senator Miller, do you have some questions you would like to ask?

Senator MILLER. No; I do not.

Senator ECTON. Mr. Chairman, I would like to have Mr. Larson tell us when this survey was completed.

How recently was your survey completed? Maybe you mentioned that before I came in.

Mr. LARSON. We completed our report in December of 1947.

Senator ECTON. When did you begin it? How long did it take?

Mr. LARSON. The investigations I worked on directly were started in 1944. Some work had been done previous to that date.

Senator ECTON. So it was over a period of practically 3 years?

Mr. LARSON. It was practically 4 years, it amounted to almost 4 years. As I say, there was considerable work done prior to that time, as well as work completed by other agencies such as investigational work on the Gila River by the Army engineers.

Senator ECTON. Then all these estimates in here are based on prices prevailing back in 1944 and 1945 and 1946?

Mr. LARSON. No. We adjusted them for prices as they prevailed in July of 1947.

Senator ECTON. Oh, they were all adjusted up to 1947?

Mr. LARSON. Up to 1947, yes, sir.

Senator ECTON. That is all.

Senator ANDERSON. May I return for just a moment to page 34, where you are talking about silt control benefits.

You estimate them to have an annual value of $1,350,000 "during the project repayment period".

Mr. LARSON. That is right.

Senator ANDERSON. How long is the project repayment period?

Mr. LARSON. Seventy years.

Senator ANDERSON. So you are estimating some $100,000,000 for silt control benefits?

Mr. LARSON. It would amount to about $14 an acre-foot.

Senator ANDERSON. But aren't you estimating it at something around $100,000,000 for silt benefits?

Mr. LARSON. That is right.

Senator ANDERSON. Now, in that you say:

This total includes the value of protecting the Boulder Canyon project, the value of this protection being based on the replacement cost of a proportionate part of Lake Mead storage.

Do you recall how much?

Mr. LARSON. We determined the amount of silt that would enter Lake Mead in that period, and then provide a reservoir of that capacity, determine the cost of the reservoir to hold that amount of silt.

Senator ANDERSON. Then you said: "It also includes the benefits associated with Buttes and Hooker Reservoirs."

Mr. LARSON. The benefits for Hooker and Buttes were determined by the Corps of Engineers.

Senator ANDERSON. Are the costs of construction of Buttes and Hooker included in the cost of the project?

Mr. LARSON. Yes, sir.

Senator ANDERSON. Off the record.

(Discussion off the record.)

Senator ANDERSON. Thank you very much, Mr. Larson.

Mr. Nielsen.

STATEMENT OF E. G. NIELSEN, BUREAU OF RECLAMATION

Senator MCFARLAND. This will be off the record.

(Further discussion off the record.)

Mr. NIELSEN. I have prepared a draft of comments while I was home last week. I do not have them mimeographed. I would like to read them from this draft.

Senator ANDERSON. That is all right.

Mr. NIELSEN. This statement has been prepared in the expectation and hope that the committee would call upon the Bureau of Reclamation to clear up those parts of our report on the central Arizona project rendered obscure by testimony given in these hearings. We have assumed that the committee does not wish an item-by-item response, and so have selected for comment those items which bear strongly upon the feasibility or justification of the central Arizona project.

Our experiences with the Colorado Basin report, and in the hearings on S. 1175 have made us particularly sensitive to the need for a full and adequate presentation of all matters involving waters of the lower Colorado River system. Throughout these investigations we have made every effort to consider carefully all comments. We have been anxious to avoid errors, and quick to rectify those coming to our attention. We have maintained a standing invitation to all concerned to visit our offices and to discuss problems arising out of our investigations. We have urged those whose studies yield results at variance with ours to bring their supporting data, since without those data little can be accomplished. The response to that invitation has not been such as to suggest that a reconciliation of data was desired.

The State of California has commented on the results of our studies of the central Arizona project. These comments have been carefully considered and appropriate revisions made. We have not considered it appropriate to follow California's suggestion that the report be altered to reflect California's views as to the division of the waters of the Colorado River. The Secretary and the Commissioner have

repeatedly stated that this is a matter which the Department and the Bureau cannot, and will not attempt to resolve. The report on the central Arizona project carries out these views consistently. Its water supply data are openly and frankly qualified by the statement that they reflect Arizona's claims, and we took some pains to point out that California challenges the validity of those claims.

A careful review of the 162-page volume of "California's Views and Recommendations" indicates no adequate basis for any substantial or important changes in the central Arizona project report. It appears that in many instances those comments are based upon incomplete studies or a misconception of the problem involved. Necessarily, then, California arrived at conclusions at variance with those of the Bureau.

In the main, California's comments criticize the report for lack of detailed surveys and estimates. I shall respond to that criticism in more detail later, but I should like to raise the question as to whether this type of criticism is not used as an indirect means of serving California's primary purpose, which is stated by Governor Warren, in the fourth paragraph of his letter of December 29, 1948, to Secretary Krug to be:

> Until there is a final settlement of the water rights by some method, the aggregate of Arizona and California claims to Colorado River water will exceed the amount of water available to the lower basin under the Colorado River compact and relevant statutes and decisions. It is only because a determination of the respective rights of the lower basin States to the waters of the Colorado River system has not been made, that California submits any criticism of your proposed report. Whenever it is finally determined what water belongs legally to Arizona, it should be permitted to use that water in any manner or by any method considered best by Arizona, so long as that use does not conflict with the right of California to the use of its water from the Colorado River system.

Senator MILLER. I am wondering in view of the various conflicts we have listened to here for days and days and will probably continue to listen to for weeks and weeks, what objection you would urge, or would not this be a very fine instance for the Interior Department to make a division of authority of lower California and Arizona? Wouldn't that settle all the difficulties?

Mr. NIELSEN. I do not feel qualified to answer that question because of the many involvements of authority.

Senator MILLER. In other words, you would have some one unit attempting to manage the whole thing, would you not?

Mr. NIELSEN. Except this, can a Federal agency move in on rights which are State rights and jealously held to be State rights?

Senator MILLER. Under the recent rulings of the Supreme Court has the State got any rights in water?

Mr. NIELSEN. That would be a good one to ask an attorney.

Senator MILLER. Well, they virtually have said so. I was just thinking about that in connection with the administration bill. For instance, the Columbia Basin administration bill which was introduced here recently; the Missouri Valley Authority that was introduced not long ago. In other words, putting it in a nutshell, if any of those areas, and notably the Columbia Valley Authority, if that is a good thing for the Columbia Basin, why is it not a good thing for the whole United States and be done with it all? Just turn it all over to agencies.

Mr. NIELSEN. I would definitely be concerned with the views of the States. The States have set up rights in the waters of the Colorado River. That water is not sufficient to go around. The superimposing of another jurisdiction upon that river might result in some pretty bitter controversies, I would think. But that is just a layman's opinion of the legal matters that are quite profound.

Senator MILLER. Well, that is what I was wondering, whether they were profound or did not amount to anything.

I might tell you a story right there that is very short and good. Fred G. DuBois was a very noted Senator from the State of Idaho many years ago. He first came to Idaho as an Indian agent; later a delegate to Congress, and still later a Senator under the Republican regime, then the Democratic regime. He was always more or less interested in Indian affairs because of his knowledge. They sent him out one time while he was a lame duck, so to speak, to try to get some of the lands lying close around Pocatello, Idaho, and the Fort Hall Indian Reservation.

Senator ECTON. For an atomic plant, Senator?

Senator MILLER. Oh, no, these were highly important agricultural lands. He was telling me the story about it as we were riding over this tract one day on the train. He related how he came out there to get these particular Tyhe lands. He and the old chieftains gathered around the council tent. Of course, the pipe of peace was passed around from hand to hand, for hours and hours. Of course they were talking through an interpreter because no Indian I have ever known anything about is going to talk English, even though he has a better command of it than I have.

Finally, Charlie Head, who was a half-breed chieftain spoke up. He said, "Fred, you say the Great White Father in Washington wants this land?" "Yes, the Great White Father needs this land." "Well," he said, "if he does, what the hell's the use of talking about it, because he'll take it away from us anyway?" [Laughter.]

That is about the way with these authorities.

Senator ECTON. Right in that connection, Mr. Chairman, if I may further delay this testimony, in view of what the Senator from Idaho said about the Supreme Court decision, that maybe the States do not have any water rights, is that not what constitutes the main objection to these authorities?

Senator MILLER. I think so.

Senator ECTON. The States are certain that with an authority, along with a Supreme Court decision, they surely will not have any rights left.

Senator MILLER. Well, of course, I am looking back to a decision not far from you up on the New River. There is where the thing first broke, more particularly, I think, than anywhere else. That is in the case of the *United States* v. *The Appalachian Power Company*. There the Supreme Court held that a stream was navigable if you could make it navigable.

Well, of course, we know that you can make almost anything navigable.

I think there is no question but what the Court would hold that no individual owns any water right. All he owns is the right to the use. But along comes the Government under these authorities and claims

they have the right to supervision of the use, not only of the waters, but the timber, the minerals, the wildlife, any everything else within the scope of it. So I do not know. It is a big problem.

I thank you for your time. I must go, Mr. Chairman.

Senator ANDERSON. Did you have a further observation, Senator Ecton?

Senator ECTON. This is off the record.

(Discussion off the record.)

Senator ANDERSON. Proceed, please.

Mr. NIELSEN. I am still on Governor Warren's letter.

However, as long as the present unsettled situation exists, it is my opinion that each State in the lower basin must of necessity interest itself in the others' projects which would overlap its claims.

Mr. Matthew's testimony before this committee contained this statement:

However, the plans and cost estimates are based upon preliminary investigations for some of the major features, and were prepared without adequate surveys, explorations, and design plans.

The committee is, of course, interested in the significance of such criticism.

Investigations incident to a project of the magnitude of central Arizona could, of course, be carried on for years if it were necessary to refine every possible feature of the project before presenting plans to the Congress. The investigations to date have cost several hundred thousand dollars. They could run into several millions. But there is general agreement among engineers and laymen alike that investigations for project planning reports shall not go beyond such reasonable program of field and office work as may be required for a reliable over-all appraisal of the project. It is the considered opinion of the Bureau of Reclamation that the report on the central Arizona project serves that requirement. It would be impossible to justify the expenditure for the investigation of every feature of a project in the detail proposed in the comments by California. These details are obtained after the project has been authorized and as required for final designs.

Standard engineering methods have been used in obtaining data and in the preparation of preliminary designs of the various features. Topography of all dam sites has been secured. The fact that some topography may have been made a number of years ago is no reflection on its accuracy. Based upon the topography, geological conditions, availability of construction materials, and the functions to be served by the feature, preliminary designs were prepared which served as the basis for estimating the construction costs.

The location of the aqueducts is based upon field surveys which consisted of a stadia traverse with side shots to establish the general topographic conditions. Standard hydraulic procedures were employed in determining the size, slope, and shape of the aqueducts These data provided the basis for estimating excavation quantities and determining the location of special structures. The estimates of construction cost for all items of the aqueducts are based upon standard procedures. Many items can be determined accurately, such as the volume of concrete required for lining canals. This item alone represents 45 percent of the total cost of the Granite Reef and Salt-Gila aqueducts.

Even though the items described represent sound engineering principles as applied to planning surveys and design, they do not represent the maximum detail or indicate the accuracy of most of the estimates. For example, because Bridge Canyon dam site is in an isolated location, a large part of the cost of investigating this feature is represented by the purchase of required special drilling and other equipment and the costs of transporting the equipment, supplies, and personnel to the site.

Because of this heavy initial expenditure and the probability that Bridge Canyon Dam and power plant would soon be constructed in any event, it was decided to complete the investigations in sufficient detail to serve the requirements of preparing plans and specifications. Therefore, the estimates for the largest single feature, which involves about 36 percent of the total project cost, are more detailed than usually prepared for project authorization reports. The cost of the pumping plants and the power plants may be estimated with reasonable accuracy without having detailed investigations covering the site. Nearly the entire cost of these installations is represented by equipment and buildings that would cost practically the same even though the location might be changed somewhat. These items together with Bridge Canyon Dam and power plant, and other features for which reliable estimates have been made total about 70 percent of the estimated project cost.

The data available for estimating the remaining 30 percent of the project cost were, in general, not as detailed as that for the previously described features. However, sufficient data were obtained and adequate estimates prepared for these items based on costs of similar construction on Bureau projects.

The Bureau does not maintain that estimates for each unit or feature are final. The over and under estimates for individual items will tend to balance so that the total cost should remain about the same as estimated.

Mr. Matthew states that the Bridge Canyon development and its necessary sediment-catching reservoirs, Bluff and Coconino, are not necessary parts of the Central Arizona project. The simple fact is that there is no block of power available for the pumping requirements of the project. He states that the real reason for their inclusion is that they would "* * * provide a source of revenue to finance most of the cost of the project."

Admittedly, Bridge Canyon commercial power revenues are needed to make the project financially feasible. There is nothing new about the use of the power revenues to assist an irrigation enterprise. To use Mr. Matthew's criterion that such power installations must be a part of works which conserve water for the immediate project would make it most difficult now to award the power privileges along the All-American Canal to the Imperial Irrigation District.

Mr. Matthew makes a complaint over the use of Lake Mead to conserve water for Arizona uses, and over the use of Lake Havasu for diversion to the central Arizona project. He might as logically have complained about their use for flood control, since the right of the United States to use those facilities for multiple-purpose is nonrestrictive.

We can pass quickly over Mr. Matthew's comments that upper Gila River developments have no necessary connection with the central

Arizona project. Firmly established rights to upper Gila water make it impossible to develop greater uses in the upstream reaches until users downstream have been satisfied from some other source. Our plan for the central Arizona project would make this water exchange possible, and, incidentally, would make it possible for the upper Gila area to share in the benefits from project power.

Mr. Matthew's analysis of water-supply requirements for the area represents a compounding of errors. Our report necessarily develops this subject in detail. Mr. Matthew finds that diversion of 500,000 acre-feet annually would satisfy the deficiencies in the area. In short rebuttal: Withdrawals from the underground basin exceeded recharge to the basin by 468,000 acre-feet a year during the period 1940–44—this period included the first real flood since 1920; lands actually irrigated during that period were short by an average of 113,000 acre-feet a year; approximately 106,000 acres were idle—we can find new water, in the amount of 418,000 acre-feet, for only 73,510 acres; we propose to furnish Tucson 12,000 acre-feet; outflow for maintenance of salt balance is required; and aqueduct losses must be met. These are not hypothetical requirements and no amount of rationalizing will reduce them.

Turning now to Mr. Peterson's first testimony, his supplementary presentation, he first presented an analysis of direct project costs, and indicated the sources of repayment of those costs. We were not in a position to see his illustrative charts, nor have we been furnished copies.

Senator ANDERSON. Just a minute. I have a copy.

Mr. NIELSEN. I say "we"; I was referring to the Bureau.

Senator ANDERSON. Did you ask for one?

Mr. NIELSEN. No; I do not think we did. Let me finish this statement. I was not intending to be critical.

Senator ANDERSON. I was going to say they were all around the table and all you had to do was to move to another chair.

Mr. NIELSEN. That statement was not intended to be critical. Let me continue the statement.

The report is amply clear as to the sources of repayment; if Mr. Peterson has added to your understanding, we are appreciative.

In the second point of his supplementary presentation, however, Mr. Peterson failed to develop fully the national interest in this or any other project built under public policies which have held for many, many years. Any public undertaking can be justified only if the benefits to be derived therefrom exceed the costs of developing those benefits. Appropriately, the Bureau developed the cost to the Nation of the central Arizona project, and set that cost out for all to see and consider. Mr. Peterson used that portion of our analysis to support his objection to authorization of the project. We fail to discover in his paper an evaluation of the offsetting item—national benefits.

If congressional committees were to receive and consider only the cost aspect of any proposed public work, our reclamation, flood control, soil conservation—all of our conservation programs would come to an abrupt halt. It is only that aspect which Mr. Peterson presented. Had he taken identical pains to present our finding that national benefits from the central Arizona project would exceed national costs by the ratio of 1.63 to 1, based upon amortization at 2 percent interest, or by the ratio of 1.46 to 1 upon the basis of 2½-percent interest, his

testimony would have been much more valuable to the committee, it appears to us.

Mr. Peterson's main statement goes to an effort to show that the firm energy generation at Bridge Canyon as developed in our report cannot be realized.

The estimated potential power production as shown in the report on the central Arizona project is based on certain predetermined criteria. Anticipated run-off was based on forecasts. Thus reservoirs could be drawn down or held at higher elevations to maintain a firm power output. Because of the undependable nature of secondary energy and its disposal, the Bureau studies disregard the secondary energy and consider only firm energy. Supplemental studies based on the same criteria indicate that any reasonable or foreseeable change in load pattern will not affect the results of the studies.

The Bureau studies consider the power plants at Bridge Canyon, Hoover, Davis, and Parker Dams as a system in which one unit helps another to produce the maximum system firm energy. To have made the studies on any other premise than this would have been to make them on the assumption that the Southwest is not fully conscious of the importance of producing the maximum amount of firm energy. This coordinated operation results in a maximum beneficial utilization of the power capabilities of the above-mentioned plants. By creating a maximum of firm energy, the area that can be served and the scope of the service is broadened to include small as well as large consumers. Under this plan of operation a minimum amount of steam or Diesel installation is required to supplement the hydroelectric system. Thus a major saving in limited supplies of gas and fuel oil is realized.

Mr. Peterson's study is based on the operation of the Colorado River power plants at Bridge Canyon, Hoover, Davis, and Parker as four individual units or with limited coordination between the Hoover and downstream power plants.

A part of the flood-control reserve at Lake Mead is available for storage of water in years of low run-off forecast. The advantage of this possibility was not considered in the Peterson study, nor was the active capacity at Lake Mead adequately utilized during the low run-off period. Thus, by maintaining a lower maximum active storage capacity and a high minimum active storage capacity at Lake Mead, Mr. Peterson's studies lose the benefit of the firm energy production of about 2,000,000 acre-feet of water and the possible increase of power head. It should be noted that the Peterson studies show the firm energy production to be the lowest monthly figure developed in the 10-year low run-off period, even though at that time water amounting to 37 percent of the active storage capacity was being held in Lake Mead. Mr. Peterson states that his studies indicate that only 4,150,000,000 kilowatt-hours of firm energy or less than present contract commitments could be produced at Hoover power plant in years of low run-off. Bureau studies show that the firm output of the Hoover Dam power plant would be 4,500,000,000 kilowatt-hours a year, or an increase of about 8.5 percent over the California figure just quoted.

Mr. Peterson's studies assume the production of large amounts of secondary energy which is usable only by large consumers who have steam or Diesel installations with capacity to firm their system when

secondary energy from Hoover is not available. However, a part of this secondary energy could be produced as firm energy by coordinated operation and proper utilization of the reservoirs.

The difference in the two independent studies is thus resolved to one of the production of a maximum firm energy which is usable by all types of consumers or production of a large amount of secondary energy which is of little monetary value for amortization of the capital investment and is usable only by large consumers with other major generating units at their disposal. In practically all markets there is a wide difference in the value of firm and dump or secondary energy. It is only natural that any electrical utility would prefer to purchase the maximum amount of secondary energy that could be utilized and sold as firm energy.

The studies by Mr. Peterson fail to utilize the reservoir storage capacities and stored water and thereby fail to show the actual potential firm power output of the Colorado River plants. Under his plan of operation, energy made secondary by his definition would be produced and purchased each year, and then actually utilized as firm energy.

Mr. Peterson finally, in appendix I of his statement, attempts to analyze the effect of silting upon the project works. It is acknowledged in the report that the reservoir formed by Bridge Canyon Dam would lose its effective regulatory capacity if silt-control structures were not provided to retain the large contributions of sediment from the Little Colorado and San Juan Rivers. Coconino and Bluff Dams have been included in the project plan as sediment-retaining adjuncts to the Bridge Canyon development. These dams would also provide flood control and river regulation benefits.

In computing the life of Bridge Canyon and other reservoirs, Mr. Peterson made the mistake of failing to recognize the fact that the total silt accumulation will exceed the gross water-storage capacity. Silt deltas in a reservoir will have a minimum slope upstream of about 1 foot a mile, consequently the silt deposits in the upstream portion of a reservoir are considerably above the maximum water-surface elevation of the reservoir.

More importantly, Mr. Peterson's estimates fail to make allowances for sediment retention in prospective upstream reservoirs. We think he exhibits too little faith in California's abilities when he assumes, as he must have, that the Glen Canyon site will not be built within the 53 years he estimates is the life of Bridge Canyon Reservoir. The Bureau's Salt Lake City office has recently circulated a planning report among the upper-basin States for informal review in which the development of the Glen Canyon site by 1957 is proposed. Our report assumes that Bridge Canyon will receive the silt burden of the main stream for 15 years before relief is afforded by Glen Canyon.

Passing now to Mr. Conkling's testimony:

Our attempts to analyse Mr. Conkling's testimony and to gain an understanding thereof have not been fruitful. The lack of supporting data for conclusions stated emphatically is disconcerting. As we understand the general plan outlined at the top of page 4 of his testimony he would meet all existing water shortages, create a water surplus, and discharge from the area all toxic waters by: (1) Salvaging the water presently consumed by phreatophytes, (2) salvaging the flood wastes

in "huge surface reservoirs already in existence," and (3) more fully utilizing the underground water basins.

Mr. Conkling estimates waste from phreatophytes in the swampy part of the project area at 270,000 acre-feet annually. He proposes to eliminate this waste, but his direct testimony is silent as to the means. Under cross-examination, he proposed surface drainage and lowering the water table to below the root zone by pumping. Bearing in mind that salt cedars have been known to put taproots down 50 feet, it is easy quickly to rejected surface drainage as an effective measure.

As to lowering the water table in this sump area by pumping, consider the physical facts. Mr. Conkling estimates the underground reservoir has 45,000,000 acre-feet of capacity within 300 feet of pumping lift. The average area of this basin must, then, be 150,000 acres. To lower the water table 1 foot annually would require pumping and wasting from the area 150,000 acre-feet as a minimum. 150,000 acre-feet is equivalent to the water demands of 37,500 acres. Compound this 37,500 acres mentally by making allowances for accelerated inflow to the sump due to pumping and for the fact that the roots of phreatophytes could probably keep pace with a water table lowering much more rapidly than 1 foot a year and our inability to follow Mr. Conkling's proposal then becomes apparent.

In justice to Mr. Conkling, it must be recognized that the 4 months he spent on these studies did not afford sufficient time to develop an answer to the elimination of phreatophytes. The Department of Agriculture, the Department of the Interior, and many private organizations have fought this battle for many years, and so far as we know, there has been no successful large-scale elimination of phreatophytic growth. The failures in the areas above Elephant Butte Reservoir on the Rio Grande and above Lake McMillan on the Pecos River make us very chary of basing an economy on the prospect of elimination of phreatophytes.

As to Mr. Conkling's second suggestion, that of conserving flood wastes in "huge surface reservoirs already in existence," he estimates average annual flood waste out of the area at 470,000 acre-feet. Records of spills at Gillespie Dam are not available for the whole of the period examined by Mr. Conkling, and there has not been time to derive estimates. We can, however, examine the occurrence of this bulk of water out of which an average of 470,000 acre-feet must have derived.

The water year 1941 provides a basis for estimating the ability of the area to withhold water. At the beginning of that year there was essentially no water in storage in surface reservoirs—34,400 acre-feet in reservoirs aggregating 3,400,000 acre-feet capacity. The virgin inflow to the Phoenix area for that year is computed at 5,300,000 acre-feet. During this year 1,036,000 acre-feet passed Gillespie Dam. Apparently the difference, or 4,264,000 acre-feet, is a measure of the area's ability to store and use water with existing facilities.

There are three flood years subsequent to 1897 in which run-off exceeded the area's full ability to store and use water. Under the condition of empty reservoirs at the beginning of each period, 3,647,000 acre-feet would have escaped in 1905, 3,154,000 acre-feet in 1916, and 1,002,000 acre-feet in 1941. These three uncontrollable flood years

contributed 166,000 acre-feet to Mr. Conkling's derived average of 470,000 acre-feet.

The Bureau's plan for the central Arizona project proposes the salvage in new or enlarged surface reservoirs of 132,000 acre-feet annually of the more stable flows. That brings us to the problem of conserving the last 172,000 acre-feet—always assuming Mr. Conkling's 470,000 acre-feet figure to be correct. We do not believe that it can be done economically.

We cannot follow Mr. Conkling's third proposition of satisfying the needs of the area by increased and deeper pumping from underground reservoirs the safe yield of which has been found to be very substantially less than present pumpage. We can accept Mr. Conkling's view that there may be stored at a depth a tremendous quantity of water, but as with a bank account, when withdrawals exceed deposits over an extended period of time, impoverishment must eventually result. No hypothetical consideration of "cyclic" or "rythmic" charge and recharge of ground-water basins during the period 1868–1948 will convince the farmer who has been left high and dry by the receding ground-water table that the cure lies in—

* * * drawing on the ground water and let nature take its course.

Finally, the point has been made by several California witnesses that our report does not afford an ability to appraise the project in the light of the provisions of S. 75, now under consideration. The repayment provisions outlined in S. 75 are slightly different from any of the four examined in our report. Employing the provisions of S. 75, and the increased charge for irrigation water as recommended by the Commissioner, the financial aspects of the project would be as follows: Irrigation water would sell for about $3.30 an acre-foot at the district headgates which is equivalent to $4.75 an acre-foot at the farmer's headgate; municipal water would sell for 15 cents per 1,000 gallons at the city mains, and the full reimbursable obligation could be met in a period of 70 years if commercial energy were sold for 4.65 mills per kilowatt-hour at the load centers.

Senator ANDERSON. Do you happen to have a copy of it now?

Mr. NIELSEN. I have a carbon copy unmarked. This has been edited to some degree.

Senator ANDERSON. California would sure like to have a copy of it for study.

Mr. NIELSEN. I would prefer to submit a clean copy.

Senator MCFARLAND. Mr. Chairman, may I ask one or two questions as to cost?

Mr. ELY. Excuse me, Mr. Chairman. Will that be mimeographed and available for study?

Mr. NIELSEN. Yes, we will have that mimeographed.

Mr. ELY. Will that be available this afternoon?

Mr. NIELSEN. Oh, no, I could not do that, but I would hope to have it in here tomorrow morning.

Mr. ELY. Thank you.

Senator MCFARLAND. On the cost item, Mr. Larson stated the cost was estimated at the 1947 level. I believe that is July 1947.

Mr. NIELSEN. July 1947.

Senator McFARLAND. I will ask you if the cost prices are not now pointing downward.

Mr. NIELSEN. Yes, sir, we have had a slackening off of prices.

Senator McFARLAND. How long a period of time do you estimate would be used in the construction of this whole project?

Mr. NIELSEN. I think we estimated once that under expedited construction it would take about 7 years.

Senator McFARLAND. It is entirely possible that that 7 years would be for Bridge Canyon, would it not?

Mr. NIELSEN. Our estimate assumed that Congress was to give us all the money we needed to complete all the units as fast as we could.

Senator McFARLAND. It would probably be more likely to be stretched out over a period of 15 years, would it not?

Mr. NIELSEN. The $738,000,000 would require $50,000,000 a year to be appropriated for one project over 15 years, and I think Congress might tend to slow us down.

Senator McFARLAND. I do not know what the period would be and I would hope it would be constructed as rapidly as possible, but even in the 7-year period it is entirely possible that the cost would be materially below the 1947 level.

Mr. NIELSEN. For the 15-year period you could almost gamble on it.

Senator McFARLAND. The income you estimated was over the period from 1939 to 1944.

Mr. NIELSEN. That is an arbitrary level selected to represent the expectation of repayment or of commodity prices over the 70-year repayment period for the project.

Senator McFARLAND. But that is a much better level you have selected there than as compared to the 1947 cost.

Mr. NIELSEN. Yes. Our long-time expectancy of collection is not predicated on the high levels which prevailed in July 1947.

Senator McFARLAND. Prices during those periods were considerably lower than they have been in the last few years?

Mr. NIELSEN. That is right.

Senator McFARLAND. The prices in the period 1939 to 1940 were considerably lower even than in other periods when they were under price control?

Mr. NIELSEN. That is right.

Senator McFARLAND. I think those are all the questions I have.

Senator ANDERSON. What is going to happen to these people in central Arizona in these ensuing 15 years if 100,000 acres of their land is already not usable and there is a continuous shortage of water?

Mr. NIELSEN. In the central Arizona project?

Senator ANDERSON. Yes.

Mr. NIELSEN. Well, it is shrinking.

Senator ANDERSON. They are extending the pumping areas this year?

Mr. NIELSEN. And at the same time there is land definitely going out of production.

Senator McFARLAND. Mr. Chairman, may I point this out: Mr. Neilsen, are there not many benefits which could be obtained in a much shorter period than that required for total completion? As soon as the

Bridge Canyon Dam and the aqueduct were constructed the benefits would start, would they not?

Mr. NIELSEN. You could get water to central Arizona and power production and power revenues ahead of the 15-year period.

Senator MCFARLAND. The construction of Coconino Dam and the Bluff Dam site would not be essential to the starting of the benefits. They could follow along after Bridge Canyon was completed, could they not?

Mr. NIELSEN. We would much prefer that those two went in as one project, so as to save Bridge Canyon capacity from the beginning.

Senator ANDERSON. Off the record.

(Discussion off the record.)

Senator ANDERSON. The hearing will be recessed until 2 o'clock in this same room.

(Whereupon, at 12:05 p. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSIONS

Senator ANDERSON. The committee will be in order. Senator McFarland, whom do you desire to call first?

Senator MCFARLAND. Mr. Lane.

Senator ANDERSON. Will you come forward, Mr. Lane.

STATEMENT OF W. W. LANE, CONSULTING ENGINEER, PHOENIX, ARIZ.

Mr. LANE. My name is W. W. Lane. I am a consulting engineer from Phoenix, Ariz. I have been engaged in irrigation work in Arizona and the Southwest for the past 30 years, and for 15 years was associated with the development and operation of an irrigation district in the Central Valley near Phoenix, comprising 35,000 acres.

The purpose of my appearance before this committee is to present data with respect to the irrigation development in central Arizona, and its need for an additional supply if the civilization now existing there is to be fully sustained.

Central Arizona has become a large argicultural empire founded upon irrigation, and playing a considerable part in the economy of the Southwest.

HISTORICAL

Remains of irrigation facilities found by the early settlers, and those yet remaining, were and are evidence of an extensive prehistoric agricultural development. This prehistoric development was probably abandoned because of prolonged droughts and its effects.

With the coming of the white man into the Southwest, irrigation of lands was revived by small earth and brush dam diversions from the streams and canals to the low lands along the rivers. This likewise proved uncertain because in years of floods their diversion works washed out, and in dry years the available water in the rivers was insufficient.

With the turn of the present century and following the passage of the National Reclamation Act in 1902, the Roosevelt Dam on the Salt River was constructed. Subsequently, other dams were con-

structed, until now the waters of all of the principal streams in central Arizona are largely in use.

The land is highly productive with an adequate irrigation supply, but without such a supply it is totally non-productive. It is valley land, of good soil less sandy than found in much of the Southwest. For this reason it holds to a high degree the moisture applied for the benefit of the plants. For full production, it requires approximately 4 acre-feet applied to the land. To obtain this amount at the land from river supply it has been found necessary to divert approximately 5.7 acre-feet per year per acre, and for ground water pumping to pump an average of 4.7 acre-feet at the well. (See table B–5, Bureau of Reclamation report, Central Arizona Project.)

It is of interest to note that major irrigation projects, or modern irrigation as we now know it, is young, all of this century. When the Salt River project was started in the early days of the Bureau of Reclamation, it was estimated that the annual per acre requirement at the farm was 3 acre-feet for the general farming then prevailing and the project area was fixed accordingly. This was based upon general farming as was the practice in that area. Due, however, to the climatic conditions permitting long growing seasons and to the highly fertile soils in this area, it has been found to be particularly adapted to specialized crops and multiple crops per year. This provides fresh foods to the Nation at times they would not otherwise be available, but to do so it is now found that 4 acre-feet per acre at the farm is required to maintain such production, or one-third more water than was originally considered necessary.

The period from 1905 to 1921 was what may be termed a wet period. Before the end of this period subsurface drainage became necessary in the Salt River Valley. Also, during this period it was found that wells could be sunk almost anywhere in the alluvial filled valleys and produce large volumes of water with increasingly efficient deep well pumps. These conditions encouraged new stream storage projects, expansion of acreage under existing projects, and the progressive development of land with wells.

Following the above wet period, there has been a decline in the precipitation and stream run-off within the State. Projects originally predicated upon river run-off installed wells to augment the river supply. Encouraged by the success of the early wells, landowners without understanding the source or characteristics of underground water, and motivated only by a desire to develop their lands installed wells progressively until at present about half of the total acres farmed in the central area is solely from pumps, and most all of the remaining land is dependent upon wells to a variable degree.

Underground water is not inexhaustible. On the contrary, such underground supply is very similar to a surface reservoir. It must have an average inflow equal to the average withdrawal to remain useful. With the progressive increased pumping that has occurred, the level of the underground water is rapidly receding, thereby increasing the depth it must be lifted, and is in some instances now reaching the depth that pumping can no longer be done economically and some fringe wells have gone dry. As this progressively occurs, land must be returned to the desert from which it was reclaimed.

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IRRIGATED LAND

As a result of the development predicated upon early estimates of river water supply and belief of unlimited underground supply, 809,000 acres had been put under irrigation at the close of 1947 in Maricopa and Pinal Counties. This area includes all the land in irrigation districts though not fully irrigated because all included lands have equal water rights. From the records of the districts, companies and other official and unofficial records—the project and individual areas are estimated as follows:

TABLE I

Maricopa County:		
Arcadia Water Co		1,550
Arlington Canal Co		4,480
Buckeye irrigation district		19,200
Broadacres, Lone Butte and Ocotilla Farms		8,175
Chandler Heights		1,290
Enterprise Canal Co		1,000
Gillespie Land & Cattle Co		20,800
Goodyear Farms and Adaman Muncipal Water Co		13,450
Indian lands		7,640
Marinette Farms		9,000
Maricopa County municipal water conservation district		35,000
Peninsula, Horowitz and Champion and St. Johns irrigation distict		3,730
Private pumps:		
East of RWCC		5,000
North of Arizona canal		11,000
South Salt River project		16,920
West of Agua Fria River		20,600
Queen Creek area		16,080
Roosevelt irrigation district		38,000
Roosevelt water conservation district		39,500
Salt River Valley Water Users' project		242,000
Miscellaneous projects along lower Gila		7,950
Total		522,365
Pinal County:		
San Carlos irrigation and drainage district:		
White lands	50,000	
Indian lands	50,000	
		100,000
Queen Creek and Magma area		4,000
Electrical districts, 2, 4, and 5 not included in San Carlos district		147,000
Stanfield district		35,000
Papago Indian lands		850
Total		286,351
Total Maricopa and Pinal Counties		808,716

Of the foregoing lands, the following projects have storage facilities:

Salt River Valley Projects, a Federal project with reservoirs on the Salt and Verde Rivers	242,000
Coolidge project, a Federal Indian Service project with a reservoir on the Gila River	100,000
Maricopa County Municipal Water Conservation District No. 1, a municipal project, on Agua Fria River	35,000
Roosevelt Water Conservation District, a municipal district, with certain storage rights in Salt River System	39,500
Total having storage facilities	416,500

Other projects having stream diversions are as follows:

Buckeye irrigation project	19,200
Arlington Canal Co	4,480
Gillespie Land & Cattle Co	20,800
Indian lands	7,640
Enterprise Canal Co	1,000
St. Johns irrigation district	3,730
	56,850
Total acres having stream diversions	473,850
Total relying entirely on wells	335,366
Grand total	808,716

As previously stated this is the total acreage included within the project area.

Senator ANDERSON. Could you give us a break-down on how long these wells have been in use and the lands irrigated by them, how long they have been irrigated? You do not have to do that now but can you tell us how recent the developments have been?

Mr. LANE. Of each of these developments?

Senator ANDERSON. No. You have 335,000 acres irrigated by wells. Is that a recent development or was that development from 20 years ago to 30 years ago?

Mr. LANE. No; there would not have been that many 20 or 30 years ago, but at least 10 years ago there would have been over 200,000 acres. Approximately 100,000 or 125,000 have come in in the last 10 years.

Senator ANDERSON. When did the other 200,00 come in?

Mr. LANE. Beginning back as early as 1917 and 1918, and gradually building up until the early thirties.

Senator ANDERSON. You may continue; pardon my interruption.

Mr. LANE. Normally up to 10 percent of farm lands are out of crops for farm building sites, roads, waste lands, et cetera.

Deducting 10 percent of the foregoing	80,872
Net irrigated lands—Maricopa and Pinal Counties	727,844

All of the foregoing projects and areas having river storage facilities and diversions also rely substantially upon wells—the amount pumped annually depending upon the annual water available from the river supply.

The 1947 Bulletin 211 of the Agricultural Experiment Station, University of Arizona, tabulates the acres actually in crop in 1947 for the foregoing areas as follows:

Maricopa County	430,145
Pinal County	195,550
Total	625,695

From the foregoing it is indicated there were 102,000 out of production in 1947.

Present water use:

In the projects hereinbefore listed as having stream diversions, table B–1 in the Bureau of Reclamation report shows average diversions for 1940–44 in column (D) to be as follows——

Senator ANDERSON. Would you mind stopping for just a moment. I would like to ask if you can give any explanation of these 102,000 acres that were out of production?

Mr. LANE. That was by taking——

Senator ANDERSON. Not how you arrive at the figure but how do you account for it?

Mr. LANE. Mostly because of lack of water and because the farmers had to reduce the amount of acres they could put in in order to get a satisfactory yield on their crops. For instance, Senator, there were a number of farms which laid out a third and even some as much as 60 percent in the last 2 or 3 years.

TABLE 3

Maricopa County unit:	
Salt River project	907,200
Roosevelt water conservation district	48,400
Indian lands	27,000
Total diverted at Granite Reef	983,400
Maricopa County Municipal Water Conservation District, Agua Fria River	54,200
Total	1,037,600
Rediversions or diversions from return flow:	
Arlington Canal Co	27,600
Buckeye water conservation and drainage district	88,700
Gillespie area	81,200
Total diverted from return flow	197,500
Total diversions	1,235,100
Pinal County unit: San Carlos Project Gila River	254,000

Bulletin 211 of the Agricultural Experiment Station, University of Arizona, above referred to, gives the acres in crop for these projects for 1947 as follows:

TABLE 4

Salt River Valley projects:	
Salt River Valley Water Users' Association	215,000
Roosevelt water conservation district	32,000
Total	247,000
Indian lands	6,700
San Carlos project:	
Gila River Indian Reservation	27,400
San Carlos white lands	32,000
Total	59,400
Other: Maricopa County municipal water conservation district	18,200
Total from Bulletin 211	331,300
Total acres in foregoing projects:	
Salt River Valley Water Users' Association	242,000
Roosevelt water conservation district	39,500
Indian lands	7,600
San Carlos project	100,000
Maricopa County municipal water conservation district	35,000
Total	424,100
Less 10 percent lay-out land	42,400
Total	381,700
Land laid out in 1947	50,400
Total	381,700

The above areas are irrigated by the initial diversions from the major streams as they enter the area and normally almost wholly divert these streams, augmenting their supply by pumping from ground water. Their supply for 1940–44 averaged as follows:

River water (from table 3)

Salt River at Granite Reef---------acre-feet--	984,400	
Agua Fria River---------acre-feet--	54,200	
Gila River—for San Carlos project---------acre-feet--	254,000	
		1,392,600
Area that can be irrigated at 5.7 acre-feet per acre---------acres--		227,200
Remainder of above area of 381,700 left to be supplied by pumping---------acres--		154,000
Pump water required at 4.7 acre-feet per acre---------acre-feet----		726,000

Although these projects are partially supplied from the principal streams of the Gila River system by surface diversions they would require from the underground water an average of approximately 726,000 acre-feet per year if they maintained their land in full crops each year. In some years of below average river supply, these dual source projects cannot maintain a full cropping. 1947 was a year of below average river run-off.

The remaining projects as listed above in table 3 having stream diversions are in the lower valley section and generally have a fair river supply from the return flow from the lands above. They are required to pump to some extent about 100,000 acre-feet from relatively shallow depths, to stabilize their supply. Their water both from the stream and pumps is extremely salty, because it is carrying the salts from the upper lands. These waters are too salty now for many crops and is increasingly building up salts in the soil. This land must have a large quantity of fresher water and better drainage to wash out the high saline concentration in its ground water which is now exceeding 4,000 parts of salts per 1,000,000 parts of water, or it will be forced out of productive crops by the salts.

As shown above, there are 335,000 acres irrigated solely from pumps. Deducting 10 percent, or 33,000 acres, for other farm use leave 302,000 acres. This at 4.7 acre-feet at the pump to supply 4 acre-feet at the land requires 1,420,000 acre-feet from the underground supply. The 1,420,000 plus the 726,000 acre-feet required by the projects, the Salt River group, San Carlos, and Agua Fria diversions, plus the 100,000 acre-feet for the westerly projects having stream diversions make a total of approximately 2,246,000 required from the underground and/or some other source.

A report of the United States Geological Survey entitled "Pumpage and Ground Water Levels in Arizona in 1947" by S. F. Turner and others, show the pumpage in Maricopa and Pinal Counties for the years 1940–47 as follows:

Year	Maricopa County	Pinal County	Total
1940	943,000	372,000	1,315,000
1941	444,000	351,000	795,000
1942	1,040,000	500,000	1,540,000
1943	1,104,000	515,000	1,619,000
1944	1,017,000	530,000	1,547,000
1945	1,143,000	610,000	1,753,000
1946	1,393,300	660,000	2,053,300
1947	1,446,500	700,000	2,146,500

The year of 1941 was a fairly wet year, and the last wet year of the above period.

SAFE AVERAGE PRESENT WATER SUPPLY

Water pumped from underground must be fully recharged if it is to be depended upon for irrigation. In the report of the United States Geological Survey, entitled "Geology and Ground Water Resources of the Salt River Valley Area, Maricopa and Pinal Counties, Ariz." by McDonald, Wolcott, and Hem, issued February 4, 1947, pages 15 to 18, particularly treat with the Salt River Valley area. It summarizes the source of supply for the area as follows:

Recharge to the aquifers of the region is derived from four main sources, listed in order of importance: (1) Irrigation and canal seepage, (2) stream flow, (3) underflow of major streams where they enter the region, and (4) rainfall.

The Pinal County area is discussed in the report of the United States Geological Survey, entitled "Ground Water Resources of Santa Cruz Basin, Ariz.," pages 33 to 61. The following is quoted from page 34 of this report:

In the Eloy area the main source of ground water is from underflow from the Avra area and from the Santa Cruz Valley. There is probably a small amount of recharge from flood losses in the small washes originating in the Sawtooth and Picacho Mountains. It is very doubtful that seepage losses from irrigation occur in appreciable amounts.

In the Maricopa area the recharge to the ground-water reservoir occurs chiefly as underflow from the Eloy area passing between the Silver Reef and Casa Grande Mountains and as underflow from the Casa Grande area passing between the Casa Grande and Sacaton Mountains. Minor amounts of underflow to the Maricopa area enter from the Santa Rosa, Vekol, and Jack Rabbit Basins. Additional recharge in small amounts may occur from washes originating in the mountains surrounding the area, and possibly from fault springs.

Recharge to the Casa Grande-Florence area is mainly from canal and irrigation seepage losses, from underflow of the Gila River, from seepage losses from the Gila River, and from washes originating in the Tortilla Mountains, particularly McClellan Wash.

As previously stated, underground water must have an inflow equal to its draft to enable sustained use. This sustaining inflow is generally referred to as the "safe yield." A report has been made upon the areas of Maricopa and Pinal Counties by the United States Geological Survey, entitled "Safe Yield of Ground Water Reservoirs in the Drainage Basins of the Gila and Salt Rivers, near Phoenix, Ariz.," by S. F. Turner, H. P. McDonald, and R. L. Cushman—1945. On pages 67 and 69 of this report, the safe yield for Pinal County area, inclusive of the Santa Cruz Basin, is given as 135,000 acre-feet annually. For the Maricopa County area the foregoing report shows a tabulation on pages 6 to 15 of the computed safe yields for the years of 1935–41, as given in the last column of the tabulation as being 579,000 acre-feet. The total, therefore, for the two counties being 714,000 acre-feet.

Referring to the pumpage tabulation as given herein, it will be noted that there was 2,146,500 acre-feet pumped in 1947, or 1,432,500 acre-feet more than the foregoing estimated safe yield for the areas. Of the 2,146,500 acre-feet pumped in 1947, 700,000 acre-feet was pumped in Pinal County, and 1,446,500 was pumped in Maricopa County. But in spite of the excess pumping, many acres within these

areas while classed as farmed did not have a full water supply, resulting in partial cropping and/or in lower yields. This acreage cannot be accurately estimated.

The underground supply can be drawn out in excess of its safe yield for a period of time, with lowering of its level as in a surface reservoir. But like a surface reservoir there should be compensating periods of reduced pumping to less than the safe yield to permit the refilling.

The effect of the overpumping is clearly shown by a graph included in the United States Geological Survey report entitled "Maricopa County," by H. M. Babcock and others, as continued for 1947. The graph is entitled "Graph showing cumulative net change in water level and water pumped for irrigation in Salt River Valley area, Maricopa County, Ariz." From the graph the composite lowering of underground water from 1930 through 1944 was approximately 12 feet, or an approximate average of 1 foot per year. For the 3 years of 1945 through 1947 the table lowered an additional 14 feet, or at an average rate of almost 5 feet per year, and in 1947 alone it dropped 6 feet of the 14. When the wells go dry, as some few have in the past year, or the level drops to the extent that the cost of pumping the water exceeds the ability of the land earnings to pay it, the lands must go out of operation.

Attached hereto is a graph entitled "Maricopa County Water Use, Source and Effect." This graph shows the relation between the amount of water diverted from storage reservoirs, and the amount of water pumped. Also, the relation between the amount of water pumped, and the safe yield from underground supply as estimated by the United States Geological Survey. Interposed on the upper part of the graph is a copy of the graph from the United States Geological Survey, as mentioned in the preceding paragraph, showing the change in the underground water level during the same period. The graph so interposed is not directly correlated to the pumping, but does depict in a general way the relation between the variation in pumping and the effect upon the underground supply.

LANDS OUT OF CROP, 1947

As previously shown herein, for the projects having storage facilities and pumps, there were 50,400 acres not cropped in 1947 after deducting for normal lay-outs of lands.

Of the 56,850 acres shown herein in projects, or areas having some stream diversions but no storage, less 10 percent, leaves 51,000 net acres. The foregoing mentioned Bulletin No. 211 of the University of Arizona, shows 37,100 acres in crops in 1947. Deducting the 37,000 acres from the 51,000 indicates approximately 14,000 acres were out of production.

Of the 335,000 acres listed herein as in areas supplied from wells only, 302,000 acres should be in crops with a normal 10 percent of idle lands, but the foregoing Bulletin No. 211 shows 273,965 acres in crops in 1947, indicating 33,000 acres of this land could not be farmed in 1947. This added to the 50,400 acres out of crop in the storage projects and the 14,000 in lower river diversion projects would indicate 97,000 acres could not be farmed in 1947, for lack of water.

Previously I indicated 102,000 from another approach. This is approximately the same amount of acreage.

UPPER GILA RIVER BASINS

The Bureau of Reclamation's report entitled "Central Arizona Project," appendixes, 1947, page B–5 shows the average acres cultivated in the upper Gila Valleys in Arizona and New Mexico as 45,640 acres. As these valleys are narrow and have been farmed for years, this is probably the maximum average for these areas.

The San Pedro River Bulletin No. 211 of the University of Arizona, 1947, shows 2,100 acres of land to be irrigated, or a total of 47,700 acres in the upper Gila and San Pedro Basins.

These lands require some less water diversions per acre because of higher elevations, with less evaporation and with more rainfall. It is estimated the irrigation water consumed per acre is 2.74 acre-feet per year. This would require 5.2 acre-feet diverted from stream flow and 4 acre-feet at the pump to serve this land.

The surface-water supply for the upper Gila Valleys as given by the Bureau of Reclamation's report Central Arizona project, appendixes, page B–8 is 182,000 acre-feet annually, and for the lands on the San Pedro River as 4,500 acre-feet annually, or a total of 186,500. The safe annual yield of underground water is given in the foregoing report—page B–84 for the upper Gila Valleys as 32,400 acre-feet, and for the San Pedro Valley as 2,200 acre-feet, or 34,600 acre-feet. The acres given for these valleys are net, and no further deduction is made.

One of the major difficulties in these areas is the irregularity of the stream flows—there being no regulation of the streams as yet. When water is available in quantity the farmers divert excessively in the endeavor to build up soil storage for the crops. This is effective to a degree, but results in a higher diversion record than is usable for crop consumption, and during the dryer periods of the year there is a shortage for the growing crops.

The summation of the total net acres in the Central Arizona project is as follows:

Maricopa and Pinal Counties	728,000
Upper Gila and San Pedro Valleys	34,600
Total acres in project	762,600

SALT

Salt in the irrigation waters, if allowed to concentrate, will build up in the soil to the point of rendering the soil nonproductive for general crops. It is generally accepted that water having in excess of 4,000 parts of salts per 1,000,000 parts of water is the maximum salinity that may be used, and this for only certain crops. Crops such as vegetables, orchards, and many others begin to show distress with more than 1,500 parts of salts per 1,000,000. Also, it is necessary to increase the quantity of water for the crops as the salinity increases, to prevent the excessive concentration of salts at the plant roots.

We have some areas there that are using water with such a high salt content that they are having to use almost 50 percent more water than they would have to use with water with a low salt content.

The concentration of salts in the water is caused by rediversion of the water. As the water is used on the higher lands the quantity of water is reduced by soil evaporation and plant use, and the remaining

or unconsumed water is either pumped out or percolates through the soil to become return flow lower down in the stream. This return flow is still carrying most of the salt that was in the water at the first diversion thereof.

In order to bring the salt ratio within tolerance limits for plant life additional sweet water must be added. In times of water shortage as is now prevailing within this area, there is no local source of additional water. The repeated repumping and rediversions is resulting in the spreading and intensification of salt concentration in the soils, surface, and underground waters with a start of abandonment in some areas.

The report of the Bureau of Reclamation entitled "Report on Central Arizona Project," "Appendices," page B–15, shows 846,000 tons of salt is now brought into this area annually by the diverted water. Water having a salt concentration of 4,000 parts per million parts is equivalent to 5.5 tons of salt per acre-foot. In order to keep this salt moving out and not exceeding 4,000 parts per million of salts in the water will require approximately 154,000 acre-feet per annum of fully salted water to be taken out of the area, with a more rapid lowering of water tables.

SALVAGE WATER

Referring to pages 284 and 285 of the report of the Secretary of Interior, "The Colorado River," June 1947, sometimes called the Blue Book, we find that the average natural river losses in the Phoenix area for the period 1897–1943 were 527,000 acre-feet. This water was lost by evaporation from water surfaces, and by percolation to adjacent bottom lands where it was evaporated by soils, trees, and other vegetation.

As the valley was settled the greater part of the valley land subirrigated by the rivers was cleared for farming much of the virgin growth was removed and crops planted and irrigated. But the remaining areas which constituted the river channels retained their growths. With the building of the storage dams and the added and more constant return flow, together with the low frequency of floods to flush out and maintain the channel ways, much of these remaining areas have become very dense with water loving plants sometimes called Phreatophytes. There are areas where such growth has become so dense and rank that there is practically no water channel, causing a very serious flood hazard for the adjacant lands, cities, and towns near the river. This condition must be relieved to prevent serious flood damage as well as for the salvage of water. Surveys are now in progress along the Salt River channel looking to the correction of this condition.

While no accurate or authoritative estimate has been made of the water now being so consumed in these river areas, because of the increased density, though lesser acres, than prevailed under virgin conditions, the losses now should be less than in the virgin stage but could easily be as much as 350,000 acre-feet per year, rough estimates have approximated this amount.

It is not possible to eliminate all of this loss. Evaporation from water and soil will continue, and with effective clearing and reasonable maintenance some growth will persist to consume some water. However, a considerable part to at least one-half of this loss may be salvaged.

Analysis of water available from all local sources and water needed from Colorado River

	Maricopa County	Pinal County	Total
REQUIREMENTS FOR IRRIGATION			
1. Land previously irrigated	470,000	258,000	728,000
2. Net consumptive use at 3.2 acre-feet per acre	1,504,000	826,000	2,330,000
SUPPLY WITHIN AREA			
3. From Gila River system:			
Salt River	724,000	----------	724,000
Verde River	298,000	----------	298,000
Gila River	----------	311,000	311,000
Agua Fria River	54,000	----------	54,000
4. Other unmeasured side streams:			
New River, Hassayampa River, Queen Creek, Santa Cruz, and other unnamed streams, excluding Agua Fria River	125,000	65,000	190,000
	1,201,000	376,000	1,577,000
5. Less required for salt balance	111,000	60,000	171,000
Net from system	1,090,000	316,000	1,406,000
Deficit	414,000	510,000	924,000
From Colorado River:			
Diversion Lake Havasu	----------	----------	1,200,000
Less transmission loss to area	----------	----------	150,000
Delivered to area	----------	----------	1,050,000
Less release for salt balance	----------	----------	210,000
Net from Colorado River	----------	----------	840,000
Deficit	----------	----------	84,000

NOTE.—This tabulation does not include the Upper Gila Valleys, San Perdo Valley, and the city of Tucson. Compensation made herein by allowing for the water withheld to serve these areas.

Estimated net salvage from clearing river channels of Phreatophytes at least the above deficit.

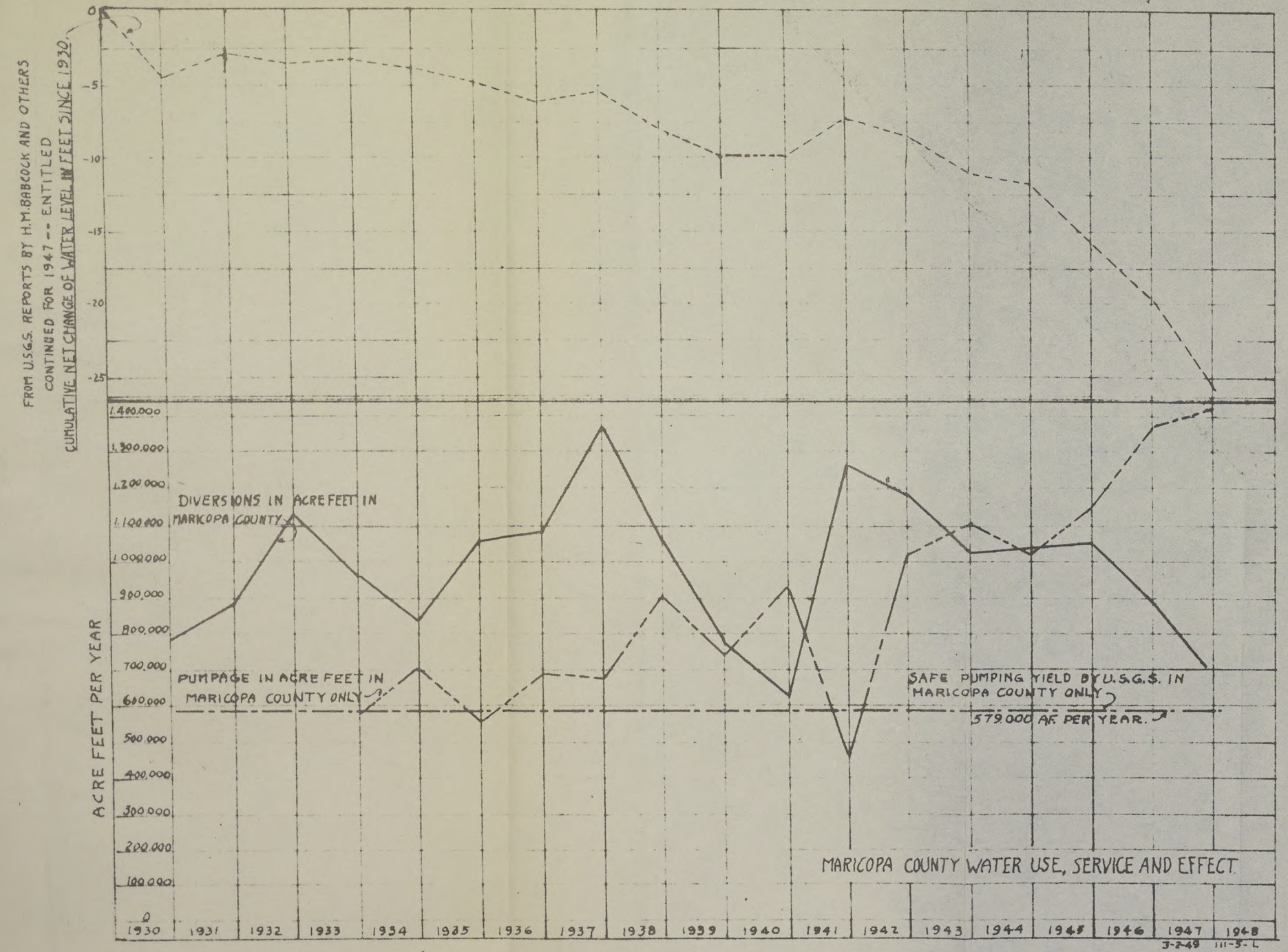
REFERENCES

1. Acreage from this statement.
2. Consumptive use per acre used by Bureau of Reclamation, table B–5 of Central Arizona project report of December 1947.
3. From table B–23—Central Arizona Report, Bureau of Reclamation, December 1947—notes 1, 5, 11, and 7.
4. Report Secretary of Interior. The Colorado River, pp. 284–285.
5. Computed from table No. B–23. Central Arizona Report, Bureau of Reclamation, December 1947.

In order to protect the underground supply from further depletion and prevent further expansion, the Arizona State Legislature has enacted an underground water code, which is now in effect, and is being put into operation.

It is evident that it will be impossible to use any of the water so proposed to be diverted from the Colorado River for new land without injury to the present irrigated lands, and it is not intended to do so.

The lands in the area are owned by thousands of individuals. There are hunreds of wells scattered over the area, serving mainly individually owned lands. Each owner has his fixed charges and living expenses he must earn to continue the ownership and live. It is, therefore, not so simple as to say lay out sufficient land to balance the supply. Nor is it the question of considering the cost of a supplemental water supply as being applicable to the number of acres such a supply alone would irrigate. Such a supplemental supply means the savings of thousands of acres owned by thousands of individuals with their all into the land to keep it from going out of production, and the



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difference between marginal and full productivity on the many thousands more.

As these lands go out for lack of water, or because the cost exceeds the income, it means farm families become destitute and the loss of business in the area is proportionate—causing more destitution. The lands will be foreclosed for mortgages or sold for taxes. In time, due to the lack of pumping under these conditions, the underground water will rise. This will encourage new people to take up the lands, they and business will prosper for a period, and the process of gradual failures will be repeated. Therefore, a supplemental water supply for this area is a must, if the civilization as now exists is maintained and if tragic losses and experiences are prevented for the generations to come.

It is therefore evident that without the additional water from the Colorado River being the only remaining source and found feasible by the report of the Bureau of Reclamation on the "central Arizona project," and to which Arizona is justly entitled, the entire economy of the area must be seriously affected, and to the detriment of the national economy.

(The chart referred to above is inserted facing p. 610.)

Senator ANDERSON. What is the effect of this new code you have mentioned? When was that enacted?

Mr. LANE. It was enacted during the recent special session, I believe about 6 or 7 months ago. They are now putting that into effect.

Senator ANDERSON. Where does the regulation rest, with the State engineers?

Mr. LANE. It rests with the State land and water commissioner who in our State operates the same as your State engineer.

Senator ANDERSON. What authority does he have to prevent additional pumping.

Mr. LANE. They establish what is called a critical area and thereafter all wells have to be approved by him before they can be put in.

Senator ANDERSON. You don't believe the same experience will repeat itself in the next few years by additional acreage coming in?

Mr. LANE. My frank opinion, Senator, is that it will not. I think they have all come to a full realization of what their supply is, and I think every effort will be made to confine it now to the acres that are under irrigation.

Senator ANDERSON. New wells are being brought in right now, are they not?

Mr. LANE. Mostly the new wells going in in the area now are within the same area where other wells have been serving. There may be a few on the outskirts, but I think they are very limited. But there are some wells going in because of the reduced amount of water they are able to get out of the present wells because of the lowering of the water table. Some of those wells are going in.

Senator ANDERSON. They will keep right on exhausting the supply, though, will they not? Just because there is another well there does not alter the fact that they will both exhaust it.

Mr. LANE. That is true, but of course we have been experiencing an extremely dry period. And the projects in particular that have streamflow water have been very shy of water, so they have had to rely almost entirely on the wells during this period. In some of those areas it will

not be necessary to pump as much as they have in the past if we begin to get some relief from precipitation. If we do not the water table is bound to continue down very rapidly.

Senator KERR. How much deeper can they drill wells in the area where the pumping is now being done and continue to secure additional supplies of water other than those now being diminished?

Mr. LANE. That is rather a difficult question to answer, Senator, because the area is very spotty. I know of a number of places within the area where dry holes have been found right in the middle of the area. In other places, they have gone down, to my knowledge, to somewhere around 1,200 feet. That is the deepest well I know drilled strictly for water. But what amount of water they have gotten below, all the way down, I think is rather problematical.

I know of some wells that have been drilled to 600 then later lowered to 1,000, and did not produce any more water.

Of course, in an alluvial-filled valley your stratifications are very irregular. Underlying that alluvial fill, the formation there apparently is just like you would see in these rugged foothills, but it has been covered over with these alluvial fills. You can hit a dry hole right out in the middle of these valleys and that has been done. So how deep your water-carrying strata is over the area is very problematical. In some areas it would be quite deep, and in other areas very shallow. I don't believe you could hit any uniform average depth that would be water-bearing.

Senator MCFARLAND. I have no questions.

Senator ANDERSON. Thank you very much, Mr. Lane.

Senator MCFARLAND. I would like to call Mr. Moeur.

Mr. ELY. Mr. Chairman, will there be opportunity for Senator Downey to ask questions of the witness this morning?

Senator MCFARLAND. It is agreeable to me to have them ask questions now, rather than to have them accumulate.

Mr. ELY. I think it would probably be better for Senator Downey to ask such questions as occur to him if the witness is going to be available tomorrow.

Senator MCFARLAND. That is all right.

Mr. Chairman, I might state this: The House hearings are going to proceed. They will be out and in, and will be available at some time when they want to ask them questions. They cannot have all of them here all the time.

Senator ANDERSON. That is satisfactory. I understand this is a summary of the hearings held last year.

Senator MCFARLAND. Yes. As you will recall at the beginning of the hearings Senator O'Mahoney suggested that each side use 2 hours in summarizing the testimony of the previous hearings. That, we had thought at the time, would be the practical extent of the testimony.

I attempted to give a summary on S. 1175. As to evidence against S. J. Res. 145, which was opposed chiefly by the basin States committee, I left that for such committee to present.

Judge Howell introduced a resolution and stated that the basin States committee would present a summary of the testimony on S. J. Res. 145, insofar as it was applicable to S. J. Res. 4. So Mr. Moeur is presenting this summary, which, as I understand it, has been approved

by the basin States committee, and in behalf of the basin States committee.

Mr. MOEUR. That is correct.

Senator KERR. Representing what States?

Mr. MOEUR. Representing the States shown here, Senator.

Senator MCFARLAND. It is submitted in behalf of and at the request of the basin States committee, representing the States of Colorado, Wyoming, Utah, New Mexico, and Arizona.

Senator ANDERSON. Proceed, Mr. Moeur.

STATEMENT OF J. H. MOEUR, SPECIAL ATTORNEY FOR ARIZONA INTERSTATE STREAMS COMMISSION

Mr. MOEUR. My name is J. H. Moeur, and as Senator McFarland has pointed out, this is a summary of a portion of the hearings before a subcommittee of the United States Senate on hearings held in 1948. This deals only with that portion in opposition to the resolution before that committee, to wit, S. J. Res. 145.

A subcommittee of the Senate Committee on Interior and Insular Affairs held hearings on S. J. Res. 145, May 10 through 14, inclusive, 1948. These hearings have been reported, and the reference pertains to that printed report. This summary will deal only with the statements of those appearing in opposition to the proposed legislation. The full text of S. J. Res. 145 appears on page 1 of the report. There is now before the Senate Committee on Interior and Insular Affairs, a similar resolution, to wit, S. J. Res. 4.

S. J. Res. 4 differs somewhat in text from S. J. Res. 145, but is obviously intended to accomplish the same purpose.

S. J. Res. 4 reads as follows:

Granting the consent of Congress to joinder of the United States in suit in the United States Supreme Court for adjudication of claims to waters of the Colorado River system.

Whereas there are controversies of long standing, among the States of the lower Colorado River Basin, over the rights of those States to use the water under certain provisions of the Colorado River compact, the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act, and the California Limitation Act (Stats. Cal. 1929, ch. 16); and

Whereas those controversies now adversely affect and limit the development of various projects in that basin for impounding, regulating, and using the waters of the Colorado River and its tributaries, the construction of which the Congress has heretofore authorized or may hereafter authorize, in the exercise of its constitutional powers; and

Whereas the Secretary of the Interior on behalf of the United States, has entered into various agreements with States, public agencies, and other parties in the lower Colorado River Basin relating to the storage and delivery of Colorado River water, and the rights of said parties to the delivery and use of water under those agreements are involved in the controversies hereinbefore referred to; and

Whereas said States, after many years of negotiation, have been unable to settle such controversies by compact; and

Whereas the Supreme Court of the United States in *Arizona* v. *California* (298 U. S. 558) held in effect that there can be no final adjudication of rights to the use of the waters of the Colorado River system without the presence, as a party, of the United States: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That consent is hereby given to the joinder of the United States of America as a party in any suit or suits, commenced within 2 years from the effective date of this resolution in the Supreme Court of the United States by any State of the lower basin of the Colorado River as

that basin is defined in the Colorado River compact, for the adjudication of claims of right asserted by such State, by any other State, or by the United States, with respect to the waters of the Colorado River system as defined in said compact available for use in that basin. Process in any such suit may be served upon the Attorney General.

It will be noted that the principal difference between the two resolutions is that under the provisions of S. J. Res. 145 Congress would have directed the Attorney General of the United States to institute and maintain an action in the Supreme Court of the United States against certain States of the Colorado River Basin and require them to assert and have determined their claims and rights to the use of the waters of the Colorado River system.

By the provisions of S. J. Res. 4 Congress would grant consent to the joinder of the United States in suit in the Supreme Court for adjudication of claims to the waters of the Colorado River. Both resolutions seek the same objective.

Statements of those appearing in opposition to S. J. Res. 145, in the order of their appearance, were as follows:

1. J. A. Howell, legal adviser to the State engineer for the State of Utah—pages 154–197.
2. Jean S. Breitenstein, attorney for the Colorado Water Conservation Board—pages 197–228; rebuttal, pages 474–480.
3. Charles A. Carson, chief counsel of the Arizona Interstate Stream Commission—Pages 228–300; rebuttal, pages 480–488.
4. Fred E. Wilson, attorney, representing New Mexico on the Colorado River Basin States Committee—page 300.
5. W. J. Wehrli, special counsel for the State of Wyoming—pages 300–303; rebuttal, pages 488–489.
6. Hon. Grover A. Giles, attorney general of the State of Utah—page 303.
7. Mrs. Nellie T. Bush, attorney and representative of the State of Arizona on the Colorado River Basin States Committee—pages 305–307.
8. Hon. Ernest W. McFarland, United States Senator from Arizona—pages 307–328.
9. Hon. John R. Murdock, United States Representative from Arizona—page 328.
10. Hon. Edwin C. Johnson, United States Senator from Colorado—pages 328–331.
11. Hon. Carl Hayden, United States Senator from Arizona—pages 333–334.
12. Statement of Hon. E. V. Robertson, United States Senator from Wyoming—pages 362–363.
13. Report of the Secretary of the Interior, dated May 13, 1948—pages 363–369.

Included in the last part of the report are certain miscellaneous documents and other matters including a reply by Charles A. Carson in compliance with the request of the committee, setting forth Arizona's right to use of its share of the waters apportioned to the lower basin (p. 516).

Judge Howell made the first statement in opposition to the resolution, first presenting the resolutions of the Colorado River Basin States Committee opposing the resolution. The full text of that com-

mittee's resolutions appears on pages 154–155. Judge Howell presented and discussed a brief which he submitted on behalf of the Colorado River Basin States Committee. This brief was signed by representatives of the States of Colorado, Wyoming, Utah, New Mexico, and Arizona. The brief first discusses the facts involved and then proceeds in part II with the argument. Under the argument the first proposition discussed is as follows:

1. The jurisdiction of the Supreme Court, in the exercise of its original jurisdiction, so far as material for our consideration, extends only to justiciable controversies between the United States and one or more States and to controversies between two or more States (p. 163).

In support of this proposition the brief states:

Article III, section 2, of the Constitution of the United States, provides, so far as material here, "The judicial power shall extend to * * * controversies to which the United States shall be a party; to controversies between two or more States." That section further provides "In all cases * * * in which a State shall be a party, the Supreme Court shall have original jurisdiction."

The Supreme Court of the United States has had occasion frequently to pass upon the meaning of the foregoing constitutional provisions in suits or actions between States, and to fix the limits of its jurisdiction thereunder. It has held that it will not grant relief against a State unless the complaining State shows an existing or presently threatened injury of serious magnitude (pp. 163–164, citing cases).

The brief then proceeds with a thorough discussion of the proposition in question, citing numerous cases in support of the proposition involved; and the argument on this particular point is concluded with the following pertinent statement:

It is impossible to conceive how there could from any point of view under the situation presented as to the Colorado River be a multiplicity of suits which is the only ground upon which the jurisdiction of the Court was predicated in the case of Texas v. Florida. Whatever suit be brought, and by either the United States or a State, any State whose rights are affected would either be parties or would have to voluntarily appear to protect their interests therein, and so there would only be the one suit (p. 167).

Proposition No. 2 in the brief reads as follows:

2. There is no present justiciable controversy between the United States and the Colorado River Basin States, or any of them, or between any of said States (p. 168).

It was pointed out that the only threat of injury advanced by the proponents of the bill was that "Arizona is asking the Secretary of the Interior to approve S. 1175 (the central Arizona project)." Commenting on that, the brief says:

Well, what of it? Suppose the Secretary of the Interior is of opinion S. 1175 should be enacted, or that it should not be, or is doubtful about the matter, or has no opinion at all. Does that opinion rise to the dignity of an existing justiciable controversy? Obviously not, and his opinion is precisely in the same category as the opinions in the case of *United States* v. *West Virginia*, which the Court held did not rise to the dignity of a controversy, because whatever be his opinion, he can take no action until the Congress acts. It may act unfavorably on the bill then there could be no controversy even at that time, much less now. Suppose it should act favorably, and the bill should become law, would the United States then want to become the moving instrumentality by which California might assert that Congress should not have passed the law? We submit not. It should require California to move to assert its right by bringing an action against Arizona, and assert that it was being injured in its rights by virtue of the authorized project (p. 168).

The position of the committee on this particular point is clearly set forth in the following pertinent language:

As we have shown there is not only now no controversy between the United States and all or any of the Colorado River Basin States suggested by the California-Nevada brief, but there are in fact none, nor could there be, because those rights were protected in the Colorado River compact, as herein heretofore in our preliminary statement of facts pointed out and they are not and could not be now questioned by any of the basin States (p. 169).

Nevada's position is discussed under this head, and it is pointed out that Nevada is concerned only because the central Arizona project bill contemplates the operation of a power plant at Bridge Canyon, above Lake Mead; and the operation of that plant will have the effect of reducing the power available to Nevada at Hoover Dam. Attention is directed to the fact that under the Colorado River compact power is subservient to the right to use the waters of the river for irrigation and domestic purposes. Therefore, the brief concludes that the real dispute is between California and Arizona, and that the points in dispute numbered three, to wit:

1. What is meant by what is called in the Colorado River compact "III (b) water"?
2. Concerns the question of uses of waters of the Gila River.
3. The issue of reservoir losses.

The meaning of "III (b) water" is discussed somewhat in detail. The pertinent provisions of the Boulder Canyon Project Act are discussed. The famous letter from Herbert Hoover to W. S. Norviel, dated November 26, 1922, was introduced in the record. That letter is reproduced on page 171 of the hearings.

The brief goes on to state:

In the light of what we have said at least from the point of view of the United States, this disposes of the contention of Nevada and California as to III (b) water, for (3) of the paragraph says that the "State of Arizona shall have the exclusive beneficial consumptive use of the Gila River within the boundaries of said State" and it explains why III (b) water was separated from III (a) water, a separation which disturbs the writers of the Nevada-California brief if it is apportioned water. It was because it had nothing to do with the division of water between the upper and lower basin. It was Arizona's because the Gila River was Arizona's. But apart from all this argument as to III (b) water, it presents no present justiciable controversy between Arizona and California, because it does not jeopardize any of California's present use of the river's water (p. 172).

With reference to the uses of Gila water, the matter is briefly discussed, pointing out the nature of the Gila River and what uses are made of the waters of that stream and its tributaries, that this use includes reuse and salvage waters, and that no State under the compact should be charged with waters so salvaged or reused. The conclusion on this particular point is well stated as follows:

The short answer to this contention is, as we have already pointed out, this water in question is not III (a) water, but III (b) water, and that Arizona is entitled to all the water of the Gila River, and that therefore what is meant by "consumptive beneficial use" in the compact becomes immaterial (p. 173).

As to the issue of reservoir losses, it is California's contention that Arizona should stand all those losses. It is pointed out that this question may be important in the future, but it cannot be now because even if all reservoir losses were charged to California that State's present use of allotted water is not in jeopardy.

After again reviewing the three issues, the conclusion is arrived at as follows:

This demonstrates that what California really wants is a definition of these words and terms for future guidance. That can only be done by agreement or by a declaratory judgment of a court. She knows that the Supreme Court has decided it will not render declaratory judgment in the exercise of its original jurisdiction because of the constitutional limitation upon it. She cannot bring an action or suit to have their meaning fixed. So, what she proposes is that the United States shall bring the suit or action and thus indirectly give color of jurisdiction which would otherwise not exist. We say that the attempt would eventually be futile, because color of jurisdiction does not suffice. It must be existant (pp. 173–174).

The first two propositions involve legal matters. The remaining propositions are largely matters of policy. Proposition number three sets forth the fact that the upper basin States were at that time negotiating the compact, and that the contemplated lawsuit would have interfered with those negotiations. Of course, the upper basin States now have negotiated that compact; and although it has not been ratified, the argument in support of that point is probably not important in consideration of the present proposed legislation.

Proposition number four is stated as follows:

4. The adoption of the proposed resolution will delay the development of the river (p. 175).

The argument advanced in support of this point is pertinent when considering the present proposed legislation. Under this proposition, the practice of appointing a master or commissioner to take testimony is discussed. It is further pointed out that this kind of litigation almost without exception involves a great deal of time; and a determination can be made, if at all, only after long years of court procedure. Quoting from the hearings on this point:

When reduced to the ultimate, this resolution is nothing but a flank attack upon the central Arizona project. But it will undoubtedly be followed—if it is adopted and the contemplated suit is brought—by frontal attacks upon every project for the development of the river. Putting it bluntly, California, having already received all the major projects needed by her to enable her to use not only the water to which she is entitled, but an amount greatly in excess thereof, wants to be in a position to use those excess waters which the other basin States are entitled to use but have not the facilities to enable them to so use. Then, after she has used them, she will raise the cry that she must not be deprived of them because it will ruin the wondrous civilization which has been built upon their use. Indeed, this cry, while somewhat vague and feeble, is nevertheless audible in the resolution and in the brief (p. 176).

The fifth proposition raised deals again with the consummation and ratification of the upper basin compact. It might here be pointed out that while the upper basin States have consummated and ratified a compact, the bill granting Congress consent to that compact its present form has met with opposition.

The summary contained in the brief pertinent to the legislation now before Congress is as follows:

1. Jurisdiction of the United States Supreme Court in controversies between States is determined by the Constitution of the United States and may not be enlarged or diminished by act of Congress.

2. The Supreme Court has, by a long and consistent line of decisions, established the rule that a suit may not be maintained against a State by another State or by the United States unless the complainant has suffered or is immediately threatened with an injury of serious magnitude.

3. The proposed suit by the United States against certain Colorado River Basin States does not come within the stated rule because there is no injury or threat of injury. This conclusively appears from the following irrefutable facts:

(*a*) Every Colorado River Basin State is now using water in an amount substantially less than that to which it is fairly and equitably entitled under the documents which constitute the law of the river.

(*b*) No project has been constructed, is under construction, or has been authorized for construction in any State which threatens to diminish the supply of water which admittedly is available to each other State under the documents constituting the law of the river.

(*c*) Very large amounts of Colorado River water are flowing unused across the international boundary into Mexico and there is no claim that within the immediate future those amounts will be so substantially reduced as to interfere with the availability of water necessary to supply the admitted share of the proponents of the resolution.

(*d*) There is no suggestion of any projects for development of Colorado River water which might interfere with the claimed rights of any State except projects which are of such magnitude that Federal financing is essential. Projects of that character must be authorized by Congress and financed by congressional appropriations. The availability of water for those projects is a proper concern for Congress when considering the necessary legislation. Under our Constitution and applicable decisions of the Supreme Court, Congress cannot avoid that responsibility or obtain assistance by requesting declaratory or advisory opinions of the Supreme Court.

4. The Colorado River Basin States committee, and the States composing that committee, affirm that they recognize as valid and binding instruments and legislations and as the law of the river the Colorado River compact; the Boulder Canyon Project Act, the California Self-Limitation Act, the Boulder Canyon Project Adjustment Act, the Mexican water treaty of 1944, * * *.

5. It is reasonable to assume that any Supreme Court litigation, such as that proposed, will require a period of years before ultimate determination by the Court. The practice of the Court in interstate cases involving disputes as to facts is to appoint a master or commissioner for the taking of testimony. Experience has shown that this process is long, drawn out, and costly. * * *

6. The effect of the proposed litigation can only result in delay in the development of the river. Congressional authorization of projects or appropriations for construction of projects will be contested upon the ground that until the decision of the Court the availability of a water supply is uncertain.

7. * * *

8. The proposed legislation is unnecessary as it must be assumed that the Attorney General of the United States and the responsible officials of each State will do their duty and institute whatever litigation is necessary to protect the rights of their respective governments.

9. The assertion that the legislation is necessary because the United States is an indispensable party to litigation involving the issues presented is without merit because (a) the mere presence of the United States in the suit does not create a justiciable controversy, (b) there is no justiciable controversy and hence legislation giving the consent of the United States to suit is unnecessary, (c) if any State believes and can establish that it is being injured or threatened with injury by another State, a suit by such injured State may not be defeated by the assertion that the United States is an indispensable party and (d) whenever in the future some controversy, as yet undefined either as to issues or parties, arises and in connection with such litigation it is proper for the United States to be a defendant, then will be the time for Congress to give consideration to legislation involving consent to be sued therein (pp. 177–179).

After several questions were asked of him, Mr. Howell continued his statement to point out:

True it is that whenever a project is presented to Congress, Congress must determine whether there is water available for the project, and whether that determination is simple or difficult, the onus of that determination is upon Congress, and while I do not want to trespass upon the field that will be covered by Mr. Breitenstein, still it is in my opinion that until a project is authorized which infringes upon the rights of some State, the question is moot and cannot give rise to a controversy cognizable before the Supreme Court in the exercise of its original jurisdiction (p. 182).

Mr. Howell's statement is followed with a statement by Jean S. Breitenstein. Mr. Breitenstein first introduced in the record the reso-

lutions of the Colorado River Conservation Board, dated April 23, 1948, in opposition to Senate Joint Resolution 145. After some preliminary discussion of the questions involved, he pointed out:

Senator ANDERSON. May I interrupt for just a second and go back over a little bit of this.

Congress must determine whether there is water available for the project.

Mr. MOEUR. That is what they said.

Senator ANDERSON. Is it your view that if Congress passes on the central Arizona project they first must determine whether there is water available in the river for the project?

Mr. MOEUR. Remember, Senator, all I am doing here is pointing out what was written up. On the other hand, if you want an opinion I would be glad to give it to you. I am only pointing out the language used by Mr. Howell here.

Senator MCFARLAND. I think, Mr. Chairman, in every project the Congress must make a determination that there is water available for it.

Mr. MOEUR. That would be my opinion or interpretation of it; however, I am only pointing out what Judge Howell said here.

Senator ANDERSON. Proceed, sir.

Mr. Moeur (reading):

> It was recited that one purpose of the legislation is to promote the development of the Colorado River Basin. And there it does not confine itself to the lower basin. Those appearing here in support of the resolution are all from California. It is interesting to note that California has admittedly already obtained the projects to utilize its share of Colorado River water. There are constructed, for use in California, of Colorado River water, projects which have the capacity to divert from the stream approximately 8,000,000 acre-feet of water annually.
>
> We feel that that is much in excess of the share of California, and that since California now has those projects, and since California, by its actions in Congress and elsewhere, has uniformly shown opposition to the larger projects which are now under study for authorization and construction, we have some doubt as to the sincerity of the proponents of the resolution in saying that it is necessary in order to further the development of the river (p. 199).

He makes some of the same points included in the Howell presentation, citing additional authorities in support of questions of law advanced. He particularly points to that part of the decision of the Supreme Court in the North Platte case which Mr. Shaw had omitted in quoting from that decision showing that in that case there was a threat of injury or injury because of the Kendrick project. When questioned by Senator McFarland he stated that the Kendrick project at that time was an authorized project, and that the main portion of the construction was accomplished during the time of litigation. (See p. 203.) He points out in the present instance there is no threat at all, that the only project that he has heard mentioned is the central Arizona project; and it is up to Congress whether or not it will ever be an authorized project. Until it is, it cannot be said that that project constitutes a threat. In that connection he makes the following pertinent statement:

> It is difficult for me to see how California can say there is an existing injury, when its present uses are a million acre-feet under what, so far as I know, the States agree California is entitled to (p. 203).

He then elaborates on the length of time involved in this kind of litigation, pointing out the specific instances with which he is familiar, discussing these cases and the length of time involved.

He also discusses briefly the question of III (b) water and beneficial consumptive use, agreeing with the conclusions reached by Judge Howell on those subjects.

He also pointed out the great expense involved in litigation of the kind contemplated, stating that in the North Platte case conservative estimates indicate that the case cost approximately $1,500,000. (See p. 217).

He also stated as follows:

> Then there is one other thing which I think should be mentioned: If the United States is an indispensable party, and if consent of Congress is necessary in order to give the consent of the United States to suit, it must be remembered that the mere fact that the United States is a party to the case does not make it a justiciable controversy. You have got to have a justiciable controversy in any event—that is, you have got to have your injury or your threat of injury. And the mere fact that Congress might give consent to the suit does not and would not create a justiciable controversy (p. 227).

Particular attention is directed to the following statement:

> Now, if a project is authorized in Arizona which California thinks is a threat to it, it can bring a suit against Arizona just as Nebraska brought a suit against Wyoming. Nebraska did not come down here and ask for any permissive legislation. It just went ahead and sued Wyoming. The matter came to the attention of the Attorney General of the United States, and he intervened (p. 226).

The next statement appearing in the record is that of Mr. Charles A Carson, chief counsel of the Arizona Interstate Streams Commission. (See p. 228.)

Mr. Carson first introduced in the record additional correspondence between Governor Osborn of Arizona and Governor Warren of California. The text of these instruments was to refute the contention made by California that Arizona had refused to discuss the water question with California officials. The gist of the matter is illustrated by the following excerpt from a letter from Governor Osborn to Governor Warren:

> However, I will be glad to meet and discuss with you and the Governors of the other Colorado River Basin States, jointly or severally, any matters of common interest, and if at such conference or conferences it should develop that there are any substantial differences, we can consider and perhaps resolve such differences, and if it should develop that anything further is necessary, we can consider the proper course to pursue (p. 235).

He also presented a letter to Governor Osborn from Governor Warren, dated October 16, 1947, a part of which appears as follows:

> No one has been more willing to discuss our mutual problems than yourself and I am sure you know that I would never make any expression to the contrary (p. 237).

Mr. Carson then introduced a statement made by E. B. Debler, given in connection with hearings on Senate bill 1175, Eightieth Congress. Mr. Debler is a consulting engineer in private practice in Denver, Colo. For about 28 years he was with the United States Bureau of Reclamation in charge of most of the project planning for the Bureau, and for some time was regional director of region 7. In this statement Mr. Debler discusses at length the pertinent provisions of the Colorado River compact, the Treaty with Mexico, and the contract by the State

of Arizona with the United States for water, Arizona's share of apportioned water, and waters available in Arizona. The summary of his conclusions is as follows:

Available for depletion to Arizona in low run-off period, 2,371.000 acre-feet.
Uses now proposed, including Gila and central Arizona projects: Tributaries above Lake Mead, 125,000 acre-feet.
Mohave Valley project, 21,000 acre-feet.
Parker (Colorado River Indian) project valley lands, 90,000 acres (table 6), 170,000 acre-feet.
Higher lands 10,000 acres at 3 feet, 30,000 acre-feet.
Gila Valley project including Yuma Mesa, North Gila, and South Gila Valleys and Wellton-Mohawk Division in accordance with S. 483, Eightieth Congress, first session, 600,000 acre-feet.
Central Arizona project, diversion of 1,200,000 acre-feet less added return of 133.000 acre-feet to Colorado River, 60 percent of 222,000 acre-feet required to remove additional salts brought into central Arizona area by Colorado River water and added use of Gila Basin waters, leaving net depletion of Colorado River by that project of 1,067,000 acre-feet.
Yuma project, Arizona portion, 130,000 acre-feet.
Making a total of 2,143,000 acre-feet and leaving unallotted by Arizona 228,000 acre-feet.
In periods of average, or better, run-off, such as 1905-29, additional water would be available (p. 246).

Mr. Carson then introduced the record of the testimony of R. J. Tipton, consulting engineer for the State of Arizona and Central Arizona Project Association, made before the Senate subcommittee considering S. 1175, Eightieth Congress. He appeared at the hearing in behalf of Arizona and the Central Arizona Project Association. He stated his experience and qualifications and then proceeded to discuss some of the testimony that had been offered by California witnesses in connection with the hearings on S. 1175. He quoted somewhat at length from the minutes of the seventeenth meeting of the Colorado River Compact Commission held at Santa Fe, N. Mex., November 15, 1922, the quotations being in connection with his theory of "beneficial consumptive use" and explained his position on the matter rather thoroughly, summarizing:

It is my conclusion that the Colorado Compact Commission did apportion the virgin flow of the Colorado River and that it considered beneficial consumptive use to be synonymous with depletion at Lee Ferry and that it did consider consumptive use on the Gila to be synonymous with the depletion of the Gila River flow at the mouth (p. 257).

Mr. Tipton then discusses the California contracts, showing those contracts in a table appearing on page 265. The table shows total contracts for water totaling 5,362,000 acre-feet; estimated present use 2,860,000 acre-feet; his conclusions on this question are as follows:

It is apparent, therefore, that the contracts held by California for the delivery of 962.000 acre-feet of surplus water are not firm contracts and are contingent upon what further apportionment might be made of waters of the Colorado River system after October 1, 1963. The water available for delivery under those contracts would not only be contingent upon the apportionment that might be made of the surplus after 1963, but it would appear that the availability of water might also be contingent upon agreement between the lower basin States as to the division of that part of the surplus apportioned to the lower basin after 1963 (p. 266).

Mr. Carson then introduced the statement of R. Gail Baker, State reclamation engineer for Arizona. This statement also was made in connection with S. 1175. It deals principally with Arizona's contention as to use of the Gila River water. He points out that the natural

flow of the Gila River to its mouth, from the period 1897 to 1943 averaged 1,272,000 acre-feet, that the low-tenure period 1931 to 1940 averaged 877,000 acre-feet per year. He also points out that the average depletion of the natural flow of 1,272,000 acre-feet per year is now 1,135,000 acre-feet per year.

The remaining portion of Mr. Baker's statement is not pertinent to the present question.

Mr. Carson then introduced the statement of Mr. Clifford H. Stone, director, Colorado Conservation Board, and Commissioner for Colorado on the Upper Colorado River Basin Compact Commission. His statement begins on page 276. Mr. Stone discusses two issues, as follows:

1. Is the water covered by paragraph (b) of article III of the Colorado River compact excess or surplus waters unapportioned by the compact, and has California, by the terms of the limitation act, renounced any claim to the 1,000,000 acre-feet by which the lower basin may increase its beneficial consumptive use?

2. Is the measure of beneficial consumptive use of waters of the Gila River in Arizona the amount of depletion of the virgin flow of the river at its confluence with the Colorado River? (p. 277).

Discussing issue No. 1, he takes the position that III (b) water is apportioned water, and explains this in detail. He discusses the pertinent provisions of the Colorado River compact, and quoting particularly from a letter by Herbert Hoover, Federal representative, in transmitting the report of the proceedings of the commission and of the compact to the Speaker of the House, he points out that the compact was not misunderstood by Mr. Hoover. The pertinent quotation is as follows:

Due consideration is given to the needs of each basis, and there is apportioned to each 7,500,000 acre-foot annually from the flow of the Colorado River in perpetuity, and to the lower basin an additional million feet of annual flow, giving it a total of 8,500,000 acre-feet annually in perpetuity (p. 279).

Mr. Stone concludes his position on this issue with a statement as follows:

By the passage of the self-limitation statute, California renounced any claim to more than 4,400,000 acre-feet of water apportioned to the lower basin by the Colorado River compact, plus one-half of unapportioned water. Apparently, to get around this limitation, California now attempts to increase the amount of unapportioned excess or surplus water so as to include the water covered by paragraph (b) of article III of the compact. She thereby recognizes that unless she can sustain her claim that III (b) water is unapportioned, she must abide by the limitation in the use of III (a) water, plus the share of unapportioned water (pp. 280–281).

He next discusses issue No. 2—"beneficial consumptive use." This discussion commences on page 281. He first points out California's contentions on this proposition, particularly on the uses of the Gila River. He quotes from a book entitled, "The Colorado River Compact," by Reuel Leslie Olson. Mr. Stone's conclusions on this question are well expressed by the following language:

This conception of the reason for the use of the term "beneficial consumptive use" by the Colorado River compact, coupled with resort in the compact to "depletion" by article III as the measure of beneficial consumptive use in the upper basin, demonstrates that it is unjustified, unreasonable, and not in accordance with the compact to measure beneficial consumptive use of the Gila River in any manner other than by depletion at its mouth (p. 282).

Mr. Carson continues his statement by introducing his own testimony in connection with S. 1175. In that statement he again reviews the correspondence between Governor Osborn and Governor Warren, and proceeds with a discussion of pertinent provisions of the Colorado River compact, explaining his contention that III (b) water is apportioned water. He discusses the effect of the California Self-Limitation Act. He then proceeds to point out and discuss the contract offered to Arizona by Ray Lyman Wilbur, at that time Secretary of the Interior, stating that this contract is shown in a book entitled "The Hoover Contracts," by Wilbur and Ely. That contract indicates that the Department of the Interior at that time recognized that Arizona was entitled to the use of 2,800,000 acre-feet of main stream water in addition to all of the water of the Gila River and its tributaries.

Mr. Carson summarizes the situation with a statement as follows:

> Arizona has been in this situation. We desired more water than was permitted to us under the compact. Finally the compact was ratified. Congress passed the Boulder Canyon Project Act and we could get no relief and no water unless we ratified the compact and came into the proposition under the terms that Congress and the compact had provided. And when we did that we considered that the questions of the rights of use of water in Arizona were settled.
>
> Now, I submit to this committee that they are settled now provided only this, that California respect her own limitation act. These attempted changes in interpretation from the long-considered, accepted meaning of these terms, it seems to me, result only from the desire of California to escape its limitation act (p. 285).

Mr. Carson proceeded with further discussion of the provisions of the Colorado River compact and the Boulder Canyon Project Act, with particular reference to the use of the phrase "beneficial consumptive use" and to the question of III (b) water. He summarizes his position on these propositions, that is, beneficial consumptive use and III (b) water, as follows:

> I do not see that anything could be clearer on those two questions of apportioned III (b) water and of the measure of beneficial consumptive use being depletion. Now, you must remember that this is a compact between sovereign States, and within their boundaries each State is free to handle its water rights on its own internal system of priorities, and the only interest that any State can have in the amount of water used in the other State is the limitation on that State's use as a whole (pp. 295–296).

Mr. Fred E. Wilson of New Mexico, Mr. W. J. Wehrli of Wyoming, Mr. Grover A. Giles of Utah, and Mrs. Nellie T. Bush of Arizona all made their statements expressing the opposition to their respective States to the proposed legislation.

This was followed by the statement of the Honorable Ernest W. McFarland, United States Senator from Arizona. He discussed the advisability of the proposed legislation, and cited the case of *Marbury* v. *Madison*, reported in 1 Cranch 137 et sequellae. He explained the fact that Congress by passing such legislation might imply that there was a justiciable controversy. He summarized this question as follows:

> Let me say this, Mr. Chairman, that the mere passing of an act such as this carries with it the implication that in the judgment of Congress, there is a justiciable controversy (p. 313).

He further points out that the Boulder Canyon Project Act made a proposition to California to agree to a division of waters of the river usable by them among the States of the lower basin and California

accepted that proposition, and agreed to the suggested division by the passage of the California Self-Limitation Act. He emphasizes the intention of Congress by quoting from the Seventieth Congress, Congressional Record—page 389, volume 70—certain questions asked by Mr. King and Mr. Phipps and answered by Mr. Johnson. Supporting his contention that III (b) water is apportioned water, he quotes questions asked by Mr. King and answers given by Senator Hayden. Senator McFarland summarizes his position by stating positively that there was apportioned to the lower basin 8,500,000 acre-feet, and that this was Senator Hayden's opinion of it. He further emphasizes that it is not necessary to go to the Congressional Record to find the intention of Congress in passing the Boulder Canyon Project Act, because that intention was made perfectly plain by the act itself.

He concludes his discussion with the following statements:

> Now, Mr. Chairman, with all of the power that I have, I ask this committee to be fair to our State, to give our State the same consideration and fair consideration that they have given California, and not to block S. 1175 by approval of a resolution like this. Let us find out whether S. 1175 would pass anyway, and if Congress is not going to pass it for other reasons, what is the use of putting ourselves to an expensive lawsuit? What good would it do any of us?
>
> And as has well been pointed out here, we can only determine this issue after S. 1175 has been passed, and California well knows this. They know that they can get into court then. I do not need to reiterate and emphasize that, if they can ever get into court. I doubt that they can ever get into court. But the settlement of the question as to whether they could would take a long period of time (pp. 323–324).

(S. 1175, above refered to, was the bill seeking authorization of the central Arizona project before the Eightieth Congress; and it is before this Congress as S. 75.)

The Honorable Edwin C. Johnson, United States Senator from Colorado, read a letter addressed to Senator Millikin, of Colorado, by Governor Knous of that State, in which strong opposition was expressed to the proposed legislation. (See p. 329.)

Senator Hayden made a brief statement saying that he had read the statement presented by Senator McFarland, and that he endorsed the same. He also recited a brief history of the passage of the Boulder Canyon Project Act, in which legislation he participated. He explained that he had opposed that bill but that an agreement was reached, in an effort to work out some method of passing a bill, after a conference with Senator Pittman, of Nevada; Senator Ashurst, of Arizona; Senator Johnson, of California; and Senator Shortridge, of California. As a result of this agreement there was included in the bill a provision which would give advance approval to allocation to Arizona of 2,800,000 acre-feet of main-stream water plus all the uses of the Gila River and its tributaries. He stated that this agreement was satisfactory to Senators Johnson and Shortridge, as follows:

> * * * So far as the Gila Basin was concerned, they agreed with us that it entered the Colorado River below any possible point of diversion into California, and, therefore, they had no interest in it (p. 334).

Congressman Murdock of Arizona presented a brief statement endorsing the position taken by Senators McFarland and Hayden.

Senator Millikin, of Colorado, then read into the record a letter from the Honorable E. W. Robertson, Senator from Wyoming, in which Senator Robertson expressed strong opposition to the bill, explaining

that legislation of this kind would delay development of the entire basin. The letter concludes with this brief statement:

> I am unalterably opposed to the enactment of Senate Joint Resolution 145, not only in its present form, but in any form. Not only is the proposed procedure legally questionable, there is no controversy, and, therefore, there certainly is no cause for action by the United States (p. 363).

Senator ANDERSON. Off the record.

(Dicussion off the record.)

Senator ANDERSON. We will be in recess until tomorrow morning at 10 o'clock.

(Whereupon, at 3:40 p. m., a recess was taken until 10 a. m. of the following day, Wednesday, April 27, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

WEDNESDAY, APRIL 27, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:15 a. m., in room 224, Senate Office Building, Senator Clinton P. Anderson, presiding.

Present: Senators Anderson, Downey, McFarland, Kerr, Ecton, Watkins.

Senator ANDERSON. The committee will be in order.

(Discussion off the record.)

Senator ANDERSON. Senator McFarland, will you call the first witness?

Senator MCFARLAND. Mr. Norman.

STATEMENT OF O. L. NORMAN, GENERAL MANAGER, SALT RIVER VALLEY WATER USERS' ASSOCIATION

Mr. NORMAN. Mr. Chairman and members of the committee, my name is O. L. Norman. I am a graduate of the United States Naval Academy and have had approximately 25 years' experience in engineering, construction, and management. For the past 15 years I have specialized in hydroelectric and irrigation developments.

I am appearing before this committee as general manager of the Salt River Valley Water Users' Association, one of the oldest, largest, and most successful irrigation districts in the United States. It is one of the few districts that weathered the depression of the early thirties, without being refinanced, and was able to meet all of its financial obligations. This organization distributes water to some 242,000 acres situated in the south-central part of Arizona, and in addition thereto, is the largest single producer and distributor of electric power in the State of Arizona.

I am also appearing as a director of the Arizona Electric Coordinating Committee, which represents the six utilities, both private and public, in the State of Arizona and who distribute approximately 95 percent of the power distributed within the State. By resolution I have full authority to testify before this committee in behalf of the coordinating committee.

I have no intention in appearing before this committee of trying to qualify myself as an expert on underground water. Our association, however, is the largest developer and user of underground water

within the State of Arizona. We have an excellent underground water section headed by a very capable engineer whom we acquired from California. He is assisted by other capable underground water men who are charged with the drilling, equipping, operation, and maintenance of irrigation wells. I have heard some of the members of this committee express themselves as being confused at some of the testimony in connection with the underground water. Frankly, I have been confused also, although I am an engineer who is supposed to be able to comprehend such engineering reports.

Underground water has entirely too many intangible things connected with it for me to attempt to qualify myself as an expert on quantity, quality, or location. There are, however, a few things I know from our actual experience in developing underground water that I feel should be brought to the attention of this committee.

The earliest report on underground water in central Arizona that I know of was prepared by Mr. W. T. Lee in 1905. He was with the underground water department of USGS. I have heard of and am sure that several other engineers have made reports on underground water conditions in central Arizona since Mr. Lee's report. The only other report with which I am familiar was made by Raymond Hill, and he is also from California, for the water users' association in connection with some possible litigation with an adjoining district.

The Lee report was made prior to any upstream storage development on either the Salt or the Verde River. The Lee report indicated that the natural recharge for the central Arizona area was approximately 360,000 acre-feet of water per year. The Hill report indicated a recharge of approximately 350,000 acre-feet per year but further indicated that by recycling the water, probably as much as 550,000 acre-feet of water could be pumped each year to supplement irrigation without depleting underground storage.

Whenever the extraction of water from the underground exceeds the recharge the result is that of mining water. In other words, you are taking water out from under the land that has been put there over a long period of years and just like a gold mine, a coal mine, or any other mining operation, you are taking something from the underground that is not being replaced and subjecting your supply to depletion.

The Hill report covered only what is known as the Phoenix-Mesa Basins. The Lee report covered the area contemplated under the central Arizona project. The Lee report estimated that the natural recharge for the area other than that included in the Phoenix and Mesa Basin was approximately 70,000 acre-feet per year. Using a value of 50 percent for recharge from recycling the total recharge to the basin other than the Phoenix and Mesa Basin would be 105,000 acre-feet per year.

Using this figure for the basin, outside the Phoenix-Mesa Basin, and using Hill's figure of 550,000 acre-feet for the Phoenix-Mesa Basin, the total recharge to the area would be about 655,000 acre-feet per year. And that does not allow for a salt balance. The average annual water pumped from the area covered by the central Arizona project is approximately 1,800,000 acre-feet per year. That is a 6-year average, and last year well over 2,000,000 acre-feet was pumped from the area. In other words, the amount of water being used from the

underground basin each year exceeds the replenishment by about 1,145,000 acre-feet. It doesn't take an underground water expert and it doesn't take much mathematics to determine what is happening to the underground water basin.

You gentlemen have been informed by prior testimony that the underground water basin supplying the lands incorporated in the central Arizona project contains some 300,000,000 acre-feet of water. I don't know this to be true but I will not contest this statement. The fact that there might be 300,000,000 acre-feet of water under the project or included in the basins supplying the project is not the answer. The impression was left with this committee that all the water users had to do was put down wells to a depth of approximately 1,000 feet and pump this water out for their use. I do contest this statement.

The figure of 300,000,000 acre-feet was evidently derived by taking all of the area, which is purported to comprise the underground water basin, multiplying that by approximately 850 feet, which is the difference between the average present static level and the 1,000-foot depth referred to, and considering that that area contained 15 percent water content. The amount of water under an area is not the answer. The amount that can be extracted from an area for beneficial use is what counts.

I have a map here that outlines this area. The portion in green is the area purported to be included in this underground basin. I know from my own experience that there is a great deal of this area where you get dry holes. As a matter of fact, up in the Deer Valley area, which is just north and west of Phoenix, a produce grower from California came over there—I do not think even he would believe all that Mr. Conkling has to say about this underground water situation—he cleared between 400 and 500 acres of land at a considerable expense to himself, put down a well, and did not get enough water out of it to take care of his domestic supply. I know that.

I know there are several other areas in there, such as the Paradise Valley area, where about all the water you can get out of a well is a domestic supply. You cannot get enough water for any irrigation out of them.

When you take this area and start saying you can go down 1,000 feet, all of this area is composed of valleys that slope in, and you have other hills within the area that do not outcrop. Therefore, you are not even going to get any typical water bearing cube by taking this area and multiplying it by 800 feet or 1,000 feet.

It also appeared to me from testimony I heard that there was an attempt to leave the impression with this committee that if we could afford to lift water 900-odd feet at one location we could afford to sink individual wells and pump water from the same depth. There is a great deal of difference in having a central pumping plant at the Colorado River as against having a thousand or more well-pumping plants spread over some 700,000 acres. The central pumping plant would be a great deal more efficient in operation, it would be located considerably closer to the source of power, and would not result in the tremendous loss in power being distributed to some 1,000-odd pumping plants over the 700,000-odd acres. You do not have to be an engineer to know you may be able to afford one without being able to afford the other.

I said a minute ago that it doesn't make any difference how much water might be contained in certain materials lying below the surface of the ground, it is the amount that can be economically extracted for use that counts. Approximately all materials underground carry a certain amount of water and the content is rather high. There is water in granite, limestone, sandstone, et cetera, but you don't get it out with a pump. Clays usually carry a higher water content than sand and gravel, but you don't get that out with a pump, the clays do not yield their water fast enough for economical pumping. We have an area in the north end of our project that is away from the river, where the water table stands higher than it does at almost any other place in the project, in fact, at times the water table is within 25 feet of the surface, and we have numerous drainage wells in this area but they yield very small amounts of water; in fact we cannot afford to operate them as irrigation pumps.

The project of which I am general manager now owns some two-hundred-odd wells and is in the process of drilling 65 additional wells which are being drilled to a depth of 700 feet. I would like to show this committee the log of some of these wells. I have just taken some wells at random here, some of these new wells we are drilling. I have a log of them, and I have the locations of them here on the map.

Well No. 1. Here is the log of that well. The red shows the clay, other colors the cemented clay and gravel, Caliche, and other formations that make up the well log. Now, that is located in a very favorable spot in this valley, for pumping.

Senator ANDERSON. What did that make in the way of a well?

Mr. NORMAN. A test pump installed produced only 85 miner's inches, with 120-foot draw-down, or 8 gallons per foot of draw-down. The standing water was 65 feet at the time of the drilling.

Senator ANDERSON. Would you state for the committee whether that is a good well, or a satisfactory well for irrigation?

Mr. NORMAN. No, sir; it is a very poor well.

Senator ANDERSON. And you think the fact that there is a couple of hundred feet at the bottom there is the explanation of that because of the tight packing of the clay?

Mr. NORMAN. Well, it is the type of material here, Senator, and I will show you some of that in just a minute. I have some samples here that have been taken from these wells.

Here is a well that went down 1,000 feet. We sunk this well simply as an experiment. We had set the depth of our wells at 700 feet, because we had not felt that after we got below 450 or 500 feet we would pick up any production out of a well by going any deeper. But since we were in this well-drilling program, I wanted to do some exploration work and I put this down as an experimental well at this point.

Senator ANDERSON. Just state for the record what sort of well that was.

Mr. NORMAN. That was a rather poor well. We got out of that well 195 miner's inches——

Senator KERR. There are some of us here who are not enlightened to any great extent by that statement.

Mr. NORMAN. That is around 2,000 gallons, gentlemen.

Senator KERR. In how long a time?

Mr. NORMAN. At 2,000 gallons a minute.

Senator WATKINS. About 4 second-feet?

Mr. NORMAN. Yes. That would be right at 4 second-feet. It would be almost 5 second-feet.

Senator KERR. What is a good yield for a well?

Mr. NORMAN. Well, we have some wells that would probably yield 10 second-feet.

Senator KERR. How many gallons is that?

Mr. NORMAN. I would have to do some multiplying here, Senator. There are 40 miner's inches in a second-foot, and a little better than 11 gallons in a miner's inch, that is——

Senator KERR. 440.

Mr. NORMAN. 440.

Senator KERR. 11 of them would be about——

Mr. NORMAN. About 4,400 gallons.

Senator WATKINS. That is a pretty good irrigation stream?

Mr. NORMAN. That is a very good well; yes, sir.

Senator WATKINS. You said one was drilled to about 700 feet, and the other a thousand?

Mr. NORMAN. That is right.

Senator WATKINS. You do not mean you actually have to lift the water that high?

Mr. NORMAN. No, sir.

Senator WATKINS That stands up in your pipe how far? How close to the level does that come?

Mr. NORMAN. That varies all over this project.

Senator WATKINS. I mean the two wells you were just talking about.

Mr. NORMAN. That varies over the project.

Senator KERR. What do these wells cost you to drill and equip?

Mr. NORMAN. About $30,000 each. That was with 120-foot draw-down, and the standing water was 65 feet. We had to draw it 120 feet in order to get that much water.

Now, you cannot work these wells with 120-foot draw-down, that is too much draw-down. We try to hold our draw-down to around 60 or 65 feet at the maximum.

Senator WATKINS. Why is it you cannot operate them at 120?

Mr. NORMAN. Well, you are running into the danger of collapsing your pipe. your casing, when you work with that much draw-down. You are drawing them off so hard that you are liable to work a great void around the well.

Senator WATKINS. I had some experience with one of these very wells on one of my farms. We have a considerable amount of it, but not anything like that.

Mr. NORMAN. No, sir; that is an extremely large draw-down to be using for a well. In order to get production out of these wells we have had to draw anywhere from 65 to 100 feet. I think it is too much.

These are just typical examples of wells that we put down. They are located through this part of the project. I think the well logs will be rather informative to the committee when they see the types of clays and other things that we are pulling this water out of.

Wells have been selected from different sections of the project which gives a fairly good coverage of the project. You can see from these logs the types of material encountered in drilling the wells to a depth

of approximately 700 feet. I also have some samples of materials taken from these wells which I would like for the committee to look at.

One of these wells, the No. 3 well, which is well up within the project, we hit black granite at 600 feet there.

Senator WATKINS. Did you go through that?

Mr. NORMAN. No, sir; we stopped right then, because there was an indication we were right on top of a mountain.

This is some caliche that came out of one of these wells.

Senator MCFARLAND. Mr. Norman, has anyone ever been able to drill through that granite?

Mr. NORMAN. No, sir; no one tries it, Senator. When they get down to the granite they stop. It yields nothing.

Senator MCFARLAND. As a matter of fact, the well-driller stops on you anyhow, does he not?

Mr. NORMAN. Yes, sir; he is not going to do much drilling in it.

This is an exhibit of the sandy clay. That is some of our better producing strata there.

This is a red sandy clay that came out of these wells.

This is some cemented sand-gravel that came out of one of them. You are not going to extract much water from that stuff.

This is the black granite we hit.

This is some volcanic ash we hit down below.

You can see from these samples the types of material encountered and make up your own minds as to about how much water you think can be extracted from them by pumping from deep wells.

These are not selected samples.

Senator KERR. They are typical samples?

Mr. NORMAN. Yes, sir. When it says on these logs "cemented clay," this is a sample of the material.

Senator MCFARLAND. Mr. Norman, as a matter of fact, with the exception of the granite, in most every well you drill you will go through these different types of material?

Mr. NORMAN. Yes, sir; and the materials are very much the same, but you do not find them at the same locations. You might drill a well over here and find this material at 400 feet, and some place else pick up that same material at 200 feet.

Senator MCFARLAND. As a matter of fact, when you hit this material, the cemented clay, after drilling in at a certain depth you usually figure you have come to the end of the well, do you not?

Mr. NORMAN. Yes. You will notice from this 1,000-foot well we were in that material right on down.

Senator MCFARLAND. If you do not go through it within 50 feet, or at least 100, you do not figure you are going to get anywhere?

Mr. NORMAN. That is right.

Senator MCFARLAND. You are just wasting money?

Mr. NORMAN. That is right.

Senator MCFARLAND. At the rate of about $12 a foot?

Mr. NORMAN. It is around $17 now, Senator.

Senator MCFARLAND. Oh, it has gone up since I had anything to do with it.

Mr. NORMAN. We like to start our perforations as far down from the surface as we can in order to attempt to get a better class of water. To show you the results of this, we drilled a well in what we call the Scottsdale area——

Senator WATKINS. Why is it that the water at the higher level is not as good a quality?

Mr. NORMAN. It carries a higher percentage of the salt, Senator.

Senator WATKINS. Is it unusable?

Mr. NORMAN. I am going to get into that and show you the quality of some of this water in just a minute.

Senator WATKINS. I was wondering, if you got water there, unless it is unusable, it would not matter whether the well was deep. In fact, it would be easier to get out if it was shallow.

Mr. NORMAN. Yes. We would not be going some 700 feet if we could get wells at shallower depths.

Senator WATKINS. That is what I was wondering about this water that is used for irrigation. A lot of it goes down into the soil. If it is not usable again then there is no hope of getting any return flow.

Mr. NORMAN. No, sir; you have to establish a salt balance. The pumping has been so heavy that we have just stopped our salt balance. We have to have so much water released out from under this land in order to carry the salts.

Now, if you continue to recycle the water like we have been doing out there, you do not carry your salts away, and the water continues to build up these salts.

On the project I am manager of, we put some 700,000 tons of salt a year from the Salt and Verde Rivers on that land.

Senator KERR. You mean in irrigating that that much salt is in the water you used, which comes out of the water and remains in the soil?

Mr. NORMAN. Yes; unless carried away, Senator.

Senator WATKINS. How do you get rid of that salt water, do you pump it out and run it into the river through drains?

Mr. NORMAN. The only way you can get rid of it is to have a sufficient amount of water, around 150,000 acre-feet of water to escape completely from this irrigated area to be carried on downstream.

Senator WATKINS. Do you put it in the river?

Mr. NORMAN. That is where it would go as rising water or in the underground water on down the river.

Senator WATKINS. I wonder if you know anything about an artificial means of getting rid of this salt water.

Mr. NORMAN. We can't do anything about it, we do not have the water to do it. And particularly when you are short of water as we have been in the last 3 years, on our project we just allocated 2 acre-feet per acre, for 1947 and 1948, and this year allocated 2½ acre-feet per acre.

Under those conditions the farmers are extremely careful with their water. They put very light applications of the water on the land. What happens is that the salts go down this short distance and crust. Some of them are pulled on back up into the surface soils.

Senator WATKINS. Your lands go alkali on you?

Mr. NORMAN. Yes, sir; they go alkali. Now, if you have a good run of the river and enough of the fresh water when it is in the flood stage——

Senator WATKINS. There is some surface irrigation there, too?

Mr. NORMAN. Oh, yes, sir. The project I am general manager of is primarily a surface irrigation project. We own six dams.

Senator WATKINS. That explains some of the questions I was asking. I was wondering if it was an entirely pumped project how you would get rid of that salt water.

Mr. NORMAN. Well, you would not.

Senator WATKINS. You would have to mix the fresh water with it and dilute it?

Mr. NORMAN. Yes, sir.

Senator WATKINS. I get it.

Mr. NORMAN. Yes, sir.

Senator MCFARLAND. Now, as to the shallow water of which you spoke. You would not get a well that would be worth while, as there would not be sufficient water to pump from a shallow strata?

Mr. NORMAN. No; you pulled it down too fast. We have wells at 200 feet that are dry.

Senator MCFARLAND. The thing that makes the shallow water usable is mixing it with the better water that you get at a lower depth?

Mr. NORMAN. That is right; yes, sir.

To show you the results of this, we drilled a well in what we call the Scottsdale area, which I will indicate on the map, and started perforations at 350 feet from the surface and perforated to the bottom of the casing. That was a 700-foot casing so we had 350 feet of perforations.

When we put a test pump on this well we were only able to produce 800 gallons of water per minute. This was not a satisfactory well so we perforated up to 250 feet and again put a test pump on the well and got a 1,800 gallon per minute. This will give you some idea of what you are up against in extracting water from the lower levels. We put one of our wells down to a thousand-foot depth and did not get as much water out of it as we did a well of 700-foot depth located less than a mile away. That is the thousand-foot well I told you about here and located right next to the adjoining section where the 700-foot well produced considerably more water than the thousand-foot well.

Naturally, having a substantial investment in wells, I have been very interested in deep well information and have read all the articles on deep well pumps and pumping that I could get my hands on. Most of these articles, supposed to have been written by experts, end up by suggesting that you see your local driller. Our project comprises only about 242,000 acres, I know of over 450 wells within this project; that is, irrigation wells, and would estimate that there are at least 500 irrigation wells in the area.

Senator DOWNEY. You mean in the whole central area?

Mr. NORMAN. No, sir; in this project, within this 242,000 acres.

These wells fairly well cover the entire project area, yet on our new well-drilling program we find almost every well we drill is a wildcat. That is, at places where we expect to get good wells we get poor wells. We have been pleasantly surprised in two or three wells where we did not expect to get very much, and got good wells.

It is nothing unusual to get a very productive well in one location and get almost a total loss only a half mile from it.

I think statements to the effect that if we can afford to raise water nine-hundred-odd feet to a central pumping plant on the Colorado River we can afford to drill wells to a depth of a thousand feet and

raise the water a thousand feet in the project and that there is approximately 300,000,000 acre-feet of water stored under the project and all we have to do is to drill wells to a thousand feet and start pumping it out is entirely misleading to this committee and would not be supported by any impartial engineer.

This committee was informed by previous testimony that all we had to do was to drill these wells and get a better quality of water than the Colorado River water. Our association has a chemical laboratory which is constantly engaged in sampling and testing water from the various wells and from different points on our canals. We have taken wells at random over the project and can point out the location of them to you on the map and will tell you the parts per million of soluble salts in samples taken from these wells.

On this map we have a well right in this location with 699 parts per million. There is one down in the central part of the project, the central part of the western end of the project, with 1,046 parts per million.

There is one down here at 1,686; 1,710; 1,865; 824; 800; 2,183; 1,919; 722; 1,482; 2,443; 3,010; 2,039.

Then we get off the project and go downstream to the Buckeye RID area, 6,170 parts.

Senator WATKINS. What is the danger point?

Mr. NORMAN. About 1,500.

Senator WATKINS. Out of a million?

Mr. NORMAN. Yes, sir.

Senator MCFARLAND. Anything over 3,000 is not considered usable, is it?

Mr. NORMAN. They are using some of it down there, Senator, but it is for grazing. When it is over 1,500 parts, you cannot do diversified farming. You can maybe go up to 3,000 parts and do some grazing.

Senator MCFARLAND. We had testimony in regard to that on the Wellton-Mohawk project where they had to go to Bermuda grass.

Mr. NORMAN. That is right.

Senator WATKINS. How much will alfalfa stand?

Mr. NORMAN. Alfalfa will stand quite a little bit of salt. I would not want to testify, Senator, I just do not know the answer on that. I have seen alfalfa growing where there were over 2,000 parts, but alfalfa growing and alfalfa growing well, are two different things

Senator WATKINS. I realize that, I have been a farmer.

Senator ANDERSON. Are there any compounds you can add to the soil to change that situation?

Mr. NORMAN. None that I know of, sir.

Senator WATKINS. It would be possible to take ocean water out if we could do that, and we would not be arguing here.

Mr. NORMAN. The reason I picked those wells is that they fairly well covered the project, and they are ones we had recent samples on

The parts per million of soluble salts in the Colorado River water is approximately 700. You will notice at a glance that the Colorado River water is much better water from a quality standpoint than water we are able to produce from the majority of our wells. I say that, because there was a statement by one of the engineers from California that this water would be better water than the Colorado River water.

As a matter of fact, the water from some of our wells has to be well diluted with surface water before it can be used at all for irrigation.

Irrigation water should not contain over about 1,500 parts per million of soluble salts, otherwise it would be too hot for diversified farming. We are having constant complaints in my office from shareholders over the amount of pump water supplied to them. This is particularly true in certain parts of the project that are being supplied a heavy percent of pump water.

As explained to you before, I am not attempting to qualify as an expert on underground water, but am presenting you only facts that I have encountered in managing an irrigation district that is expecting to receive a supply of water from the central Arizona development.

I've heard testimony before this committee to the effect that all the water that is needed for the entire central Arizona area is approximately 300,000 acre-feet. As general manager of the Salt River Valley Water Users' Association I can tell you that although our area comprises only about a third of the area covered by the central Arizona project we expect to apply for, purchase if allotted, and put to beneficial use approximately that much water in our own right and we are the only project in the entire area that has a substantial surface supply and are primarily dependent upon pumping for our requirements.

I have heard a great deal of testimony before this committee on wastage of water in central Arizona and the amount of water that could be salvaged and put to beneficial use. In one capacity or another I have worked on irrigation projects from Montana to the lower Rio Grande Valley and it is my opinion that most irrigation areas could take lessons from central Arizona in the conservation and economic use of water. From what I have observed and heard from the Imperial Valley of California and their wastage of water into the Salton Sea, flooding areas of productive land, they could certainly take lessons from Arizona. We don't have that kind of water to play with.

There are a lot of our farmers who go from this project and farm large acreages in the Imperial Valley. They tell me what goes on over there in the way of water wastage, things that cannot happen on our project. When a farmer orders water on our project, if it is going to be delivered at 2 o'clock in the morning, he is there to take it. If he does not take it it is charged to him and it is charged against his allotment. It means that that is water gone by, so far as that farmer is concerned.

I have always been somewhat astounded at engineers who attempt to draw up a water balance similar to a financial statement. I don't know who they are trying to impress, certainly not other engineers who have some knowledge of the intangibles involved in trying to balance out water.

I have heard a great deal of theory on underground water and although I am not an underground expert, I know that water comes into an underground basin from sources we know nothing about, and I know it leaves from places that we know nothing about.

I was somewhat bewildered but not enthused with the impression that one of the witnesses attempted to leave with this committee concerning the amount of water that could be salvaged in central Arizona simply by eliminating salt cedars. It is granted that salt cedars do consume a great deal of water. They are an obnoxious plant and should be destroyed but neither the United States Government through its various agencies nor the people of central Arizona have been asleep on this problem. Experiments on the eradication of salt cedars have

been under way continuously by both Government agencies and by individuals and districts. To date the results have not been encouraging. There is one thing I am sure of, that you are not going to kill salt cedars by trying to pump the water out from underneath them. If my memory serves me correctly there was quite an extensive program on the eradication of phreatophytes——

Senator KERR. Is that just another word for salt cedars, or is that another plant?

Mr. NORMAN. What is that?

Senator KERR. The word you just pronounced.

Mr. NORMAN. I just learned to pronounce that word a short while ago, Senator.

Senator KERR. I notice you were very proud of the way you used it, and I would like to know whether it is identical or synonymous with salt cedars.

Mr. NORMAN. A salt cedar is a phreatophyte, but cattails and lilies and all these water-consuming plants are referred to as—I don't know where they got the name—phreatophytes.

Senator KERR. But it is a good word.

Mr. NORMAN. Yes, sir; it is a good word. I am surprised that they can live under the name.

Mr. NORMAN (continuing). On the Pecos River and the middle Rio Grande in New Mexico by the Bureau of Reclamation and the Department of Agriculture. The experiments ended up in turning the area into a bird's sanctuary.

Senator WATKINS. You mean they could not do the job?

Mr. NORMAN. No, sir; they could not do the job.

Senator WATKINS. We have a project on now, and I understand that is one thing we are going to try to do is to get rid of the salt cedars, the phreatophytes.

Senator ANDERSON. My most enthusiastic regards to you, but the area he speaks of, I assume, is the area just north of the Elephant Butte Dam in New Mexico around San Michel. They tried to take the salt cedars out of there for a period of years and finally have made a wilderness area out of it.

Senator WATKINS. That was one of the discussions we had a year ago, I remember, when we were talking about your projects in New Mexico. I understand that was what they were going to do, get rid of those salt cedars. They used up so much of the water.

Senator ANDERSON. They did not, anyway.

Senator WATKINS. Yes, I know they did not.

Mr. NORMAN. They may find some way to get rid of them, Senator, but I do not think we can wait.

Senator WATKINS. You have not got a spray that will get rid of them like you do the weeds?

Mr. NORMAN. No, sir.

Senator WATKINS. They have sprays now that will kill the weeds.

Mr. NORMAN. I do not wish to take up the committee's time in hashing over things that have already been covered but I would like to make a brief statement in connection with the power angle of this development. Arizona's power loads have been growing by leaps and bounds. There has been absolutely no attempt to increase the loads in our area by promotional rates or promotional sales campaigns

encouraging the use of electric energy. As a matter of fact, all companies in Arizona have been discouraging load. In particular, on irrigation pumps quite a few Diesel and gas-driven engines have been installed. These installations are all potential electric power customers. We have all been quite concerned about our power requirements and about power costs.

I told you that our project is the largest single producer and distributor of power within the State. For the last 3 years we have been curtailing power. In other words, on these irrigation pumps we have been allowing them to run only a part of the time 5 days a week and part of the time at 6 days a week. We have been distributing that curtailment around over the project in order to have enough power to keep going.

Now, when power is available it creates a market for it. I have gone into many areas where large developments of power have been made, with the people wondering and worrying about getting the market for those areas. But in all those areas within a short period of time all the power has been consumed and they are calling for more.

I was chief engineer of the lower Colorado River development in Texas. We built that development with no power market whatsoever, with none in sight.

Senator WATKINS. Where was this?

Mr. NORMAN. In Texas. We have a Colorado River in Texas.

Senator ANDERSON. It has no connection with the Brazos, has it?

Mr. NORMAN. No, sir; it is the second largest river in Texas.

Senator WATKINS. I wanted to be enlightened. I have heard of the Colorado River winding around, but I did not know it went through Texas.

Mr. NORMAN. No, sir.

Senator ANDERSON. It carries a pretty heavy content of red clay?

Mr. NORMAN. That is right.

Senator ANDERSON. Not quite as much as the Brazos, but it gets its name from the color of the river water?

Mr. NORMAN. Yes, sir.

Well, we put in this power development and had no semblance of a market for the power. By the time we got it built we had the power sold. The other day they informed me they were building two more dams down there because of the power shortage, and in the meantime have acquired a 60,000-kilowatt steam plant.

The coordinating committee, that I referred to at the beginning of my statement, has employed a very highly qualified engineer to study our load and power conditions. We got him from California, too. The engineer has had benefit of engineering help and advice from all the utilities in the area. These studies indicate it would cost us approximately 6.1 mills per kilowatt-hour to produce power with steam generation using natural gas as a fuel at a cost of 18 cents per thousand cubic feet. Gas at 18 cents results in a cost of approximately 16½ cents per million B.t.u. content. This is an oil equivalent of about $1.02 per barrel. The above figure is based on operation at 60 percent load factor which is about the load factor available from hydroelectric energy developed on the Colorado River. Hydroelectric energy has a great many characteristics that are desirable

over steam generation particularly so for peaking power, in that it is not necessary to keep equipment on the line and warmed up in order to carry the swings of the load. With hydroelectric power you can call for it, and within 2 or 3 minutes have it on the line, where with steam power you have to keep your generator on the line and hot, and sometimes with a spinning motor in order to have it when you call for it. With steam it takes anywhere from 30 to 42 hours to put them on the line from a dead start.

We feel that hydroelectric energy from the Colorado River at a price ranging around 5 mills would be very desirable capacity to operating companies in Arizona. Our load growth studies show that at the time power could be produced from the central Arizona development the State of Arizona could consume all of the power so produced and the companies of Arizona are ready and willing to contract for this power. Therefore, it will not be necessary for California to take any of the power. They have complained about the price being too high and us wanting to sell this power to them to subsidize our irrigation over in Arizona. They can forget that worry, we will take it.

It is my feeling that California's main objection to the central Arizona project is that with the central Arizona project included as a part of the over-all development, power from Bridge Canyon will cost more than it otherwise would if Bridge Canyon was developed as a power project only. Undoubtedly the Bridge Canyon development will be made whether or not the central Arizona project is tied into it. The question is whether it will be developed as a higher cost power project, yet with power still at a competitive figure, to assist agriculture in Arizona, or whether it will be developed as a low-cost power project with a substantial part of the power going to California resulting in cheap power for California and the subsidizing of industry in California. As economy in the United States starts at grass roots, as successful agricultural developments in Arizona sells automobiles in Detroit, steel in Pittsburgh, paint in Cleveland, shoes and clothes in St. Louis and Boston, it is my opinion that the subsidizing of agriculture in Arizona is a great deal more important to national economy than the subsidizing of industry on the west coast which results in a large extent in pulling industries from other sections of the country to the west coast.

Senator WATKINS. How about Arizona, wouldn't you pull them over there if you had all this power?

Mr. NORMAN. We have no aspirations toward being highly industrialized, Senator.

Senator KERR. You just want that "which comes naturally"?

Mr. NORMAN. Yes, sir.

Senator WATKINS. In other words, you will not object to it when it comes, if they stop in Arizona on their way to California?

Mr. NORMAN. No; we are just not set up over there to become highly industrialized. We might very well have some small diversified industries.

Senator WATKINS. You are going to have to use all this power and there is going to be an awful lot of power. The point I am making is that you are probably doing in Arizona just what you say California wants to do. You will use this power for industry and that is about

the only thing you can use it for. You cannot use it for pumping, because you are going to do away with a lot of that well pumping.

Mr. NORMAN. We will still pump because we have to pump.

Senator WATKINS. You have power enough for that now?

Mr. NORMAN. No, sir; we are curtailing power every day now.

Senator KERR. You are just pumping the water you now have?

Mr. NORMAN. Yes, sir.

Senator WATKINS. You pump all the water you have; do you not?

Mr. NORMAN. We think we are pumping a lot more than we have, than we can continue to have.

Senator WATKINS. The point I make is that would you say about California would simply apply to Arizona, too. You have to use the power and you have to have people to pay for it, and industry is the only one who could pay for it.

Senator KERR. If I understand his remarks, they are willing to take the power at 5 mills within that vicinity in order to pay whatever is necessary in connection with the cost of irrigation, and they perfer to do that rather than have the power developed without irrigation, even though it could be sold for 3 mills to somebody else.

Senator WATKINS. I would not think that California would get it at 3 mills, either. I think you would probably have to pay 5 mills, no matter how it is developed.

Senator KERR. The statement here the other day was that it could be sold at 3.06, I believe.

Mr. NORMAN. Yes, sir; that is right. We need power, Senator.

Senator WATKINS. I realize you do. I am not against your idea of using the power in Arizona. I only pointed out that it seemed to me what you were saying about California could likewise be said of Arizona.

Mr. NORMAN. No, sir; I would guarantee that right within our project we can build our load by at least 100,000 kilowatts, simply by promotional rates. They are using butane all over the valley for heating and cooking. If we could throw power in there to compete with that that would be a good sale.

Then also, we need a little air-conditioning out there.

Senator KERR. Let me ask you this: You say you are on the El Paso line, are you not, that goes from El Paso to California?

Mr. NORMAN. Yes, sir.

Senator KERR. Is your rate at the line of 18 cents for industrial or municipal gas, either one?

Mr. NORMAN. No; that is industrial power plant gas.

Senator KERR. How does that compare as a fuel for industry with power at 5 mills? As I gather, it must be more favorable, because you said if you used it at 18 cents, it would result in power cost before distribution of 6 mills.

Mr. NORMAN. Yes, sir; 6.01 was our figure on it. I could not give you that figure without guessing, Senator.

Senator KERR. Then you would have at least a sixth advantage by having power at 5 mills than you would be using gas at 18 cents?

Mr. NORMAN. Oh, yes. You mean, if we got the Colorado River power, yes, sir; that is true.

Senator KERR. And certainly as of now the gas for fuel at 18 cents would be by far the cheapest fuel available to you?

Mr. NORMAN. Yes, sir.

Senator KERR. Because if it compares with oil at $1.02 a barrel that is less than half of what you can buy the oil for?

Mr. NORMAN. We cannot buy oil for that, Senator. We buy it on the west coast for around $2 a barrel.

Senator KERR. Before you ship it?

Mr. NORMAN. And then we have, I think, a $1.47—as it runs in my mind; either $1.28 or $1.47—freight.

Senator KERR. You certainly do not have any surplus wood for fuel?

Mr. NORMAN. Wood?

Senator KERR. Yes.

Mr. NORMAN. No, sir.

Senator KERR. All right, proceed.

Mr. NORMAN. In summing up my remarks I request that this committee consider the following facts:

(1) We are mining our water in central Arizona.

(2) That two-thirds of the area now under cultivation is entirely dependent upon pumping from the underground for its water supply, and that the other one-third is dependent upon underground pumping for its supplemental supply.

(3) That the area is desperately in need of a supplemental supply of water from the Colorado River, otherwise thousands of acres of productive land now contributing to the general economy of the Nation will be taken out of production.

(4) That central Arizona is very conscious of water conservation and is and has been taking all steps that are practical to conserve its water supply.

(5) That statements to the effect that there is a great underground basis of water in central Arizona, which only needs tapping and pumping to supply an adequate amount of water for irrigation purposes are entirely misleading.

(6) That no simple and practical method of eradication of phreatophytes has yet been developed, and that any insinuation that all we have to do is to pump the water out from under the phreatophytes to kill them off is an impractical supposition.

(7) That it is not necessary for California to spend any money for power from the Bridge Canyon development and therefore carry any of the burden of financing the central Arizona project. The utilities in central Arizona need and are ready and anxious to purchase all of the power so produced for use in Arizona.

(8) That it is more important to the economy of this country to use revenues from power sales to assist agricultural development in Arizona than it is to expend Government moneys in constructing facilities to produce low-cost power for California.

I appreciate the opportunity of appearing before this committee and of being permitted to present my views in connection with this very necessary and worth-while project.

I have a statement here by Mr. Wingfield, who is engineer and consultant for the Arizona Power Authority that discusses power loads and the requirements of Arizona, which I would like to have put in the record.

Senator ANDERSON. Without objection, it will be received.

(Discussion off the record.)

(The statement referred to above is as follows:)

STATEMENT OF K. S. WINGFIELD, ENGINEERING CONSULTANT TO THE ARIZONA POWER AUTHORITY

My name is W. S. Wingfield. I am a graduate in electrical and mechanical engineering and I have had better than 25 years' experience in the electric power field. During the course of my experience, I have had occasion to make numerous surveys and economic studies of power generation, both steam and hydro, together with market analyses, rate studies, and investigations of proposed transmission line interconnections. For the past 8 years I have conducted a consulting engineering business with headquarters at Washington, D. C. During the last 4 years of that period I have been acting as consultant on electric power matters for several of the irrigation and the electric districts in central Arizona, as well as for the Arizona Power Authority, although for the past year the work of the power authority has required almost my full time. Just prior to undertaking these assignments in Arizona, I took leave of absence from my consulting engineering firm and was chief of the Branch of Marketing and Operations of the Power Division of the Department of the Interior for a period of 18 months. While in such capacity, I became familiar with the operations of the Bureau of Reclamation and the program of development for the Colorado River Basin.

The development of the Colorado River in the lower basin has always contemplated the sale of a considerable block of electricity in southern California. This has been true because, until recent years, southern California constituted the principal nearby market. This has also been true because electricity generated at Bridge Canyon and other Colorado River developments will probably represent to southern California markets the cheapest sources for large blocks of electric power, if considered over the long term. However, the rapid growth in the use of power in Arizona and its outlook for large demands for power in the future have decreased the importance of the southern California market to the development of the Colorado River.

In analyzing power markets, power sources, and probable costs, many factors must be considered, assumptions must be made, and future conditions anticipated, or predicted. These elements of opinion make it impossible to reduce such analyses to exact mathematical comparisons. However, it would appear that the probable outlook for higher costs of power generation in both Arizona and southern California indicates a market demand for all available energy that can be delivered from the Bridge Canyon hydroelectric power plant.

The Bureau of Reclamation's December 1947 report on the central Arizona project states that the Bridge Canyon power plant should be able to deliver annually to load centers an average of 2,679,000,000 kilowatt-hours of firm power. This represents energy available over and above that required by the project for water pumping and is the average over a 78-year period of repayment. The Bureau further states in its report that such power should be delivered at the load centers at charges estimated at 4.82 mills per kilowatt-hour. Should the 78-year period of repayment not be established, the Bureau estimates that Bridge Canyon power could be delivered at the load centers for not to exceed 6.22 mills per kilowatt-hour.

I have made no study of these estimates of the Bureau, but have only attempted, in the following statement, to present estimates of the probable costs of generation in the Phoenix and Los Angeles areas of power that might be used in lieu of Bridge Canyon power. Following which, estimates are presented that show the effect on the market for Bridge Canyon power, as a result of the constantly increasing demands within Arizona itself.

Steam-electric generation has been assumed to represent the best criterion of market price for replacement for hydroelectric energy developed at multipurpose projects having a long term useful life such as hydroelectric power generated at Bridge Canyon. In a report which the Federal Power Commission is preparing entitled "Colorado River Power Market Survey—Lower Basin" the following statement is made: "The natural gas reserves are being rapidly depleted and a pipe line is now being laid to bring gas from the Texas and New Mexico fields to southern California. All natural gas used in Arizona at the present time is obtained from fields in New Mexico. In the past natural gas as well as oil has been used for fuel in steam-electric generating plants in the area, natural gas being used during months when the demand for gas was 'off peak'. Due to the diminishing gas supply in the region and the increased use

for domestic and industrial purposes, which has necessitated transporting additional gas into the region, it cannot be considered as a dependable source of fuel for steam-electric plants in the future. In view of these facts, the costs of steam-electric generating plants shown in this study are based on oil-burning equipment."

In estimating the probable cost of steam-electric generation for comparison with the range of estimated costs of Bridge Canyon power delivered, the principal cost factor will be the price of fuel at Los Angeles, or at Phoenix. As the long-term outlook for continued output of natural gas is stated by the Federal Power Commission to be not dependable, cost estimates are submitted below based on the present prices of oil at $2 per barrel for tank car delivery at Los Angeles and $3.45 per barrel for tank car delivery at Phoenix. Also large steam-electric generating plants designed to burn oil initially should be changeable to coal for the longer term. Indications are that coal would be higher than oil on an equivalent heat unit basis, as it would have to be shipped into either California or Arizona from fields outside of either State.

Under the present outlook for cost of labor and materials, a large steam-electric generating plant consisting of 50,000 kilowatt units, using 1,250 pounds per square inch steam pressure, with boilers and building designed for oil as fuel but changeable to coal, condensing water without cooling towers, simple architecture and finish, and not including transformers, switching, or transmission, could probably not be construed for an average cost of less than $130 per kilowatt of capacity.

This investment would be subject to fixed charges of interest, amortization or depreciation, taxes, insurance and administration. As interest rates and taxes (or tax equivalents) would vary as between private and municipal financing, fixed charges have been estimated on the basis of 5 percent interest for private financing and 3 percent interest for municipal. After giving effect to the useful life of various portions of the plant, the weighted average annual rates for interest and amortization have been estimated at 6.47 and 4.99 percent, respectively. Adding the estimated rates for the other items included in fixed charges results in the following:

Fixed charge rates	Private financing (5 percent interest)	Municipal financing (3 percent interest)
	Percent	*Percent*
Interest and amortization	6.47	4.99
Local taxes	1.50	
Contributions in lieu of taxes		2.50
Federal income tax equivalent	1.64	
Insurance and administration	.50	.50
Total fixed charge rates	10.11	7.99

Assuming operation of the steam plant at 5,000 hours annual use, burning oil for fuel having 6,200,000 B. t. u. per barrel with a plant efficiency of 11,000 B. t. u per kilowatt-hour produced, the annual at-site cost of steam-electric power is estimated as follows:

Plant at Los Angeles

Annual costs	Private		Municipal	
	Per kilowatt in dollars	Per kilowatt-hour in mills	Per kilowatt in dollars	Per kilowatt-hour in mills
Fixed charges	13.15	0	10.38	0
Fuel oil (plant use 9,000,000 B. t. u.)	2.91	3.55	2.91	3.55
Supervision, engineering, labor, water, supplies and maintenance	3.30	.20	3.60	.22
Total	19.36	3.75	16.89	3.77
Kilowatt costs converted to cost per kilowatt-hour at 5,000 hours use		3.87		3.38
Total energy cost		7.62		7.15

The increased cost of fuel oil delivered at Phoenix would increase the estimate for the annual at-site cost of steam-electric power at Phoenix to 10.59 mills per kilowatt-hour with private financing and 10.10 mills per kilowatt-hour with municipal financing. The Federal Power Commission, in its power-market survey referred to above, estimates that production from comparable plants in the southern California area and in the central Arizona area would cost 7.40 mills per kilowatt-hour and 8.23 mills per kilowatt-hour, respectively. Any of these estimates are well above the probable cost of Bridge Canyon power of 4.82 mills per kilowatt-hour, as estimated by the Bureau of Reclamation. They also exceed the maximum cost of 6.22 mills per kilowatt-hour estimated by the Bureau for Bridge Canyon power under the requirements of the existing reclamation law.

Thus, it would seem reasonable to assume that both the southern California and the Arizona markets have at-site costs of generation over the long term, which will result in each market absorbing, to the extent possible, the Bridge Canyon power made available to it. As the Arizona market is the nearest large market and as the Bridge Canyon project lies wholly within that State, it also seems reasonable that Bridge Canyon power will be delivered to the Arizona market to the extent of that market's capacity to absorb it. The balance, if any, would be delivered to southern California, or such other markets as may be available.

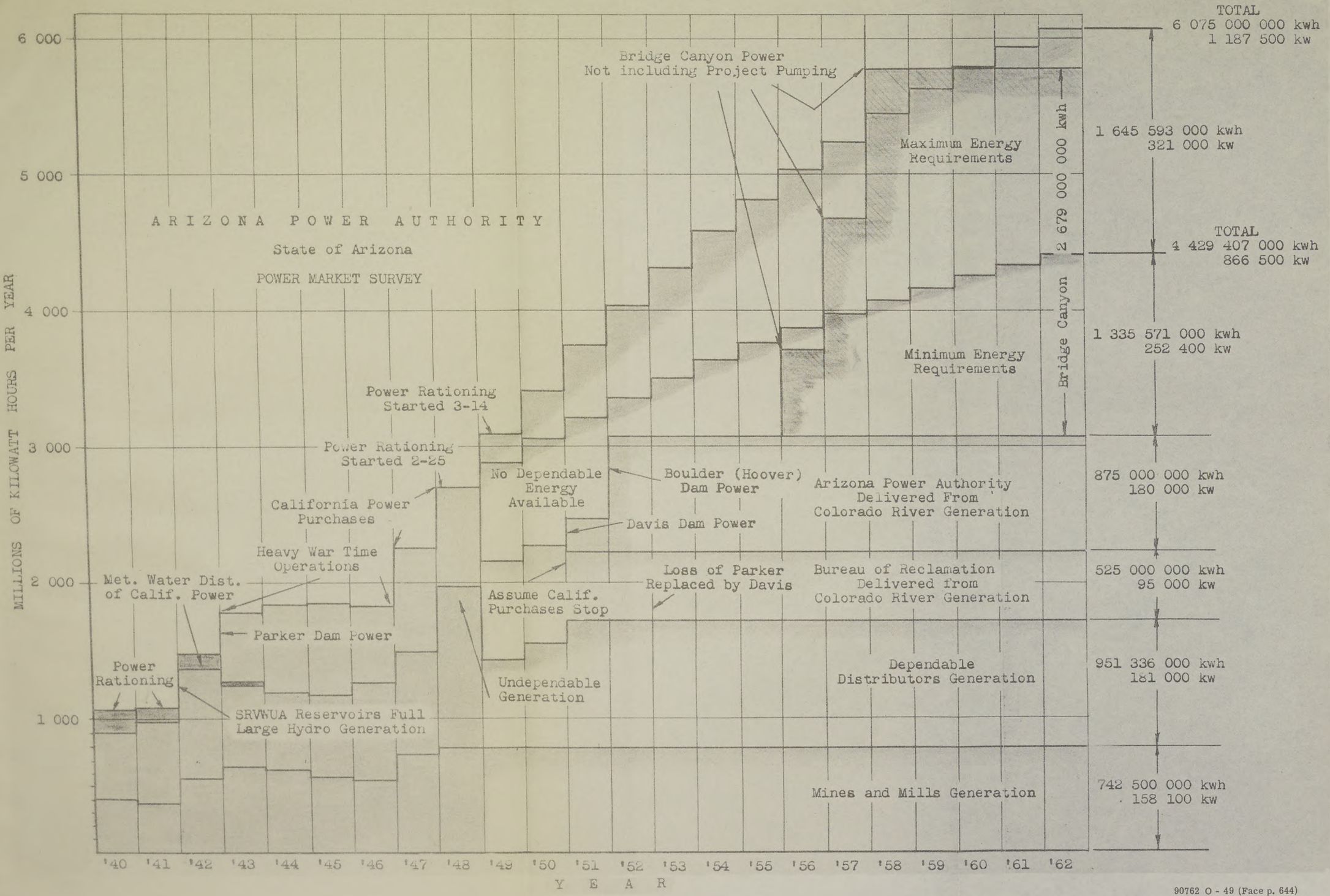
The electrical producers, distributors, and consumers in the State of Arizona are united in their desire that the Bridge Canyon project be completed at the earliest date, including the transmission lines needed to make the power available to the market centers. These producers, distributors, and consumers embrace both public and private interests, both industry and agriculture, both urban and rural populations. They are all in agreement that Arizona's welfare depends upon the rapid and continued development of the Colorado River as a source of both power and water. Within the past 10 years Arizona has had repeated power shortages—often requiring rationing of power. Some of these shortages have resulted in losses to agriculture and industry running into millions of dollars. Arizona has never had sufficient electric power.

The Arizona Power Authority is a public corporation and agency of the State of Arizona charged with administering and making available to the citizens and residents of that State electric power and energy generated at public works on the Colorado River. These developments along the river have already been undertaken by the Federal Government, with Hoover and Parker Dams already completed and Davis Dam under construction. The Federal Government now owns all of the major transmission lines within Arizona and has started building extensions and supplemental lines to that system. For the Arizona Power Authority, or any other agency, to attempt construction of works along the Colorado River, or major transmission lines within Arizona, would introduce duplication of facilities, and consequent conflicts would delay their completion, which has been heretofore avoided. If Arizona is to avoid power shortages in the future, Bridge Canyon and other developments along the Colorado River, together with the necessary transmission lines, must be completed as early as possible.

Attached is a chart showing the results of a State-wide power-market survey recently completed by the Arizona Power Authority. This shows that the consumption of electricity within Arizona during 1940 and 1941 was about 1,050,000,000 kilowatt-hours. In those years no power was available to Arizona from the Colorado River developments, except a small amount purchased through the Metropolitan Water District of Southern California. During those 2 years power was so short that it had to be rationed in certain areas. Then in 1942 the use of electricity in the State rose to nearly 1,500,000,000 kilowatt-hours. This was made possible by the availability of power which resulted from the large run-off in the Salt River drainage basin filling the reservoirs along that river.

Beginning with 1943, power was delivered at Arizona load centers by the Bureau of Reclamation following completion of Parker Dam. With availability of power, the use in Arizona rose to nearly 1,800,000,000 kilowatt-hours for that year. Then, through 1946, consumption in the State remained slightly over 1,800,000,000 kilowatt-hours annually due to wartime conditions. During this period declining production from the Salt River power plants and from the generating plants of the mines and mills was offset by heavy wartime operations at Hoover, with consequent increased production at Parker, together with some purchases of energy from California.

During 1947 and 1948 the demands for power in Arizona increased sharply, with the 1948 consumption nearly reaching 2,700,000,000 kilowatt-hours. This



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large increase was provided for by the use of practically every generating unit in Arizona which could be operated and kept on the line, and by purchasing energy from California to the extent existing facilities would permit its delivery. Due to shortages of electrical equipment and the long time required for delivery of such facilities, it was impossible to meet such rapid growth by installation of additional generators. One new generator of 30,000-kilowatt capacity did go into service at Phoenix about the middle of 1948. Despite all efforts to meet the demands for power in those 2 years, however, power had to be rationed and such rationing is continuing into the present year.

Estimated on a very conservative basis the minimum energy requirements in Arizona should grow to at least 3,300,000,000 kilowatt-hours for the year 1952. This means that such a demand will exceed by about 200,000,000 kilowatt-hours the assured output from all plants, both private and public, within the State, both now existing and proposed by that year, plus the energy then available to Arizona from the Colorado River, whether delivered by the Bureau of Reclamation or the Arizona Power Authority.

With ample power and energy made available in Arizona at reasonable rates the growth of electric use in the State should be at a more rapid rate. Abundant low-cost power usually finds its own market and, in the case of Arizona, many markets for electricity have not been developed but have actually been retarded by lack of supply and by high rates. It is estimated that under such conditions the energy requirements in the State would approximate 4,000,000,000 kilowatt-hours by 1952.

These two rates of growth have been shown on the attached chart as indicating estimated "minimum" and "maximum" energy requirements. The chart shows that under minimum conditions, namely, shortage of power and high costs, the energy requirements will approximate 3,900,000 kilowatt-hours by 1956. This should be sufficient to absorb all firm commercial energy likely to be available from Bridge Canyon in its first year of operation, assuming two units installed. With ample power available to Arizona at reasonable cost, namely with Bridge Canyon power plant and the necessary transmission lines completed, the estimate of maximum energy requirements indicates that the Arizona market would exceed 5,000,000,000 kilowatt-hours in 1956. Such a market for power would enable Arizona to absorb all firm commercial energy likely to be available from Bridge Canyon in its second year of operation, assuming four units installed. Four years later, or by 1960, the Arizona market, estimated at 5,800,000,000 kilowatt-hours, should be able to absorb the entire firm commercial output of the Bridge Canyon power plant estimated at 2,679,000,000 kilowatt-hours.

Obviously some provision must be made for the growth of energy requirements after 1952, when Hoover power becomes available to Arizona, and before 1956, when Bridge Canyon power might be expected. This will undoubtedly be accomplished by construction of additional generating plants within the State located adjacent to the market centers. Such plants are needed, along with the hydroelectric developments on the Colorado River, to assure Arizona of adequate power reserves and proper protection and regulations for the network of transmission lines interconnecting the generating plants and the market centers. The Arizona Power Authority, in conjunction with other distributors and users in the State, proposes to see that such need is met and looks to the Federal Government to continue its development of the Colorado River to meet the needs of the area.

(The chart hereinabove referred to is inserted facing p. 644.)

Senator ANDERSON. Senator Downey.

Senator DOWNEY. Mr. Norman, you expressed the opinion, as I understood your statement, that either the State of Arizona or some public agencies of the State, would be willing, before this project went ahead, to enter into enforceable contracts to buy all of the commercial power from Bridge Canyon?

Mr. NORMAN. I said we would buy it; yes, sir.

Senator DOWNEY. When you say "we," whom do you mean, your irrigation district?

Mr. NORMAN. My irrigation district and the other utilities of the State of Arizona, the coordinating committee, composed of six of them who distribute 95 percent of the power in the State of Arizona.

Senator DOWNEY. At what price would these agencies be willing to purchase the commercial power?

Mr. NORMAN. I believe the estimate there is 4.65 mills.

Senator DOWNEY. I do not think that is correct, Mr. Norman.

Mr. NORMAN. The Bureau of Reclamation so testified to 4.65 mills per kilowatt-hour.

Senator DOWNEY. Is your statement based upon that assumption? Supposing it turned out to be 5½ or 6 mills.

Mr. NORMAN. Well, you could get it up so high we could not buy it, Senator, but I would say as long as it is under gas, under what we can produce it for with steam, that we can take it. We figure our load growth, by the time this development is made, will be such that we will require all the power to be produced by Bridge Canyon.

We are afraid of not being able to get it. We even had to scrap with California to get some of the Davis power. We are not afraid of having to take it.

Senator DOWNEY. Did California get any of the Davis power?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. How much did Arizona get?

Mr. NORMAN. Arizona got ostensibly half of it. We got a quarter of it to firm up Parker contracts which really did not mean any new power to Arizona. It meant power that had been coming to Arizona from Parker. We got a quarter of it as new power to Arizona.

California got 25 percent of it and Nevada got 25 percent, but California gets Nevada's 25 percent until Nevada needs it, which I think is going to be for quite a time.

Senator DOWNEY. How much of the Hoover power is Arizona now using?

Mr. NORMAN. We are not using any of it.

Senator DOWNEY. Why not?

Mr. NORMAN. We are putting in the generators now. I do not mean we are putting them in, but the generators and generating equipment are on order now for our two units at Hoover.

Senator DOWNEY. Since Hoover was finished, you have been entitled to 18 percent of the power from Hoover, have you not?

Mr. NORMAN. That is correct.

Senator DOWNEY. And that is very much cheaper power than it would be from Bridge; is that right?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. But so far you have not been using that?

Mr. NORMAN. We are going after it now.

Senator DOWNEY. How many kilowatt-hours will that amount to?

Mr. NORMAN. As I remember—and I am just giving you very approximate figures—as I remember it is some 800,000,000.

Senator DOWNEY. And how much will Davis amount to?

Mr. NORMAN. I cannot answer it right off the bat. It is 45,000 kilowatts at 60 percent load factor.

Senator KERR. That would be 27,000.

Mr. NORMAN. Twenty-seven thousand continuous.

Senator DOWNEY. What would it be, about a half million kilowatt-hours?

Mr. NORMAN. Eight thousand seven hundred and sixty hours a year. That would be the 27,000, times 8,760 continuous use.

We have taken that into consideration, Senator.

Senator DOWNEY. How much is the commercial power that will be developed at Bridge, Mr. Norman?

Mr. NORMAN. I forget.

Senator DOWNEY. It is 3,000,000,000 kilowatt-hours, is it not?

Mr. NORMAN. I think that is right. I do not have it here, but it is some place around there.

Senator DOWNEY. About what is the present load factor in the State of Arizona? About how many kilowatt-hours are you using there.

Mr. NORMAN. The load factor?

Senator DOWNEY. About how many kilowatt-hours do you use?

Mr. NORMAN. We use around a billion ourselves.

Senator DOWNEY. I mean, the whole of Arizona?

Mr. NORMAN. I cannot answer for the whole of Arizona.

Senator DOWNEY. Do you have any idea?

Mr. NORMAN. It is about 2,100,000,000.

Senator DOWNEY. Mr. Carson, did you want to make any suggestion?

Mr. CARSON. I wanted to tell you that in the chart you have attached to the Wingfield statement is a statement of the present load factor and its projected growth. That is in the Wingfield statement.

Senator KERR. Is that the one he referred to?

Mr. CARSON. Yes.

Senator DOWNEY. But in any event you do state to the committee here that as a prerequisite to going ahead with this project public agencies of the State of Arizona, who are in sound financial position, would be willing to make a binding contract for the purchase of this power at the necessary figure?

Mr. NORMAN. If that is a prerequisite, I do not think there will be any difficulty with that at all, Senator.

Senator DOWNEY. And would they be willing to bind themselves over the period of years it is necessary to liquidate this project out?

Mr. NORMAN. We have to bind ourselves on prior contracts. We do not want any short ones.

Senator DOWNEY. Mr. Norman, I wish you would insert in the record here, in your testimony, a statement of just what is the amount of electrical power now used in the State of Arizona.

Senator KERR. Senator, I think you have that before you.

Senator DOWNEY. Is it all in?

Mr. NORMAN. Yes.

Senator DOWNEY. All right, Senator, if it is in Mr. Wingfield's report, that is satisfactory.

Senator KERR. It is here.

Senator DOWNEY. What is the total amount used?

Senator KERR. Well, when it comes to reading these electrical figures I would not want to risk that myself.

Senator DOWNEY. Anyway, what you are now using is a comparatively small fraction of the power that will come from Davis and your share of Hoover, together with what would come from Bridge Canyon?

Mr. NORMAN. I did not understand that, Senator.

Senator DOWNEY. I will withdraw the question.

Mr. Norman, have you the Raymond Hill report which you referred to, on water?

Mr. NORMAN. Not with me.
Senator DOWNEY. Can you produce that for the committee?
Mr. NORMAN. I can.
(The report follows:)

EXHIBIT A

LEEDS, HILL AND JEWETT.
Los Angeles, Calif., November 12, 1947.

Subject: Control of ground waters.

Mr. O. L. NORMAN,
General Manager, Salt River Valley Water Users' Association,
Water Users' Building, Phoenix, Ariz.

DEAR MR. NORMAN: The following is my suggestion of the technical material to be incorporated in the joint report to be made to the board of governors next Monday at the special meeting to consider control of ground water within Salt River project. In this connection it should be pointed out that the data are from incomplete studies being made in preparation for trial of the Roosevelt Irrigation District action so that the quantities stated are provisional and subject to modification.

SOURCES OF GROUND WATER

In a state of nature the water underlying Salt River Valley was derived from absorption in the channels of Salt River and Agua Fria River and on the alluvial cones of such tributaries as Queen Creek and Cave Creek. The total contribution then was undoubtedly small relative to the present, which includes seepage from canals and percolation from irrigated fields, because the outflow from the ground-water basin was limited to the amount of rising water in the channels of Salt River and Gila River. There is, of course, no record of the quantity of natural drainage, but it probably was in the order of 100 cubic feet per second. In any event, it is apparent from reports of early explorers that both Gila River and Salt River were perennial streams throughout their courses across the desert.

When modern irrigation was commenced in the Salt River Valley more than 75 years ago, conditions were radically changed. Water was diverted from the surface flow into canals and spread over lands far back from the river. Seepage from canals and field percolation progressively built up the ground-water level until the slope toward the river became steep enough to produce subsurface outflow equal to the average contribution by percolation. Under these conditions Salt River was a gaining stream throughout most of its course across the valley, so that contributions to the ground-water supply by absorption in natural channels must have been limited almost entirely to absorption of the flow of tributary streams.

When it became necessary about 30 years ago to install drainage works conditions were further altered. Ground water was removed at a large number of points by pumping from wells so that less water had to make its way to the channels of Salt River and Gila River, which were the natural drains for the valley. As the amount of such pumping was increased to supplement the supply of water used for irrigation, the ground-water level throughout the valley lowered progressively until now it is generally below the levels of 40 to 50 years ago.

The primary source of the ground-water supply underlying Salt River project, however, has continued to be seepage from canals and laterals and field percolation, the contribution by absorption of surface streams being relatively insignificant.

AMOUNT OF GROUND-WATER CONTRIBUTIONS

The quantities of water which reach the ground waters underlying the project from streams other than Salt River cannot be estimated accurately, but reasonable limits can be fixed.

Until 20 years ago Agua Fria River contributed a substantial quantity to the ground-water supply along the westerly side of Salt River project. With the completion of Carl Pleasant Dam and the diversion of practically all of the natural run-off of Agua Fria River for irrigation of lands in the Maricopa County Water Conservation District along the easterly side of the White Tank Moun-

tains, this supply was effectively cut off. The entire run-off of Agua Fria River controlled by storage, has been found to be inadequate to serve the area under that canal system. In fact, it has been necessary for the Maricopa District to supplement its supply by pumping from a large number of wells. Only part of the natural flow was absorbed in a state of nature because most of the flow during large floods, which is now impounded, would have passed downstream into Gila River. The natural contribution to the ground water was probably no more than an average of 50,000 acre-feet per year and may have been much less. In any event, the contribution from this source is almost nil under present conditions.

New River, Skunk Creek, and Cave Creek, which enter the valley east of Agua Fria River, have contributed small amounts to the ground-water supply underlying Salt River project. New River, which forms the northwesterly boundary of the project, discharges very much less water than Agua Fria River, so that the contribution from this source must be quite small. Skunk Creek is of even less importance.

The natural contribution from Cave Creek can be judged roughly from the effect upon the elevation of the ground water along Arizona Canal of pumping for irrigation in Deer Valley through which Cave Creek passes. While records are scattering, nevertheless it is apparent that progressive lowering of the ground-water level underlying the Cave Creek cone commenced soon after this land was placed under irrigation. The rate of lowering has become rapid, indicating a very heavy overdraft upon this source.

Some portion of the flow of Cave Creek is absorbed in its channel north of the Phoenix Mountains, and in the opinion of some, this water follows ancient buried channels into Paradise Valley and thence into Salt River Valley east of Camelback. The quantity must, however, be small because the gradient through Paradise Valley is flat and there are few productive wells in the area.

In general the contribution to the ground-water supply by absorption from surface streams entering the north side of Salt River Valley may have been a little more than 50,000 acre-feet per year in a state of nature. Twenty years ago, however, due to the interception of the flow of Agua Fria River, such contributions were reduced to probably less than 10,000 acre-feet per year. Now because of pumping from wells in the alluvial cone of Cave Creek north of Arizona Canal and pumping for domestic and minor irrigation use in the Paradise Valley the inflow of ground water from all sources along the northerly and westerly boundaries of Salt River project may not exceed 5,000 acre-feet per year. This quantity is so small relative to the total draft upon the ground-water supply of the basin as to be insignificant.

On the easterly side of the project only Queen Creek has been a material source of supply. Flood waters from this stream spread out over the desert and are there absorbed. Much of the water is lost by evaporation from the moist soil, but a substantial portion of the average run-off percolates downward to join the ground water. In a state of nature this water moved westerly and contributed to the supply of the Mesa Basin. During the past 20 years, however, pumping for irrigation in the Queen Creek area has intercepted this underflow and now so much water is being pumped from wells that the natural gradient of the ground-water table has been reversed. No accurate estimates have been made of the supply from this source, but it appears from such data as are available that Queen Creek formerly contributed about 20,000 acre-feet of water per year.

In general, the contribution to the ground water underlying Salt River project from sources east of the project boundary may have been as much as 25,000 acre-feet in a state of nature, including absorption of run-off in ephemeral streams draining the west slope of Superstition Mountain. Today substantially all of this supply has been intercepted and in places water is now being drawn out from under the project by the reversal of the gradient caused by overdraft in the areas to the east.

There is no contribution to the ground water from sources along the southerly boundary of the project; on the contrary, there has always been a natural outflow of ground water around the easterly end of the Salt River Mountains into the Gila River above its confluence with Salt River.

In a state of nature, therefore, it is probable that the total contribution to the ground water underlying the present Salt River project, exclusive of absorption in the channel of Salt River itself, was in the order of 75,000 acre-feet per year, approximately 100 cubic feet per second on the average. When Carl Pleasant Dam was built on Agua Fria River half of this contribution was cut off. Pumping in areas outside of the project has since intercepted most of the remainder,

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so that the net contribution is now so small as to be insignificant in relation to the draft being made upon ground water within the boundaries of Salt River project.

DIRECT CONTRIBUTION FROM SALT RIVER

In a state of nature there was probably little more than temporary absorption of floodwaters from the surface flow of Salt River between Granite Reef and its confluence with Gila River, with the exception of the quantity required to support underflow to the south around Salt River Mountains into the trough of Gila River. With the beginning of modern irrigation in the valley, however, the surface flow of the stream was cut off during part of each year so that natural drainage appearing as rising water in Salt River and Gila River unwatered some of the gravels which were refilled by absorption of winter floodwaters. Later, when artificial drainage by pumping from wells was instituted, more and more of the gravels underlying and bordering the river were unwatered so that substantial quantities of surface water were absorbed in the channel of Salt River at times of spill over Granite Reef Dam. This probably amounted to as much as 100,000 acre-feet in the flood of 1941, but the average contribution from this source has been much less because of the infrequent occurrence of floods exceeding the capacity of the storage reservoirs on Salt River and Verde River.

In general it may be said that in a state of nature absorption of the flow of Salt River was small because the ground-water basin was full to the level of the stream. Later, when seepage from canals and field percolation raised the ground-water level under the irrigated area, the subsurface flow was toward the river, so that absorption of floodwaters was prevented below Tempe and probably became nominal between there and Granite Reef. More recently, as the ground-water level has been lowered, the opportunity for absorption of the surface flow of Salt River has greatly increased, particularly in the areas west of Phoenix where heavy pumping by Roosevelt Irrigation District has pulled the normal water level well below the stream channel. This increased opportunity for water to be absorbed has been offset, however, by regulation of the flow of both Salt River and Verde River, reducing both the frequency of floods and the quantities of water which pass over Granite Reef Dam.

In brief, therefore, Salt River has not been and cannot be expected to be a large contributor to the ground-water supply by absorption in its channel between Granite Reef and its confluence with Gila River.

CONTRIBUTION FROM IRRIGATION

The primary contribution to the ground-water supply underlying Salt River project has thus for many years been seepage from canals and percolation from irrigated fields. The proportion which this contribution bears to the total ground-water supply is uncertain, but it is at least 80 percent and more probably 90 percent. Quantitatively the supply from this source of ground water is equal to the difference between the total amount of water diverted at Granite Reef and all evapo-transpiration losses from canals and laterals and from irrigated fields.

The quantity of water which can be diverted at Granite Reef varies from year to year but within restricted limits. The safe draft on Stewart Mountain Reservoir has been determined to be 700,000 acre-feet each year. The supply available from Verde River for diversion at Granite Reef will average practically 350,000 acre-feet per year, ranging, however, from less than 200,000 acre-feet in very dry years to at least 500,000 acre-feet in such years as 1941. On the average, therefore, the gross supply available for diversion at Granite Reef amounts to 1,050,000 acre-feet per year.

From this average total there must be deducted about 50,000 acre-feet per year delivered to Roosevelt Water Conservation District, at least 10,000 acre-feet to Indian lands, and about the same amount to Buckeye Canal Co. pursuant to court decrees and contracts. The net available for association irrigation use will thus average about 980,000 acre-feet per year, which is almost exactly 4 acre-feet per acre of gross area within the project.

Approximately 40 percent of the water diverted is not accounted for in deliveries to users but it is doubtful whether actual losses by evaporation and seepage amount to more than one-third of the total diverted. Evaporation from water surfaces and vegetation along canals and laterals may account for 10 percent of the loss; hence, there is reasonable basis for the assumption that seepage from canals and laterals amounts to 300,000 acre-feet per year on the average.

TOTAL CONTRIBUTION TO GROUND WATER

In general, there is reasonable evidence that the total contribution to the ground-water supply of the Salt River project and other irrigated areas east of Agua Fria River is about 350,000 acre-feet per year, exclusive of percolation from irrigated fields. The amount of such field percolation varies widely from year to year and depends to a large extent upon the nature of crops grown and irrigation practices. It may amount to more than 2 acre-feet per acre per year on lands having old normal flow rights, while on other lands without normal flow water there may be little or no field percolation. In general, the average should be a little more than 0.5 acre-foot per acre but not exceeding 150,000 acre-feet per year from all lands within Salt River project.

The total contribution to the ground-water supply from all sources is thus in the order of 500,000 acre-feet per year under present conditions, ranging from as little as 350,000 acre-feet in dry years to at least 600,000 acre-feet in wet years when there is protracted spill over Granite Reef Dam.

DRAFT ON GROUND WATER

Only part of this normal contribution of 500,000 acre-feet per year to the groufidwater supply underlying the Salt River project is available for reuse within the project. Allowance must be made for natural outflow and for exportations which the association cannot prevent. Further allowance must be made for the movement of groundwater across the boundaries of the project by reason of overdrafts on the supply available to contiguous areas.

The water which rises in the channels of Salt River and Gila River near the westerly boundary of the project is now much less than was formerly customary and amounts to only about 60,000 acre-feet per year. No further reduction in this natural outflow can be expected; on the contrary it would be better if there were more natural drainage.

The pumping done by Roosevelt irrigation district within the boundaries of the project accounts for practically all direct exportations of groundwater. This has increased during the 20 years of operation of that district from about 100,000 acre-feet to more than 170,000 acre-feet per year. The association offered in compromise of pending litigation to permit the exportation of as much as 400,000 acre-feet in any three consecutive years. This offer was refused by Roosevelt irrigation district so that the quantity which will be taken out of the basin for use on lands west of Agua Fria River is uncertain. For purposes of this analysis, however, exportations at an average rate of 130,000 acre-feet per year are assumed.

Pumping in the area along Agua Fria River west of the project and in the Marinette Ranch between New River and Agua Fria River was formerly offset by contributions to the groundwater supply from Agua Fria River. Under present conditions, however, groundwater is moving out from under the project to replace the water pumped from wells along its westerly boundary.

The same situation is developing in the area immediately north of Arizona Canal where the contribution to the project supply from Cave Creek has been intercepted and there may be now an actual reversal in the gradient of the groundwater table. Certain areas around Arcadia have for years drawn upon seepage out of Arizona Canal. Further to the east in Paradise Valley uses have increased and a reversal of the hydraulic gradient may already have developed there.

Along the easterly boundary of the project, Roosevelt water conservation district has been obtaining from half to two-thirds of its water supply from wells. This draft, together with pumping in the Queen Creek area to the east, first intercepted the natural contribution of groundwater which had its source in Queen Creek and other minor tributaries draining the slopes of Superstition Mountain. In recent years the overdraft in the Queen Creek area and within Roosevelt water conservation district has progressed to the point where a definite reversal of gradient has developed, causing a movement of groundwater easterly from within the project.

The Goodyear ranch, southwest of Chandler, for 30 years has drawn upon the natural outflow of groundwater from the Mesa Basin around the easterly end of the Salt River Mountains to Gila River. More recently large quantities of water have been pumped from wells for the irrigation of lands in the Indian reservation just to the south. This pumping, together with that in the Goodyear ranch, has caused the movement of groundwater southerly across the project boundaries to be about the same as it was before the Mesa Basin was drawn down to its present level. If this had not been the case, the lowering of the Mesa

Basin would have pulled some water back to the north from outside the project; hence to that extent such pumping may be looked upon as a draft upon the supply of groundwater underlying the project.

The total subsurface outflow of water across the boundaries of Salt River project, due to natural movements as well as to overdrafts upon the supply underlying adjoining areas, is very uncertain. However, this outflow may be more than 100,000 acre-feet per year.

The total of such deductions from the average annual contribution to the ground-water supply underlying Salt River project is probably close to 300,000 acre-feet per year. The net available for consumptive use within the boundaries of Salt River project is therefore only about 200,000 acre-feet per year under present conditions; an average of more than 250,000 acre-feet per year appears improbable even though Roosevelt irrigation district be restricted considerably and some control be had over pumping in areas contiguous to the project.

SAFE DRAFT ON GROUND WATER

The total quantity which can be pumped from underground for use in the irrigation of lands within the project is substantially greater than the net available for consumptive use, because this water from wells is delivered into canals or laterals where leakage occurs and is then used in the irrigation of fields from which there is percolation.

The total amount which can be pumped for use within the project without lowering the ground-water level varies from year to year with the proportion which the pumped supply bears to the quantity of gravity water available. When there is ample gravity water, pumping from wells has less effect than it does in years in which the gravity supply is deficient, because the consumptive use of water does not increase proportionately to the quantity delivered to the land. For example, in a year such as 1941 the addition of 1 acre-foot per acre of pumped water to the quantity of gravity water delivered would not have increased the consumptive use materially. On the other hand, in drought years such as 1940 and 1947, when the suppl yto lands was restricted, most of the water delivered to lands was consumed, so that the net draft on the ground-water supply was almost as great as the total quantity pumped.

From certain incomplete calculations being made, it appears that there would be no further progressive lowering in the Mesa Basin under present conditions if pumping there for use within the project were limited to about 150,000 acre-feet per year. It also appears from the same calculations that another 150,000 acre-feet could be pumped from the Phoenix Basin under present conditions for use within the project without further progressive lowering of the ground-water levels in this portion of Salt River Valley. If the draft on this supply now being made by Roosevelt irrigation district were limited, the reduction would be offset in part by an increase in the natural outflow, so that a maximum draft of 200,000 acre-feet from the Phoenix Basin for use within the project would seem to be the probable upper limit.

The total draft which can be made upon the ground-water supply for use within Salt River project without progressive lowering of water levels is thus about 300,000 acre-feet per year under present conditions, divided about equally between the portions of the project lying east and west of the Tempe Buttes. The difference between this total and the 200,000 acre-feet estimated as available for consumptive use is that portion of the pumped water which seeps out of canals or percolates from irrigated fields to rejoin the ground water.

OVERDRAFT ON GROUND WATER

It is significant that the average draft upon ground water which can be made within Salt River project for use within the project can be exceeded substantially in wet years without causing lowering of water levels, but that in dry years the opposite is true. Consequently, when pumped water is most needed to supplement the supply available from Salt River and Verde River, more lowering of the ground-water plane must occur than would be the case if the same quantity were pumped in a year of average supply.

In recent years the amount of water pumped by the association alone has exceeded the safe draft upon the ground-water basin. In addition, substantial quantities have been pumped by individual shareholders for their own benefit. The total draft in the past 3 years has averaged more than 450,000 acre-feet per year; this amount was at least 50 percent in excess of the supply of ground water actually available for use within the project.

A very serious overdraft is thus being made upon the ground-water supply underlying Salt River project. This has been evidenced by very substantial lowering of ground-water levels. Such lowering has been progressive for many years, interrupted only in 1941, a year of very large run-off when free water was available for irrigation for 3 months and the pumping draft upon ground water was greatly reduced throughout the year.

Similar overdrafts in contiguous areas further deplete the common supply of ground water which must be drawn upon for irrigation during periods of drouth.

Sincerely yours,

RAYMOND A. HILL.

Senator DOWNEY. You referred to another report, did you not?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Can you produce that for the committee?

Mr. NORMAN. That is a USGS record, and I believe it is out of print.

Senator ANDERSON. There were two reports that you referred to.

Mr. NORMAN. The W. T. Lee report, that is the USGS report.

Senator DOWNEY. What is the average lift of water in the wells in the Salt River Valley project, at the present time?

Mr. NORMAN. I cannot answer that question, Senator, because every one of these wells varies and I never have hit an average on them. It depends on the amount of draw-down you use in the well. Some of the wells we may draw-down in pumping as much as 100 feet. Other wells we draw-down maybe 15 or 20 feet, so I cannot tell you what the average is.

Senator DOWNEY. Is the pumping lift in most of your wells around 50 feet?

Mr. NORMAN. Oh, no.

Senator DOWNEY. Well, what is it? Give us some idea.

Mr. NORMAN. I would just have to guess now, and it would be purely a guess. I would say it is well over 100 feet.

Senator DOWNEY. Average?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. How much was the pumping lift at the time Mr. Hill made his report?

Mr. NORMAN. Mr. Hill's report was made up last year, or not over 18 months ago.

Senator DOWNEY. Oh, I thought Mr. Hill's report was made back in 1904.

Mr. NORMAN. That was the Lee report.

Senator DOWNEY. What was the lift when Mr. Lee made his report?

Mr. NORMAN. They were not doing any pumping.

Senator DOWNEY. They were not doing any pumping at all?

Mr. NORMAN. No, sir.

Senator DOWNEY. What is the maximum lift that you have there in the Salt River, a successful lift that the people are using for irrigation?

Mr. NORMAN. You mean, within our project?

Senator DOWNEY. Yes.

Mr. NORMAN. I believe, if my memory serves me right, it is on this No. 2 here, which is about 250 or 260 feet.

Senator DOWNEY. That is the maximum?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. What are some of the minimum lifts, Mr. Norman?

Mr. NORMAN. I think we have some wells down in the eastern end of the project where the lift will probably be 85 or 90 feet.

Senator DOWNEY. Those are your minimum wells?

Mr. NORMAN. We may have some wells right on the river, Senator, with less lift than that, but I could not tell you that.

Senator DOWNEY. In the written statement which you read, Mr. Norman——

Senator MCFARLAND. Pardon me, Senator, may I ask just one thing? When you say "lift," you mean including the draw-down?

Mr. NORMAN. Yes. That is what he asked me. He did not say the static level.

Senator MCFARLAND. That is what I thought.

Senator DOWNEY. Just what do you mean by the "draw-down"?

Mr. NORMAN. Whatever you are pulling the well down by pumping water, Senator. That may vary according to how much you are trying to pull out of the well, how much you are developing the well for.

Senator DOWNEY. Let me ask you the question this way: Are the figures you have given me the level of the water when you commence pumping the wells?

Mr. NORMAN. No, sir. You asked me what our lift was on these wells. Our lift is how high we are lifting the water when we are pumping it out of the well.

Senator DOWNEY. On page 4 of your statement, Mr. Norman, you have this:

> The average annual water pumped from the area covered by the central Arizona project is approximately 1,800,000 acre-feet per year.

Do you mean presently, in this last year?

Mr. NORMAN. No, sir; that is the average. This last year, and I think Mr. Lane gave it in his statement yesterday, there were 2,100,000-odd acre-feet pumped.

Senator DOWNEY. Over what period of time is that average?

Mr. NORMAN. This is a 6-year period.

Senator DOWNEY. Covering what years?

Mr. NORMAN. That would be from '42 through '48, would it not?

Senator KERR. It would be '43 through '48, would it not?

Mr. NORMAN. That is right.

Senator DOWNEY. Then you add this:

> In other words, the amount of water being used from the underground basin each year exceeds the replenishment by about 1,145,000 acre-feet.

Mr. NORMAN. Yes, sir.

Senator DOWNEY. And that, too, is what you say has been happening over the last 6 years?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. How much has your water table fallen in that period of time?

Mr. NORMAN. About 28 feet.

Senator ANDERSON. That is for a longer period, is it not? That is from the early thirties to 1948, if you are going to take 28 feet.

Mr. NORMAN. No, sir. That is since '42, Senator. You see, there was a build-up there in 1940.

Senator ANDERSON. We probably do not have the same charts. Do you have the chart attached to the Lane report?

Mr. NORMAN. No, sir. This is a chart within this project I am speaking of.

You have to remember, when we talk about the water table in our area, that this is more or less in the center of the pumping area and that water is flowing in toward this area.

Senator DOWNEY. Mr. Norman, I am just trying to discuss the figures you have given to the committee.

Mr. NORMAN. That is right.

Senator DOWNEY. Do you have the static depth of water in this area as of 1920?

Mr. NORMAN. For 1920—these things are just not uniform, Senator.

Senator DOWNEY. Do you have the average? Is it not averaged there on your chart?

Mr. NORMAN. Yes, sir; at about 15 feet.

Senator MCFARLAND. May I ask a question there?

Did you have many wells there to know what the average depth was?

Mr. NORMAN. No.

Senator MCFARLAND. That was before pumping really started?

Mr. NORMAN. That is right. We do not have too much information on the underground water. As it is now we are keeping very accurate records of some 200-odd wells, plus wells of other people that we keep for general information.

Senator DOWNEY. All right. What is your static depth of the water presently?

Mr. NORMAN. The average now over the entire project is right at 69 feet.

Senator DOWNEY. When you say the entire project, what do you mean by that?

Mr. NORMAN. That is this project, the Salt River Valley Water Users' Association district.

Senator KERR. What is the acreage?

Mr. NORMAN. 242,000 acres. The water from the outlands drains in toward this project, so the water tables would fall faster in those areas than it would in this area where the water is draining toward it.

Senator DOWNEY. How many years in the immediate past do you consider you have had a drought period?

Mr. NORMAN. I do not know that I can give any information on that, Senator. It has been very dry that I know of down there since 1941. I have been manager of this project for just a little over 2 years, and it has been very dry in that time.

Senator DOWNEY. What was your static level in 1940?

Mr. NORMAN. Fifty feet.

Senator DOWNEY. So in the last 8 or 9 years during a drought period your static level has declined about 16 feet, is that right?

Mr. NORMAN. No, sir; because that table built up in 1940–41. The table built up from 37 feet, and now it is down to 69 feet.

Senator DOWNEY. That would be a drop of 32 feet in that period of time?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Over how many years?

Mr. NORMAN. That is since the middle of 1941, to the beginning of 1949.

Senator DOWNEY. Do I understand you mean to say that during the period of time the static level declined by that thirty-odd feet, there

was an excess use of water over the area we are talking about, of about 1,145,000 acre-feet a year?

Mr. NORMAN. No, sir. The figures I am giving you now that you are asking me about, concern the Salt River Valley water users' district, which comprises one-third of this entire area.

Senator DOWNEY. I beg your pardon.

Mr. NORMAN. You can get out to places where the water has dropped out from under them faster than they could add column pipes to their pumps.

Senator DOWNEY. Then tell me this: What, in your opinion, has been the excess pumping by an average year during this period of time, in the Salt River project?

Mr. NORMAN. I would guess at some place around 300,000 acre-feet.

Senator DOWNEY. 300,000?

Mr. NORMAN. No; it has been more than that, it has been about 350,000.

Senator DOWNEY. What do you think would happen now, Mr. Norman, if you went into a series of wet years in the Salt River project?

Mr. NORMAN. We would build our groundwater up some.

Senator DOWNEY. Would it not build it up proportionately to the amount of excess water that would be coming in?

Mr. NORMAN. No, sir.

Senator DOWNEY. Why not?

Mr. NORMAN. Because all of that excess water is not going into the underground. You cannot get a light rain out on that area without having considerable run-off from the light rain. You would have to take all the prairie out there and do scouring and so forth on it, using a router, in order to get water down into the underground. You would have to terrace it, or otherwise it would run off. So it just does not percolate that way, Senator.

Senator DOWNEY. Again I am somewhat confused, Mr. Norman, and bear with me. Were these figures that you gave showing the static level back in 1920, of 15 feet, as I think you said, would those figures apply to the whole project, or just the Salt River Valley?

Mr. NORMAN. Just the Salt River Valley water users' project and at that time there was virtually no pumping within the project.

Senator DOWNEY. How much annual pumping do you think there is presently, on an average?

Mr. NORMAN. I would hazard a guess at about 750,000 acre-feet within the project.

Senator DOWNEY. And with all that pumping, despite the fact that you have had a series of lean years, the static lift has only fallen over that period of time about 50 feet, is that correct?

Mr. NORMAN. I do not say these are lean years, Senator, some years might come a lot leaner than these. The records only go back for about 50 years on precipitation and run-off back there. So far as I know we can be heading into a dry cycle just as well as we are into a better cycle or an average cycle.

Senator DOWNEY. Mr. Norman, I thought you indicated it was your belief that we have had a series of drought years.

Mr. NORMAN. It has been awfully dry since I have been out there, but I cannot tell you that that was a dry cycle and that we are com-

ing into a wet cycle. I do not think any of us know about predicting run-off in these areas to make any such statement.

Senator DOWNEY. I think the figures you gave for 1941 show a build-up in the water table there of 20 feet during one year, is that correct?

Mr. NORMAN. I think not.

Senator DOWNEY. Then tell us what it was in 1941.

Mr. NORMAN. About 12½ or 13 feet.

Senator DOWNEY. What was it in 1940?

Mr. NORMAN. 50½.

Senator DOWNEY. And what was it in 1941?

Mr. NORMAN. 37½.

Senator DOWNEY. And what was it in 1942?

Mr. NORMAN. It started down then; 40.

Senator DOWNEY. Now, Mr. Norman, a part of this project as planned by the Bureau of Reclamation called for your Salt River Valley association exchanging 300,000 or 400,000 acre-feet of your present water for Colorado River water; is that correct?

Mr. NORMAN. I do not think so, sir. It is laid out one way where there is an exchange of water, and the other way it considers a pumping plant and pumping the water.

Senator DOWNEY. Did the Bureau not lay it out on an exchange basis, Mr. Norman?

Mr. NORMAN. I think they did, and I think they laid it out the other way, too, where there could either be an exchange or not an exchange.

Senator DOWNEY. Is it not true that the exchange, if worked out, would be much more economical for the project as a whole?

Mr. NORMAN. I do not think so. I think if the exchange is not made it costs the people down in the Pinal area this additional pumping lift, which may cost them a little bit more per acre-foot.

Senator DOWNEY. How much additional pumping lift would there be there?

Mr. NORMAN. I don't know.

Senator DOWNEY. About 200 feet?

Mr. NORMAN. I don't know.

Senator DOWNEY. Would you say it would not be 200 feet?

Mr. NORMAN. I would not say anything, Senator, I just do not know.

Senator DOWNEY. If there is 200 feet additional pumping required because of the failure to work out this exchange we are talking about, you would not call that a small item, would you, pumping it 200 feet?

Mr. NORMAN. From what I understand if we do not make the exchange and they have to pump this, there may be a charge of two-bits, or something like that, an acre-foot more for the water going down to Pinal. I do not think that is exorbitant.

Senator DOWNEY. I would agree with you that if that is 25 cents an acre-foot that would not be very large. If your assumption is correct we will have to explore it further.

Mr. NORMAN. You will have to explore it with the Bureau, Senator, because I just do not have the information.

Senator DOWNEY. Probably I am misinformed. I understood an additional pumping lift of 200 feet would be required, Mr. Norman, which, of course, would be several times 25 cents an acre-foot.

Your organization has refused to enter into this so-called exchange agreement, has it not?

Mr. NORMAN. I would not say they have refused, Senator.

Senator DOWNEY. Well, you passed a resolution to that effect?

Mr. NORMAN. There is a resolution on the books down there. I did not bring a copy of it because I did not know it would be necessary. That resolution was made by a board different than the present board, and is to the effect that the water users were not in favor of an exchange. That is an internal affair within the State of Arizona and lies between ourselves and the other districts. Frankly, I do not know what the board or the people would do if it were put to them.

But I think this project is sound one way or the other. If we make the exchange it means a saving.

Senator DOWNEY. Mr. Norman, explain to the committee what was meant to be accomplished by this exchange agreement of water by the Salt River Valley association for Colorado River water that we have been talking about.

Mr. NORMAN. Explain to the committee what is to be accomplished by it?

Senator DOWNEY. What was proposed to be accomplished by the exchange agreement.

Mr. NORMAN. I am not familiar with all the details of that, Senator. So far as I know it means a siphon instead of a pumping lift for the Pinal county water.

Senator DOWNEY. Is it not correct that it was proposed the Salt River association should give up about 400,000 acre-feet of its water which comes from its own dams and reservoirs, allowing that to be used elsewhere on the project and taking in lieu thereof an equal amount of water from the Colorado River?

Mr. NORMAN. I think so; an equal amount as to quantity and quality.

Senator DOWNEY. Why was it your association refused to enter into that exchange?

Mr. NORMAN. I was not there, Senator, at the time.

Senator DOWNEY. You do not know, Mr. Norman?

Mr. NORMAN. No, I do not, and I do not know what this board would do.

Senator DOWNEY. Up to date, Mr. Norman, your board of directors has refused to make that exchange, is that not correct?

Mr. NORMAN. We have never been asked to make the exchange.

Senator DOWNEY. I thought there was a resolution passed by your board refusing to make the exchange.

Mr. NORMAN. We did not refuse to make any exchange. The resolution was passed by the board before I was associated with the association, which said, as I remember it, that the board was not in favor of an exchange.

I do not know what this board would do. The association has never been requested to make the exchange, Senator. When that time comes it will be taken care of by the board. Whether they will or will not, I just do not know.

Senator DOWNEY. You do not think there is a resolution in effect now stating they are unwilling to make the exchange?

Mr. NORMAN. It says they were not in agreement with or favorable to an exchange.

Senator DOWNEY. Could you secure a certified copy of that resolution for us.

Mr. NORMAN. I am sure I can.
Senator DOWNEY. Would you please do that?
Mr. NORMAN. Yes, sir.
(The resolution follows:)

RESOLUTION

Be it resolved by the board of governors of the Salt River Valley Water Users' Association that it favors the bringing in of Colorado River water into central Arizona; be it further

Resolved, That this board of governors favors contracting for a part of such water for the use and benefit of the shareholders of said association; be it further

Resolved, That in the bringing in of the Colorado River water that the right of the association and its shareholders in and to its present supply and facilities be not disturbed.

CERTIFICATE

I, J. F. Griswold, the duly appointed, qualified, and acting secretary of Salt River Valley Water Users' Association, hereby certify that the foregoing is a true, correct, and complete copy of a resolution unanimously adopted by the board of governors of said association at a regular meeting thereof duly and regularly held on the 1st day of July 1946, at which said meeting a quorum was present and voted.

Witness my hand and seal of Salt River Valley Water Users' Association, this 2d day of May 1949.

[SEAL] J. F. GRISWOLD,
Secretary.

Senator Downey subsequently requested that the following resolution of the board of governors of the Salt River Valley Water Users' Association be inserted:

RESOLUTION ADOPTED BY BOARD OF GOVERNORS, MARCH 1, 1948

Be it resolved, That the association again goes on record as being opposed to an exchange of water between the association and water from the Colorado River, based on the report of the United States Bureau of Reclamation on central Arizona project, dated December 1947.

Senator DOWNEY. What is the quality of the water that your district presently gets from its reservoirs and surface streams as to salinity?

Mr. NORMAN. Of course, that varies from year to year and from time to time with the amount of water that we have in storage, and the run-off for the year; our water can be very salty in times of low flow. I think the average will probably run about 500 parts at Granite Reef.

Senator DOWNEY. Taking all the water over a period of years, about 500 parts?

Mr. NORMAN. Probably about that.

Senator DOWNEY. Is there any reason why the salinity of that water would increase as it comes to you?

Mr. NORMAN. None in particular.

Senator DOWNEY. So it is less saline than the Colorado River water?

Mr. NORMAN. That is right.

Senator DOWNEY. And we generally expect that the salinity of the Colorado River water in Lake Mead will increase with greater use of the water above, do we not?

Mr. NORMAN. That is the theory.

Senator DOWNEY. It would seem pretty plain that is going to happen, Mr. Norman.

Mr. NORMAN. I do not know what the upstream use is going to be, Senator.

Senator DOWNEY. So the quality of the water from the Colorado River would not be equal to the quality of the water it is proposed your district might exchange?

Mr. NORMAN. Things like that can be worked out. It does not make any difference in your quality. You get a little more water for the exchange, so it would be a balance, whether it would be more economical to furnish us enough water to balance off the addition for salinity equality, or whether it is more economic to pump.

Senator DOWNEY. Would you not consider that your present source of supply there would be a safer source of supply and a more certain source of supply than one coming from the Colorado River?

Mr. NORMAN. Why, I would not know why.

Senator DOWNEY. It is a much closer source, is it not?

Mr. NORMAN. Yes; it is closer.

Senator DOWNEY. And it is not involved in any legal argument with the State of California, is it?

Mr. NORMAN. That is right. We are not going to turn that water loose up there until we are getting our water from the Colorado.

Senator DOWNEY. Likewise you have a much greater assurance of this amount of water being there than you would have in any event down in the Colorado River, would you not?

Mr. NORMAN. I do not know about that. There would be large storage dams on the Colorado River.

Senator DOWNEY. You know the financial balance there is pretty precarious now, do you not, Mr. Norman?

Mr. NORMAN. What financial balance?

Senator DOWNEY. I mean the balance of the water supply, the books of account.

Mr. NORMAN. You mean the cost of this water?

Senator DOWNEY. No; I do not mean that, Mr. Norman. Don't you know our balance of supply is rather precarious there now? I am talking about the water supply on the Colorado River.

Mr. NORMAN. It depends upon whether California lives up to her Self-Limitation Act of 4,400,000. I think if they would live up to that we will have plenty of water.

Senator DOWNEY. Mr. Norman, there is at least one thing the State of California and your district agreed on, and that was in very determined opposition to the Mexican Treaty, is that right?

Mr. NORMAN. I was not there, and had nothing to do with it, and my present board was not there. I think Mr. Ely can tell you more about that.

Senator DOWNEY. You know that your board did quite strongly resist that, and I am congratulating them on that.

Mr. NORMAN. I am not congratulating them on it, Senator. I was not there. I am sure Mr. Ely can tell you more about it than I can, because I think he was right in the middle of it.

Senator DOWNEY. I think I can tell you about it, because I was, too, Mr. Norman.

Mr. NORMAN. I think if I had been there it would have been the other way.

Senator DOWNEY. You think that?

Mr. NORMAN. I think if I had been there and they were against it then, we would have taken the other course.

Senator DOWNEY. You would have been for giving this water to Mexico?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. I regret to hear you say that, even retrospectively, Mr. Norman.

Mr. Norman, what is the total indebtedness per acre presently on the lands of the Salt River Valley?

Mr. NORMAN. About $90.

Senator DOWNEY. $90 an acre?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. And what are the annual charges?

Mr. NORMAN. I do not remember, Senator, probably around a million dollars.

Senator ANDERSON. Is that per acre?

Senator DOWNEY. That is what I want to ask, Mr. Chairman.

What are the annual charges per acre?

Mr. NORMAN. For water?

Senator DOWNEY. Yes.

Mr. NORMAN. $10 is the assessment. That is $5 per acre-foot. Ten dollars gives you 2 acre-feet of water.

Senator DOWNEY. Is that the total charge the water user has to pay for his water?

Mr. NORMAN. No, sir. If he gets additional water, which some of them are entitled to under pump rights, and some of them are entitled to under normal flow, they pay the excess water costs.

Senator KERR. Five dollars per acre-foot?

Mr. NORMAN. The excess water cost, Senator, is $3.50 for normal flow and $4 for pump this year. That amount is set each year by the board.

Senator DOWNEY. What do you consider your requirement duty per acre there?

Mr. NORMAN. The average on our land has been a little under three acre-feet per acre, but that does not give us enough water to get the maximum out of our land. I think in order to get the maximum production out of our land we should have a minimum of four acre-feet.

Senator DOWNEY. You are speaking of gross application now, Mr. Norman?

Mr. NORMAN. I am talking about it at the users' headgate.

Senator DOWNEY. I mean that, too, but that is his gross application?

Mr. NORMAN. That is right.

Senator DOWNEY. Assuming there would be a gross application of 4 acre-feet, how much would be consumed in the land itself? How much would be the consumptive use?

Mr. NORMAN. You mean what would be the recharge?

Senator DOWNEY. What would be the consumptive use?

Mr. NORMAN. I do not know. The recharge—if that is what we are trying to get at, Senator, how much would go back down into the underground—is dependent upon the application of the water, how it is applied. If you use light irrigation, practically none of it will get back down into the underground. If you are using heavy irrigations like they use during the lettuce runs when they are trying to sprout lettuce, sometimes as much as 50 percent or more will go into the underground.

But in general application it is a rather small amount that would go back into the underground by your application to the land.

Senator DOWNEY. What is the gross application there now for most of the farmers, not for those who are getting additional water?

Mr. NORMAN. Last year it was 2 acre-feet per acre. That was all the water they were allotted. Some of them had normal flow and got some additional water in that way; some of them had some pump rights and got some additional water that way.

Senator DOWNEY. What happened to the crops on that 2 acre-feet?

Mr. NORMAN. Well, on the 2 acre-feet the fellow just has to pull in his horns and cut his land to his water supply, unless he can raise a crop of grain on it.

Senator KERR. Make one crop, instead of two?

Mr. NORMAN. Make one crop instead of two; yes, sir. You can raise a crop of grain on 2 acre-feet.

Senator DOWNEY. How much would the additional charge be, Mr. Norman, for the water you would expect to get from this project?

Mr. NORMAN. Four dollars and 75 cents at the farmer's headgate.

Senator DOWNEY. It would increase your water charge by about 50 percent?

Mr. NORMAN. Well, yes, just about.

Senator DOWNEY. Has the district had any difficulty in its financial operations over the last few years?

Mr. NORMAN. No, we are getting along very nicely.

Senator DOWNEY. Did you have to claim a moratorium to the Government for its payments?

Mr. NORMAN. That may have been true back in '32, but they have made all their payments, they have never defaulted on a dollar.

Senator DOWNEY. Did you have to claim a moratorium, do you know, Mr. Norman?

Mr. NORMAN. Not since I have been with them.

Senator DOWNEY. How long have you been with them?

Mr. NORMAN. Two years. We are doing pretty well.

Senator DOWNEY. I am sure that under your able administration you would, Mr. Norman.

Mr. Chairman, I think that is all I will ask Mr. Norman this morning. I may want to ask some additional questions this afternoon.

Senator MCFARLAND. I have one or two questions. They will not take but a minute.

Senator KERR. If he is coming back this afternoon, don't you think you might do it then?

Senator MCFARLAND. I think I could finish my questions in 5 minutes.

Mr. Norman, you state this $4.75 an acre-foot would increase the water charge by 50 percent?

Senator KERR. He meant because he would get 50 percent more water.

Senator ANDERSON. It goes from 2 feet to 4 feet.

Senator MCFARLAND. But it would not increase the cost of the water?

Mr. NORMAN. No.

Senator KERR. It would not increase the cost per acre-feet.

Mr. NORMAN. That is right. I will give you an example of that. A farmer came into my office last year who had 80 acres of cotton in. He said, "I have to have one more wetting." One more wetting is 27 acre-feet of water. He says, "If I get one more wetting I will make 120 bales of cotton, and if I don't I will make 80." That is a

difference of 40 bales of cotton that I guess was worth $6,000 to that farmer. For 27 acre-feet that water was worth a lot to that fellow.

Senator McFARLAND. In other words, that additional acre-foot is the acre-foot that really means money?

Mr. NORMAN. That is right.

Senator McFARLAND. And he can well afford to pay a great deal more?

Mr. NORMAN. That is right. You have fixed charges set there.

Senator McFARLAND. The other question I want to ask is this:

We have heard a lot of testimony about 1,000, 1,500, or 2,000 dollars an acre charge per acre. What do you have to say in regard to how that cost is spread?

Mr. NORMAN. That was a little fast for me to keep up with, Senator. It was kind of like Amos and Andy pulling these figures out of the air. But that is not the way the thing works out. In an irrigation district you cannot just go out there and say to the farmer, "We are going to take your piece of land out of cultivation." That farmer is going to sit there and sweat that land out just as long as he can get any water. The thing is all going down together. It is not going out in one piece of land or two pieces of land. And it is going to be the little fellow who will go, because the big fellow will be out of it before that time comes.

Not only that, but the land in this valley is supporting millions of acres of range land back up in the mountains. If we wanted to find out how much this is per acre, instead of just grabbing a little piece of land here and there and dividing it into 300,000,000, 200,000,000 dollars, or whatever you use, let us take all the range land and divide that in, then we will get it down to a few dollars an acre. That is what it is benefiting; it is not benefiting just this land. This land is growing feed and so forth to back up that range land. The two go together.

Senator McFARLAND. In other words, this project affects the economy of the whole State?

Mr. NORMAN. The entire State and not just a few acres or a few hundred thousand acres down here in the valley.

Senator McFARLAND. I believe you stated these wells cost an average of how much?

Mr. NORMAN. About $30,000.

Senator McFARLAND. About $30,000 per well?

Mr. NORMAN. Yes, sir.

Senator McFARLAND. A question was asked here in regard to one well with a 250-foot lift. Water is put into a pool, it is all a common supply, is it not, so far as your project is concerned?

Mr. NORMAN. No, sir.

Senator McFARLAND. In other words, because one well would pump 250 feet does not mean that the farmer who happened to receive that particular water would pay any more than a farmer in the lower part of the project where it was shallower?

Mr. NORMAN. No, sir; they get the benefit of the average in this project.

Senator McFARLAND. You spoke about the objection of the water users to this pumped water. You know, of course, there was a lawsuit that I tried when I was on the bench, which took 3 months. The farmers objected to receiving that water instead of the river water.

Mr. NORMAN. Yes, sir.

Senator McFARLAND. I believe that is all.

Senator DOWNEY. Mr. Chairman, before we go I would like to ask just one question of the witness.

Senator ANDERSON. Proceed.

Senator DOWNEY. Mr. Norman, about what proportion of this area in the Salt River Valley is in cotton?

Mr. NORMAN. I do not know, Senator. There is practically no cotton in our project.

Senator DOWNEY. In the Salt River project?

Mr. NORMAN. Yes, sir. There is very little cotton.

Senator DOWNEY. I was talking about your project.

Mr. NORMAN. There is very litle cotton there.

Senator DOWNEY. What is your area in principally now?

Mr. NORMAN. Alfalfa, grains, and vegetables.

Senator DOWNEY. How much in grains?

Mr. NORMAN. Senator, you catch me unprepared on that. As I remember, it was about 72 or 73 thousand acres last year.

Senator DOWNEY. How much in vegetables?

Mr. NORMAN. I do not know. I have all those figures at home.

Senator DOWNEY. Do you have them with you?

Mr. NORMAN. No; not with me. They are down in my office, and I could send for them if you want them in the record.

Senator DOWNEY. Mr. Debler seems to be coming to our rescue here. Perhaps you can give them to us from that chart, Mr. Norman.

Mr. NORMAN. Maricopa County, 133,000 acres in alfalfa; 59,350 acres in cotton; 79,000 in barley; 1,000 in corn; 44,500 in grains; 13,900 in wheats; 100 in dry edible beans.

Senator KERR. 100,000?

Mr. NORMAN. No, sir; 100 acres. Truck crops, 60,000; flax, 2,500; grapefruit, 10,000; oranges, 8,000. That is a total of 415,000 acres for Maricopa County.

Senator DOWNEY. Is that fairly representative of your district?

Mr. NORMAN. Except that I do not think we would have that high a percentage of cotton in our district.

Senator DOWNEY. Those are all the questions I have now. I shall have some this afternoon.

Senator ANDERSON. Do you have any questions, Senator Kerr?

Senator KERR. No, sir.

Senator ANDERSON. May I just ask you this:

When did pumping really start on the large scale? We have never had any figures on how many wells there were in 1910, 1915, 1920, or 1925?

Mr. NORMAN. I can only answer for this project, Senator.

Senator ANDERSON. That is what I am asking about.

Mr. NORMAN. My record here shows that pumping really got under way in about 1928.

Senator ANDERSON. Then it was relatively small?

Mr. NORMAN. Yes, sir. It gradually has increased.

Senator ANDERSON. How many pumps were there in 1928?

Mr. NORMAN. I would not know.

Senator ANDERSON. Who would know?

Mr. NORMAN. I could get those figures for you.

Senator McFARLAND. What year did you ask about?

Senator ANDERSON. I am trying to find out how many pumps there were in 1930, how many there were in 1935, how many in 1940, and how much water was being pumped. We hear this explained steadily as a rescue project, and I am trying to find out a rescue from what? Was it rescued because of the surface waters, or was it rescued because you started to pump additional areas and that pumping water is dropping off?

Mr. NORMAN. That is it, Senator. We just got more land in over there and we have to have water for it.

Senator ANDERSON. The Salt River Valley Water Users Association was started a long time ago?

Mr. NORMAN. Yes, sir.

Senator ANDERSON. How much land was there under the original project?

Senator MCFARLAND. 100,000 acres.

Mr. NORMAN. That was a development along the river.

Senator ANDERSON. Now how many acres are in the project?

Mr. NORMAN. 240,000.

Senator ANDERSON. Are those additional acres dependent chiefly on surface water, or do you pool all your water?

Mr. NORMAN. We pool all the water.

Senator ANDERSON. You pool all of your water?

Mr. NORMAN. Yes, sir.

Senator ANDERSON. How many of these acres that came in came in on the basis of wells?

Mr. NORMAN. I would say none of them came in on the basis of wells.

Senator ANDERSON. You expected to have sufficient surface water to take care of 242,000 acres?

Mr. NORMAN. Yes, sir.

Senator ANDERSON. In the Salt River Valley?

Mr. NORMAN. Yes, sir. There was no pumping for irrigation until around 1925, 1926, or 1927.

Senator ANDERSON. And 242,000 acres were in it at that time?

Mr. NORMAN. Yes, sir.

Senator MCFARLAND. Senator, I believe Mr. Norman will bear me out on this, that the acres were added as they added those additional dams, largely.

Mr. NORMAN. That is right.

Senator ANDERSON. That is what I am trying to get. It is the failure of surface water, then?

Mr. NORMAN. Yes, sir; and the change in crops, and things like that.

Senator KERR. A whole lot in change of crops, is it not?

Mr. NORMAN. Yes, sir.

Senator ANDERSON. Have the crops all changed? What does alfalfa take? What is the duty of alfalfa?

Mr. NORMAN. Alfalfa will take roughly an acre-foot of water per cutting. If you get five cuttings it takes 5 acre-feet. If you have 2 acre-feet you can get two cuttings and a grazing.

Senator ANDERSON. Grain is only 2 acre-feet?

Mr. NORMAN. Grain comes off in the wintertime.

Senator ANDERSON. Then alfalfa takes more water than cotton?

Mr. NORMAN. Oh, yes. Cotton takes about three and a half.

Senator ANDERSON. And it takes more than citrus?

Mr. NORMAN. Well, the citrus needs about three and a half to get by.

Senator ANDERSON. But it is five for alfalfa?

Mr. NORMAN. Well, alfalfa will take more if you feed it to the alfalfa; yes, sir.

Senator MCFARLAND. What you do is to diversify your crops so that you get an average of a duty of 4 acre-feet?

Mr. NORMAN. That is right.

Senator MCFARLAND. Which it is estimated they should have?

Mr. NORMAN. Yes, sir.

Senator ANDERSON. Off the record.

(Discussion off the record.)

Senator ANDERSON. The hearing will be in recess until 2 o'clock in room G–23 in the Capitol.

(Whereupon, at 12:05 p. m., a recess was taken until 2 p. m. of the same day.

AFTERNOON SESSION

The CHAIRMAN. The committee will be in session.

Will the witness who was on the stand this morning please resume?

Do you care to ask some questions?

Senator DOWNEY. A few questions, Mr. Chairman.

STATEMENT OF O. L. NORMAN—Resumed

Senator DOWNEY. Mr. Norman, at the conclusion of your testimony this morning, you expressed the opinion that this project was a proper and feasible one from a financial viewpoint.

Mr. NORMAN. Yes, sir.

Senator DOWNEY. That is correct, is it not?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. I assume that in making that statement you realize the Bureau of Reclamation allocates approximately $100,000,000 against the irrigation benefits of this project?

Mr. NORMAN. I do not know just what the allocation is, Senator. I am thinking of it from the standpoint of the water cost.

Senator DOWNEY. Well, Mr. Norman, if you do not know what the figures are, how can you form an opinion? What figure are you using?

Mr. NORMAN. I know two figures, Senator. One of them is $4.75 per acre-foot for water. We can pay that. We want the water.

The other one is 4.65 mills for electric power. We can pay it, we want the power.

Senator DOWNEY. That is all you are expressing an opinion on?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. You are not expressing an opinion that it is a feasible project from the standpoint of the taxpayers of the United States or the Reclamation Bureau?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. You say you are?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. How can you express the opinion that you do not know how much the irrigation benefits will cost?

Mr. NORMAN. Well, the irrigation benefits are set up by the Bureau. I do not purport to take the project and tear it to pieces by the amount

of benefit here, there, or elsewhere. The Bureau of Reclamation says it is a feasible project provided that water can be sold for $4.75 and provided power is 4.65 mills per kilowatt-hour.

Senator DOWNEY. Do you understand that the Bureau of Reclamation in its report states that if this project is not put into effect there would have to be the equivalent of 150,000 acres go back to desert, and about 76,000 acres not now presently irrigated that could not be irrigated? Do you understand that statement?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. That makes a total of about 226,000 acres.

Mr. NORMAN. Yes, sir.

Senator DOWNEY. It is to procure the irrigation of that 226,000 acres that it is proposed to have the Government advance or expend, however you want to express it, about $100,000,000 for irrigation benefits. Do you understand that?

Mr. NORMAN. No, sir; I do not understand that.

Senator DOWNEY. Well, what do you understand, Mr. Norman?

Mr. NORMAN. This thing cannot be tied down into so many acres, Senator. There are seven-hundred-thousand-odd acres involved that need a supplemental water supply. Now, it is the 700,000 acres and not a specific number of acres here and there that do not now have water, that are concerned. In addition to that, the range land of Arizona now depends upon irrigation and production from these irrigated acres to support the range land, to supplement feed for cattle, to finish the cattle. It is the businesses of Arizona that are concerned, not just a few acres of land.

Senator DOWNEY. You are not intimating, are you, Mr. Norman, that the Bureau of Reclamation under this Bureau of Reclamation project, or some other agency of the State, could not go out and buy in this 226,000 acres at $200 an acre, or something less than $50,000,000?

Mr. NORMAN. I haven't seen any $200-an-acre land down there.

Senator DOWNEY. What do you think it is worth?

Mr. NORMAN. They do not have any hesitance in asking you four or five hundred dollars for the land down there.

Senator DOWNEY. I might state that your own witnesses here have testified that much of the land is priced at less than $200 an acre, Mr. Norman.

Mr. NORMAN. I can tell you what the land sells for in our project.

Senator DOWNEY. We have had several witnesses on that.

Senator MCFARLAND. I think in fairness to the witnesses, I might say the testimony in regard to the land has been over the whole of the central project, and not just the Salt River Valley.

Senator DOWNEY. I am talking about the whole of the project.

Mr. NORMAN. I do not know what land would sell for all over the project.

Senator DOWNEY. I am talking about land over a major part of it, and at least an important part of it is in grain, is it not?

Mr. NORMAN. Over what?

Senator DOWNEY. I am talking about the whole project, Mr. Norman.

Mr. NORMAN. No; I would not say a major part of it is in grain.

Senator DOWNEY. Will you get the booklet Mr. Debler had for you, showing the different categories of crops?

Are all the croplands in Maricopa County within this project?

Mr. NORMAN. Yes, sir; I believe you are right.

Senator DOWNEY. Now, Mr. Debler has the figures for Maricopa County?

Senator MCFARLAND. I think you must have misunderstood the question, Mr. Norman. The question was whether all the crop acreage in Maricopa County was within the project. Senator Downey is referring to the central Arizona project, and you are answering in regard to the Salt River Valley water-users project, are you not?

Mr. NORMAN. Yes.

Senator ANDERSON. I thought the question was just the reverse from what you stated it. He asked if the Salt River project was in Maricopa County; is that not right, Senator?

Senator DOWNEY. Well, let me start over again.

You have certain figures there showing the percentage or amount of cropland in Maricopa County; have you not?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Is all of that in the central Arizona project, the proposed central Arizona project?

Mr. NORMAN. That I cannot answer, Senator. I suspect the majority of it is.

Senator DOWNEY. A large part of it?

Mr. NORMAN. Yes.

Senator DOWNEY. Read us those figures so that we may have an idea as to the different kinds of crops in this area and the percentage.

Senator ANDERSON. Would you excuse me for just a minute?

Senator DOWNEY. Surely.

Senator ANDERSON. What land in Arizona is not in the central Arizona project that is in the central part of the State?

Mr. NORMAN. That I could not answer, Senator.

Senator ANDERSON. You have lived there 2 years.

Mr. NORMAN. I know.

Senator ANDERSON. You are fairly familiar with it. He asked you if all the irrigated acres in Maricopa County were not within the central Arizona project.

Mr. NORMAN. I think they possibly are.

Senator MCFARLAND. Mr. Chairman, in fairness to the witness, the lands which will be selected have not yet been selected. There are some 725,000 acres in cultivation. The Bureau of Reclamation does not anticipate that all of that will be covered. Some of this is land—even in Maricopa County—that may push out next to the mountains where this project will not reach. That is the reason why Mr. Norman, I judge, is not able to give a definite answer because some of these pumped lands may be too high, unless and until the Bureau has determined where the lines are going to be drawn. Otherwise, no one could give a correct answer.

Mr. NORMAN. That is right.

Senator MCFARLAND. Unless all of the lands in cultivation were to be covered.

Mr. NORMAN. There may be some above the aqueduct that would not be in the project.

Senator DOWNEY. All right, read me those figures, if you will, Mr. Norman.

Mr. NORMAN. Alfalfa, 133,000 acres; cotton, 59,350 acres; barley, 79,000 acres; corn, 1,000 acres; grain from sorghums, 44,500 acres; wheat, 13,900 acres; dry edible beans, 100 acres; truck crops, 60,000 acres; flax, 2,500 acres; grapefruit, 10,000 acres; oranges, 8,000 acres. That was for 1947.

Senator DOWNEY. What is the total for that acreage?

Mr. NORMAN. That is 415,000 acres. That is in Maricopa County.

Senator DOWNEY. I am still confused, in view of the statements made here. Is it planned that all of the acreage you have just been reading about is in the central Arizona project?

Mr. NORMAN. Well, so far as I know all that they can put water on from the aqueduct, but there may be some tracts that are not.

Senator DOWNEY. Mr. Norman, would it not be much cheaper for the State of Arizona, the Bureau of Reclamation, or some other agency, to purchase the amount of land there for which there is not a sufficient supply of water and retire it from cultivation?

Mr. NORMAN. Senator, we have people living on that land. We have people that are out in Arizona to make their living, a lot of them because of their health and who have to stay in Arizona because of their health. They are dependent on this land for a living. We have businesses in Arizona that are dependent on the production of this land for a living.

I do not know just what the ratio is, but I have heard economists toss figures around any place from six to eight families that one farm family keeps, just one farm family.

Senator DOWNEY. Are you talking about the United States?

Mr. NORMAN. Well, I said I have heard those figures from economists. I do not know what they cover. But one farm family keeps several families going.

Now, the people are out there. They are dependent on this, and businesses are built up on this farming.

Senator DOWNEY. Why don't you say that one factory keeps hundreds of families going? Why say one farm does?

Mr. NORMAN. Because there is a lot of difference in one factory that may be employing several hundred people as against one farmer. I do not know that the ratio is anywhere near as high with the factory, the number of men working in a factory, to the percentage of total families kept, as it is on a farm. I don't think it is anywhere nearly as high.

Senator DOWNEY. You are of the opinion, Mr. Norman, that if in any community land that has been agricultural land and ceases to be valuable for that purpose, because the land goes sour from alkali, erodes, or lacks proper fertilization, that the taxpayers of the United States would be justified in going in to restore that land at a cost of $1,500 or $2,000 an acre?

Mr. NORMAN. I don't see that this costs $1,500 or $2,000 an acre. That was the California witness' figures. But let us look at it this way——

Senator DOWNEY. Wait a minute, Mr. Norman, what do you say it costs?

Mr. NORMAN. I don't know, I haven't made any studies on it.

Senator DOWNEY. All right, you say to this committee that you consider this a justifiable project.

Mr. NORMAN. Yes, sir.

Senator DOWNEY. From the standpoint of the Nation and the taxpayer, do you?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. All right, what is it going to cost per acre, then? What is it going to cost the Government?

Mr. NORMAN. Take your 700,000 acres of farmland, divide that, then take some of the range land it backs up, and I don't know what the answer will be, but it certainly is not going to be pinned down to 100,000 acres or so.

Senator DOWNEY. If it comes to the question of spending this $400,000,000 to irrigate 226,000 acres, at a rate of $1,700 an acre, you would not express the opinion that that project would be justified; is that it?

Mr. NORMAN. This is not a new project, Senator. This project is to salvage acreage and to salvage a civilization down in Arizona.

Now, when we talk about spending money, Federal funds for salvaging something, let us look over on the Mississippi River. Let us look at flood-control projects. The Government does not get a dime of that back, yet we spend millions of dollars. As I remember, they are spending around $500,000,000 over in the Los Angeles area right now, and not a dime of it will be paid back. That is for flood protection. That is helping civilization over there, and I cannot see the difference between spending Federal moneys to preserve a civilization against floods and preserving it against a lack of water.

Senator DOWNEY. How much do you think the Government would be justified in spending per acre to preserve land?

Mr. NORMAN. Senator, it comes back down to how much does the water cost and how much does the power cost. Can you afford to pay it? If this water was going to run $40 or $50 an acre-foot, that would be something else. If the power was going to run a cent or so a kilowatt-hour, that would be something else.

But the Bureau of Reclamation has made an economic study of this project, that power can and will be sold for the price they say it has to be sold for to justify the project economically. The water can and will be sold for the price that they say it has to be sold for in order to justify it economically.

We are salvaging this civilization. We are not talking about bringing in a new project.

Senator DOWNEY. Mr. Norman, if you can answer my questions I wish you would, and if you cannot, I wish you would indicate. I have no disposition to prevent you from making as long an argument or explanation as you want. If you can answer my questions I would appreciate your doing it.

Mr. NORMAN. I will certainly try, Senator.

Senator DOWNEY. You speak now about salvaging a civilization.

Mr. NORMAN. Yes, sir.

Senator DOWNEY. To what extent and how would it injure the Phoenix area if you took an approximate 200,000 acres out of cultivation there? What would happen in Phoenix, do you think?

Mr. NORMAN. Senator, you cannot take an acre of land out of cultivation without having an effect on the economics of the State, and I will pass that on to the economics of the Nation.

Now, to pin me down on taking so many acres out and what effect it would have, I do not know. But as acreage goes out of produc-

tion businesses are going to go out in Arizona. Ranches are going to become marginal because they depend on this agricultural area.

Senator DOWNEY. Mr. Norman, do you not know that for the last 150 years, starting in with New England and the South, and going all over the United States, there have constantly been ranches going out of production for one reason or another?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Don't you know that there are constantly ranges going out because of erosion all over the United States?

Mr. NORMAN. Yes.

Senator DOWNEY. And because of lack of fertilization?

Mr. NORMAN. Yes.

Senator DOWNEY. And in some places because they are alkaliing up?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. We will agree that is an unfortunate thing, is it not?

Mr. NORMAN. Very unfortunate; yes, sir.

Senator DOWNEY. But I am asking you, Do you think the national economy would justify putting in $1,700 an acre, or its equivalent, in order to bring back land that when you get it there is only worth $150, or $250, or $300, or $400 an acre, whatever you want to put on it? Do you think you are justified in doing that?

Mr. NORMAN. I do not know it costs any $1,700 an acre.

Senator DOWNEY. Let us assume it does.

Mr. NORMAN. I cannot assume that, Senator, because the thing involves too much in Arizona to try to pin it down to so many acres of land at so many dollars per acre.

Senator DOWNEY. Mr. Norman, the Bureau of Reclamation program is generally counted to be particularly for the small man with 160 acres or less. You are familiar with that rule, of course?

Mr. NORMAN. Yes, sir; I am familiar with it.

Senator DOWNEY. Now, at the cost here stated by the Bureau of Reclamation at $1,700 an acre, a 160-acre parcel would come to $272,000.

Mr. NORMAN. I am not familiar with the statement by the Bureau of $1,700 an acre.

Senator DOWNEY. I might state that for 800 acres the subsidy from the Government would be $1,360,000, and for 8,000 acres—I understand there is one parcel that large—it would come to $13,600,000. Do you think we are justified in developing small farms at a cost such as that?

Mr. NORMAN. I do not know anything about those figures, Senator. I have not looked into it from that angle.

Senator DOWNEY. Well, here are what the figures are, Mr. Norman. The Bureau of Reclamation allocates approximately almost exactly $400,000,000 against the agricultural benefits.

The Bureau of Reclamation says there are now 152,000 acres of land that is now enjoying irrigation and that would have to go back to the desert if they do not get water on it. The Bureau of Reclamation states—we do not concede these figures—but the Bureau of Reclamation states there is another 76,000 acres scattered all through this area that are not now cultivated. If you take the 226,000 acres, the sum of those two sums, and divide it into $400,000,000, you get between $1,700 and $1,800 an acre.

Mr. NORMAN. That is not the way to go about it, Senator.

Senator DOWNEY. All right; you tell us how you would go about it.

Mr. NORMAN. Because the land does not go down by just so many acres. It just does not work out that way. The people are out there living on the acreage, and they try to farm it. They spread their water and they spread it thin, and it ends up by not making profitable crops. They do not take out so many acres and just lay it up and say, "I ton't have any water for that," or "I am going to sell those acres because I don't have any water for them." That is not the way it works out.

This project spreads over as a supplemental supply of water to 700,000 acres of land.

Senator DOWNEY. But, Mr. Norman, would it not be very simple for the farmers themselves, or in lieu of their default some State agency, or in lieu of that, a Bureau of Reclamation project, that would go in there and purchase the most strategic 200,000 acres, more or less, and retire it?

Mr. NORMAN. No; knowing farmers, I would say it would not be practical at all.

Senator DOWNEY. You mean they would not sell their acreage at a fair price?

Mr. NORMAN. I guess they would sell it at a fair price, but that does not answer the question, Senator. These acres are now supporting other people besides the farmers on them. They are supporting range lands, millions of acres of range land, back in Arizona.

Senator DOWNEY. Let us talk about that, Mr. Norman.

How are they supporting millions of acres of range land?

Mr. NORMAN. Because they are raising feed for the supplemental feeding of cattle up there, and they are finishing cattle. I do not know how many we finish, but it is approximately 200,000 head of cattle in the valley every year, and winter over 100,000 sheep in the valley over every year that come from up on the range.

Senator DOWNEY. Well, is not a large part of that done with grains and corn that you import from the Mississippi Valley?

Mr. NORMAN. No, sir; we raise our feed down there.

Senator DOWNEY. You are sure of that, that you do not import any large amount?

Mr. NORMAN. I do not think there is any feed, none that I know of, shipped in for feeding these cattle. It would be cheaper to ship the cattle the other way.

Senator DOWNEY. Well, Mr. Norman, is it not true that in California, and all over the Southwest, we import into our States the great proportion of our feeds?

Mr. NORMAN. That I do not know, Senator; I do not know what you do in California. I know you are dependent on a lot of our beef to eat over there, because they are shipping beef from New Mexico. Every pound of beef from west of a north-south line drawn from the western boundary of New Mexico is going to the west coast.

Senator DOWNEY. As a matter of fact, in some years can you not import your grains into Arizona cheaper than you raise them?

Mr. NORMAN. We are not in the importing end of it, Senator; we raise our feed. That is our business, to raise our feed and feed our cattle down there.

Senator DOWNEY. I am asking if you cannot import your grains in many years as cheaply as you can raise them.

Mr. NORMAN. I don't know.

Senator DOWNEY. Would that make any difference, in your opinion?

Mr. NORMAN. No; we still have to have our farms to support our people and to support those in the community.

Senator DOWNEY. Take in Wyoming, do they not raise cattle and sheep?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Successfully?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Do they not import practically all of their corns and grains?

Mr. NORMAN. I think they send their cattle and sheep out to finishing places in Kansas, Iowa, and in through there.

Senator DOWNEY. They successfully use their range lands, do they not?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. Are they not successfully used all over the West?

Mr. NORMAN. Yes, sir. They have some irrigation projects up there to furnish hay for wintering, too.

Senator DOWNEY. Mr. Norman, just what do you think would be the financial or economic result in Phoenix if you did take 200,000 acres of land out of cultivation there? What would happen?

Mr. NORMAN. I think it would have a tremendous effect on the economy of Phoenix. It could not help it because we have these businesses, and so forth, that have been built up based on what that ground is producing, the whole area. So you cannot take any acreage out of cultivation without it affecting the businesses in Phoenix.

Senator DOWNEY. Mr. Norman, has that not been going on constantly all over the United States?

Mr. NORMAN. There has been some of it.

Senator DOWNEY. Hasn't it been going on constantly? Don't you know that over in California we have had hundreds of thousands of acres go back to the desert because we have exhausted our water supply?

Mr. NORMAN. No, sir; I do not know that.

Senator DOWNEY. Well, that is correct, I can assure you of that.

Mr. NORMAN. I know there is a lot going to waste in the Salton Sea that is being covered up by water you are getting out of the Colorado River.

Senator DOWNEY. Mr. Norman, if you are here to give that kind of testimony and that kind of an answer, I do not care to examine you any longer. Constantly throughout the examination you have been evasive, and that sort of a remark to a fair question about the Salton Sea is totally irrelevant. It has nothing to do with what I was asking you. I have no further questions to ask you.

Mr. NORMAN. I am sorry you feel that way, Senator.

Senator DOWNEY. Well, I do. What is the use of getting in an argument about the Salton Sea when we are trying to test the probability of land going back and what its effect would be? There is no relevancy between any water that may be running from the Imperial Dam into the Salton Sea, and lands going back to the desert because of lack of water, is there?

Mr. NORMAN. It is covering up agricultural land as it fills the Salton Sea.

Senator DOWNEY. Covering up agricultural land?

Mr. NORMAN. Yes, sir.

Senator DOWNEY. No further questions.

Senator MCFARLAND. No questions.

The CHAIRMAN. You are excused, sir.

Mr. NORMAN. Thank you, sir.

Senator MCFARLAND. Mr. Chairman, yesterday we had witnesses from the reclamation service on the stand. It was requested that they be here for questioning when Senator Downey was here.

Before we proceed further with Arizona's testimony, I would like, if possible, that Senator Downey finish with the reclamation service, as we only have two more witnesses. We would like to round out our testimony after the examination of the Bureau witnesses is finished.

The CHAIRMAN. You mean you want to call somebody from the Reclamation Bureau for examination by Senator Downey?

Senator MCFARLAND. Yes. We accorded him that privilege yesterday.

The CHAIRMAN. Is that agreeable?

Senator DOWNEY. From the Reclamation Bureau?

Senator MCFARLAND. Yes.

Senator DOWNEY. Senator McFarland, I was not here yesterday.

The CHAIRMAN. Off the record.

(Discussion off the record.)

Senator DOWNEY. Mr. Chairman, I have not had an opportunity to prepare my examination, so I would ask that that be deferred.

Senator MCFARLAND. Do you have any questions in regard to Mr. Lane? We cannot keep our witnesses here indefinitely. We have them here. We brought them back today, that is, the witnesses for Arizona. The Reclamation Bureau witnesses will be here from time to time, but have you any questions of Mr. Lane?

Senator DOWNEY. Mr. Lane?

Mr. HOWARD. Mr. Lane is the engineer from Phoenix who testified yesterday. I do not think it would be necessary to spend time cross-examining him on those figures.

Senator DOWNEY. No; that will be satisfactory.

Senator MCFARLAND. Then, Mr. Lane, you are excused, as far as this committee is concerned.

The CHAIRMAN. Mr. Debler.

STATEMENT OF E. B. DEBLER, CONSULTING ENGINEER, STATE OF ARIZONA

Mr. DEBLER. I think I have heretofore qualified before this committee, so I will go right on with my paper.

With regard to this statement, Mr. Chairman, I think it might not be a bad idea to introduce this statement as a whole in the record and to be so printed, and then to discuss it. It might make it a little easier to cover it.

The CHAIRMAN. Very well, that will be done.

(The statement is as follows:)

STATEMENT BY E. B. DEBLER, CONSULTING ENGINEER FOR ARIZONA, ON S. 75, CENTRAL ARIZONA PROJECT BEFORE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, EIGHTY-FIRST CONGRESS, FIRST SESSION

This statement is intended to present a summary of waters available to Arizona from the Colorado River system in accordance with interpretations of applicable law by Mr. Charles A. Carson and others representing Arizona in such matters.

BASIS FOR DIVISION OF LOWER BASIN WATERS

(*a*) The Colorado River compact in article III (d) and III (b) has apportioned to the lower basin the beneficial consumptive use of 8,500,000 acre-feet of water which is attained when the natural gain in Colorado River flows from Lee Ferry to the international boundary is reduced by that amount.

(*b*) The upper basin in article III (d) is obligated to deliver at Lee Ferry a minimum of 75,000,000 acre-feet in any 10-year period, and in addition one-half the deficiency, if any, by which the resulting lower basin waters fail to fill the apportionment of 8,500,000 acre-feet to the lower basin and to supply 1,500,000 acre-feet to Mexico.

(*c*) California by the self-limitation act of its legislature dated March 4, 1929, may use a maximum of 4,400,000 acre-feet of apportioned water, plus one-half of any surplus water.

In the following tabulations, quantities are acre-feet per year.

Comparison of apportionments with long-time average flow

Long time (1897–1943) average flow at international boundary		[1] 17,720,000
Apportionments pursuant to the Colorado River compact:		
Upper basin by article III (a)	7,500,000	
Lower basin by article III (a) and III (b)	8,500,000	
Mexico by treaty pursuant to article III (c)	1,500,000	
		17,500,000
Surplus, unapportioned and subject to apportionment after 1963, in accordance with article II (f)		220,000

[1] From p. 12 of the Blue Book (March 1946 report; Bureau of Reclamation).

DIVISION OF LOWER BASIN APPORTIONMENT AUTHORIZED BY BOULDER CANYON PROJECT ACT

Gila River, assigned entirely to Arizona with amount of water not stated, but at the time generally assumed to be 1,000,000 acre-feet.

	Acre feet	Percent
Main stream:		
Arizona	2,800,000	37⅓
California, by required self-limitation act, a maximum of	4,400,000	58⅔
Nevada, main stream	300,000	4
Total	7,500,000	100
Utah and New Mexico, not mentioned, estimated in Blue Book at	138,000	

DIVISION OF LOWER BASIN AVAILABLE WATER

Since the Boulder Canyon project act in authorizing a lower basin compact failed to designate any water for the States of Utah and New Mexico, the contemplated use by these States is herein deducted from the total supply ahead of the division between Arizona, California, and Nevada.

Evaporation losses from the main-stream reservoir are similarly deducted since all three States receive benefits from these reservoirs by reason of regulation of their water supplies, diversion from the dams and reservoirs, and use of power produced at the dams.

Since Arizona and New Mexico will deplete Gila River by 1,138,000 acre-feet instead of the 1,000,000 acre-feet in mind in the Boulder Canyon project act, a suitable adjustment is made to avoid penalizing California and Nevada for this extra Gila use.

The resulting division thus is—		
Apportioned to lower basin		8,500,000
Less Gila River use contemplated at time of Boulder Canyon project act		1,000,000
Main stream use contemplated by act		7,500,000
Less:		
Use by New Mexico above Hoover Dam	13,000	
Use by Utah above Hoover Dam	101,000	
Main stream reservoir evaporation	870,000	
		984,000
Available main stream water for further use		6,516,000
Arizona share 37½ percent of 6,516,000		2,432,000

Arizona utilization of Colorado River system

Available water after deduction for evaporation from main stream reservoirs:		
Gila River depletion assumed in Boulder Canyon project act	1,000,000	
Main stream water	2,432,000	
Total		3,432,000
Utilization:		
Contemplated Gila River depletion by Arizona and New Mexico		1,138,000
Main stream water available for Arizona use		2,294,000
Present and authorized projects:		
Present use above Hoover Dam	64,000	
Present use on Williams River	3,000	
Parker Valley (Colorado River Indian project, authorized)	215,000	
Gila project, authorized	600,000	
Yuma project	130,000	
Total present and authorized		1,012,000
Available for additional projects		1,284,000
Contemplated for Central Arizona project:		
Diversion	1,200,000	
Return to Colorado River	88,000	
		1,112,000
Balance for further projects		172,000

Low run-off period 1930–46

Main stream water:		
Minimum delivery at Lee Ferry		7,500,000
Net gain Lee Ferry to international boundary exclusive of Gila River (small reduction in inflow offset by reduction in valley loss)		180,000
Gila River ultimate outflow		150,000
Total		7,830,000
Lower basin long-time use	6,516,000	
Main stream reservoirs	600,000	
Mexico	1,500,000	
		8,616,000
Deficiency to be secured by draw down at Lake Mead		786,000
Necessary total draw down in 17-year period		13,362,000
Available for draw down		18,000,000

Mr. DEBLER. I will read parts of the statement and then discuss it as we go through it.

This statement is intended to present a summary of waters available to Arizona from the Colorado River system in accordance with in-

terpretations of applicable law by Mr. Charles A. Carson and others representing Arizona in such matters.

BASIS FOR DIVISION OF LOWER BASIN WATERS

(*a*) The Colorado River compact in article III (d) and III (b) has apportioned to the lower basin the beneficial consumptive use of 8,500,000 acre-feet of water which is attained when the natural gain in Colorado River flows from Lee Ferry to the international boundary is reduced by that amount.

(*b*) The upper basin in article III (d) is obligated to deliver at Lee Ferry a minimum of 75,000,000 acre-feet in any 10-year period, and in addition one-half the deficiency, if any, by which the resulting lower basin waters fail to fill the apportionment of 8,500,000 acre-feet to the lower basin and to supply 1,500,000 acre-feet to Mexico.

(*c*) California by the self-limitation act of its legislature dated March 4, 1929, may use a maximum of 4,400,000 acre-feet of apportioned water, plus one-half of any surplus water.

In the following tabulations, quantities are acre-feet per year.

	Acre-feet	Percent
Main stream:		
Arizona	2,800,000	37½
California, by required self-limitation act, a maximum of	4,400,000	58⅔
Nevada, main stream	300,000	4
Total	7,500,000	100
Utah and New Mexico, not mentioned, estimated in blue book at	138,000	

Comparison of apportionments with long time average flow

Long time (1897–1943) average flow at international boundary		[1] 17,720,000
Apportionments pursuant to the Colorado River compact:		
Upper basin by article III (a)	7,500,000	
Lower basin by article III (a) and III (b)	8,500,000	
Mexico by treaty pursuant to article III (c)	1,500,000	
		17,500,000
Surplus, unapportioned and subject to apportionment after 1963, in accordance with article III (f)		220,000

[1] From p. 12 of the Blue Book (March 1946 Report; Bureau of Reclamation).

DIVISION OF LOWER BASIN APPORTIONMENT AUTHORIZED BY BOULDER CANYON PROJECT ACT

Gila River, assigned entirely to Arizona with amount of water not stated but at the time generally assumed to be 1,000,000 acre-feet.

DIVISION OF LOWER BASIN AVAILABLE WATER

Since the Boulder Canyon Project Act in authorizing a lower basin compact failed to designate any water for the States of Utah and New Mexico, the contemplated use by these States is herein deducted from the total supply ahead of the division between Arizona, California, and Nevada.

Evaporation losses from the main stream reservoir are similarly deducted since all three States receive benefits from these reservoirs by reason of regulation of their water supplies, diversion from the dams and reservoirs, and use of power produced at the dams.

Since Arizona and New Mexico will deplete Gila River by 1,138,000 acre-feet instead of the 1,000,000 acre-feet in mind in the Boulder Canyon Project Act, a suitable adjustment is made to avoid penalizing California and Nevada for this extra Gila use.

Senator ANDERSON. Where do you get the figure 1,138,000?

Mr. DEBLER. That is a figure that appears in the Reclamation report.

Senator ANDERSON. Is that adding in Utah?

Mr. DEBLER. No; that is actual reduction. The virgin flow of the Gila River at the mouth is estimated at 1,272,000. The final flow is 222,000, of which 88,000 is Colorado River return flow, making 134,000. Deducting 134,000 from 1,272,000, we get 1,138,000.

Senator ANDERSON. I have just been struck by the fact that is exactly the same as the 138 plus the million that you used up above.

Mr. DEBLER. Yes. That is because when the Boulder Canyon Project Act was passed and the three-State compact was authorized, they were thinking in terms of a million acre-feet of use on the Gila and the balance, 7,500,000, on the main stream. Now we find that the depletion of the Gila actually will be 1,138,000. Therefore, this 138,000 is in turn assigned to Arizona's use of the main stream water so as not to make an additional draft on California and Nevada by reason of that extra Gila River use.

Senator ANDERSON. I just wanted to be sure that this 1,138,000 is not the sum of 138,000 which you have up above and 1,000,000 which you have on the next page. It just happens that they are identical figures, is that right? They have no relationship to each other?

Mr. DEBLER. No; they are——

Senator ANDERSON. Will you look at the bottom of page 2?

Mr. DEBLER. Yes.

Senator ANDERSON. You get a figure of 1,000,000 acre-feet.

Mr. DEBLER. That is right.

Senator ANDERSON. Then part way down page 3 you have Utah and New Mexico, 138,000.

Mr. DEBLER. That is purely accidental. I had never noticed that before. I did not realize that those figures were just exactly the same. There is no relationship at all.

I was at the bottom of page 3.

Senator ANDERSON. I am sorry.

Mr. DEBLER. That is all right, Senator, that was a very good question to ask, because I had not noticed that.

The resulting division thus is:

Apportioned to the lower basin	8,500,000
Less Gila River use contemplated at time of Boulder Canyon Project Act	1,000,000
Main stream use contemplated by act	7,500,000

Deducting as stated before the use by New Mexico above Hoover Dam, 13,000 contemplated and by Utah above Hoover Dam, 101,000 and the main-stream reservoir evaporation, long-time average of 870,000, it makes a deduction of 984,000 acre-feet, leaving available main-stream water for further use, 6,516,000 acre-feet.

The Arizona share, as set out at the top of page 3, is 37½ percent, or 2,432,000.

Proceeding from there we go to the Arizona utilization of the Colorado River system.

Available water after deduction for evaporation from main-stream reservoirs.

Gila River depletion assumed in Boulder Canyon Project Act, 1,000,000 acre-feet; total main-stream water derived just above there is 2,432,000 acre-feet, making a total of Arizona water of 3,432,000 acre-feet.

In the utilization of this water, the contemplated Gila River depletion by Arizona and New Mexico, 1,138,000 is deducted, leaving for main-stream water available for Arizona use, 2,294,000 acre-feet.

The present and authorized projects in Arizona above Hoover Dam, use is 64,000; present use on Williams River, 3,000; Parker Valley, 215,000 acre-feet.

The Gila project, authorized, 600,000 acre-feet; Yuma project, 130,000, making a total present and authorized use of 1,012,000, leaving available for additional projects, 1,284,000 acre-feet.

The contemplated additional use for the central Arizona project is a diversion of 1,200,000 acre-feet, and its return to the Colorado River of 88,000 acre-feet, making a net draft for that project of 1,112,000 acre-feet, leaving a balance for further projects in Arizona of 172,000 acre-feet of available water.

The question has sometimes been asked: What happens to the Colorado River in the low run-off period? At such a time the upper basin is obligated to deliver at Lee Ferry a minimum of 75,000,000 acre-feet in a 10-year period. That is stated here as a minimum delivery at Lee Ferry of 7,500,000 acre-feet per year.

The net gain at Lee Ferry to international boundary, exclusive of the Gila River, and there I have a small note, "small reduction in inflow offset by reduction in valley loss," is 180,000 acre-feet. What I mean by that little note is this: That in this low run-off period there was actually a small reduction in average inflow between Lee Ferry and the Gila River.

However, with those low flows, there is also a low flow in the main river and consequently there is less loss by vegetation and other evaporation, which will offset that small reduction of inflow, leaving the gain in that section of the river about the same as the long-time average.

The ultimate outflow from the Gila River is estimated at 150,000 acre-feet in this low run-off period. It is less in that period than it is for the long-time period, for the reason that during this low run-off period no flood waters are expected to escape from the Phoenix area.

That leaves then a supply of 7,830,000 acre-feet produced in this particular period.

The long-time average yield for use is shown to be 6,516,000 acre-feet a year, near the top of page 4. To continue that kind of a draft, in addition to meeting the mainstream reservoir loss, which may be as high as 600,000 acre-feet during that period, and with Mexico receiving 1,500,000 acre-feet, it requires a supply of 8,616,000 acre-feet, leaving a deficiency of 786,000 acre-feet a year to be secured by drawing down Lake Mead.

For the 17-year period to which these figures apply, that would require a total draw-down of 13,362,000 acre-feet.

I have previously stated to this committee that we could make a total draw-down at Lake Mead of 18,000,000 acre-feet in a critical low

run-off period. Consequently, this particular period would not be a complete test of Lake Mead to meet the situation in the low run-off period.

The CHAIRMAN. You mean by that in your opinion the draw-down from Lake Mead would have to be greater than that at times?

Mr. DEBLER. It could be made greater than required for the 1930–46 period. There is more water there than will be required to maintain for that period, a supply of 8½ million for the lower basin.

The CHAIRMAN. I understood this table to indicate that in your opinion, taking the low run-off period 1930–46 as an example, a deficiency of 786,000 acre-feet would have to be made up out of Lake Mead.

Mr. DEBLER. That is right.

The CHAIRMAN. What I wanted to know is whether you think that is a maximum draw-down.

Mr. DEBLER. I had in mind a period as high as 20 years as being about all we could expect. There is the possibility, of course, of a longer low run-off period than this 17-year period of 1930 to 1946. There is even the possibility in a period of that length of even less average flow.

The CHAIRMAN. I am talking about practical purposes. Of course it is possible that the river might dry up. But talking in terms of experience and likely future use, does this represent a maximum draw-down, in your opinion, or not?

Mr. DEBLER. For all practical purposes, yes, the maximum requirement. We had testimony here, Mr. Chairman, by the Reclamation Bureau several weeks back in which a comparison was made of that period with other low periods for the past 700 years, I believe, in which it was indicated it was almost as bad as any of them.

The CHAIRMAN. Yes; I am aware of that. Another question I wanted to ask you has to do with the contemplated use on the Gila River at the time of the Boulder Canyon Project Act, 1,000,000 acre-feet. You have used that figure on several occasions in the preparation of these tables. Has the experience since the Boulder Canyon Project Act had any effect upon that 1,000,000 acre-feet?

Mr. DEBLER. Yes; because we have progressively gone to more complete utilization of our streams since then.

The CHAIRMAN. What then are the facts in the light of the experience?

Mr. DEBLER. We make a more complete utilization and we use relatively more of that water and let relatively less escape than what we had in mind back in the earlier years. We build larger reservoirs.

The CHAIRMAN. Let me put it this way: Is the Gila River using 1,000,000 acre-feet, or is it more or is it less now, in the light of experience?

Mr. DEBLER. At this time it is still less—well, I would say it is flirting with a million right now, on the average, the depletion of the Gila.

The CHAIRMAN. Then it is not a matter of an estimate now?

Mr. DEBLER. Not exactly, except to this extent: That while we have recorded outflows going back some 40 years now, during that time we have had a constant building of reservoirs. In the last 20 years all this ground water pumping which results in a further decline of the overflow has taken place. In order to find out what the situation

would be for the present development the engineers must go back and make adjustment each year for what the result would be for the present-day development. To that extent it is an estimate.

With all that estimating, the present-day depletion of the Gila is just about 1,000,000, with the present-day works.

The CHAIRMAN. You have this estimate of 138,000 which represents contemplated Gila River depletion by Arizona and New Mexico.

Mr. DEBLER. That is in addition to the 1,000,000.

The CHAIRMAN. On what is that estimate based?

Mr. DEBLER. That is based on estimates made by the Bureau, and which I have gone over quite carefully and agree with, of the results of the additional works to be built, and among those the work of the central Arizona project, such as the Buttes Reservoir, enlargement of the Horseshoe Reservoir; enlargement of McDowell Reservoir. Those all lead to additional depletion.

The CHAIRMAN. How much of that is in New Mexico?

Mr. DEBLER. About 37,000 total.

I beg your pardon. It is 24,000 on the Gila, 37,000 total; 24,000 on the Gila.

Senator ANDERSON. Would you mind identifying where that use is to be?

Mr. DEBLER. That 24,000 is on the Gila. There are about 2 or 3 thousand acres on the San Francisco and I think there are about 4,000 acres in the Virden Valley; about 3,000 in Red Rock, and maybe a total of about 1,000 in the towns of Gila and those areas up there.

Senator ANDERSON. Is that III (a) or III (b) water?

Mr. DEBLER. I would not want to say, Senator, I don't know.

Senator ANDERSON. How have you classified it here?

Mr. DEBLER. This is not a legal opinion, Senator, but as an engineer I would say that it comes out in III (a) because III (a) says to cover present rights. But the attorneys tell me I am not so good an attorney, so maybe I better let that go.

Senator ANDERSON. I did not mean to break in on the chairman, but may I ask a question or two at that point? You had just asked a question about New Mexico.

The CHAIRMAN. That was quite all right, because it was quite evident to me you had the same query in your mind that I had in mine.

Senator ANDERSON. I am just wondering how you can fix the rights of Arizona without compact, but do not recognize that we might have a little bit greater division than 138,000 to Utah and New Mexico.

Mr. DEBLER. Senator, I was only going by this report, as what is believed to be the physical facts.

Senator ANDERSON. That brings me back to the same question: Whether you think the Bureau of Reclamation by that document has effectively apportioned the waters.

Mr. DEBLER. No.

Senator ANDERSON. You will notice the right that we might have.

Mr. DEBLER. You will notice I did not even segregate your waters from Arizona.

Senator ANDERSON. You do this 138,000 for Utah and New Mexico, in which 100,000 is for Utah and thirty some thousand for New Mexico.

Mr. DEBLER. That is right.

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Senator ANDERSON. You have 138,000. One hundred and one of that is for Utah.

Mr. DEBLER. That is right.

Senator ANDERSON. Therefore that leaves us about 37,000 in that whole valley?

Mr. DEBLER. That is right.

Senator ANDERSON. Now, if we put a large dam somewhere out there and started lifting water over into the Mimbres we might be able to use quite a bit more than that, could we not?

Mr. DEBLER. Well, Senator, I do not know at the moment what your average flow is up there that you are talking about. Where would you lift it?

Senator ANDERSON. I don't know. You are not a lawyer and I am not an engineer. Fortunately, I am neither a lawyer nor an engineer and that gives me greater freedom in asking the questions.

Mr. DEBLER. That is all right. I will try to give you some information on that.

Senator ANDERSON. I keep trying steadily to resist the idea that New Mexico is limited because the Blue Book only gives it so much.

The CHAIRMAN. Does the Senator from New Mexico desire to have the record show that he is uninhibited by either the law or the facts? [Laughter.]

Senator ANDERSON. I have driven over a good deal of this area, Mr. Chairman, and have followed the river all the way down. We have some reasonably good-sized industries down there that could use some power, and we have some land on the same basis that Arizona has in the central valley project which could be watered and utilized. I do not know there is any water there that could be available for that purpose or not.

Mr. DEBLER. Senator, you know where Gila is?

Senator ANDERSON. Yes.

Mr. DEBLER. At Gila the river average from 1929 to 1946 is 98,000 acre-feet.

Senator ANDERSON. Do you have any idea what the quantity might be that might be stored at Hooker Dam?

Mr. DEBLER. 98,000, and that is the capacity. It is just 1 year's flow.

Senator ANDERSON. In any event there might be some water there so that we might get some additional, and I think there is very little contemplated now, is that right?

Mr. DEBLER. If you could also take care of the people down in Virden Valley, Duncan Valley, and Safford Valley, that is, if you could take it without hurting them, it could be.

Senator ANDERSON. There was a theory once that upper States have some rights, however; is that not right?

Mr. DEBLER. Oh, yes; I am not by anything I put in here trying to outline a compact for your States, Senator.

Senator ANDERSON. No, but your figures are based upon a total for New Mexico of 37,000 acre-feet from the Gila?

Mr. DEBLER. That is right; 24,000 from the Gila and 13,000 from the Little Colorado.

Senator ANDERSON. I did not intend to get into a discussion of figures except to say that we have some reservations on the amount of water.

Senator DOWNEY. Mr. Debler, is the way you fix those figures for Utah and New Mexico, by reason of your belief that that is all of the water that would be physically available for them?

Mr. DEBLER. Well, Senator, I do not have enough information about it to suggest anything different from what the Bureau has reported. I cannot deny that I have a lot of knowledge of that country because lots of the investigation work on which this report was based is based on my work done prior to 1944.

I do recall that we made investigations in those areas to develop possible projects.

Whether further additional projects can be found, I do not know; it is not going to be easy, I can tell you that.

Senator DOWNEY. Mr. Debler, I do not know anything about it, and there was no implication from my question at all, except that I wanted to elicit this: Apparently you would have no justification in limiting New Mexico and Nevada the way you have, except upon the theory that that is all the water that feasibly could be gotten to them, is that right?

Mr. DEBLER. The figures I have taken here are taken from the Blue Book. There is no intention here to in any way limit any State, where nothing was said about the State in the Boulder Canyon Project Act, where it was not mentioned. These are the only figures we have today that so far as I know are based on rather comprehensive investigations. I do not know of any others that have been made.

Senator DOWNEY. Let me ask you this: If Nevada and/or New Mexico could propose projects which would take some of this water you have allocated to Arizona or to California, at a cost of $500 or $750 or $1,000 an acre, that would be a perfectly just proposal for them to put forward, compared with the proposal put forward by Arizona, would it not? Would Arizona have any superior right?

Mr. DEBLER. Well, I do not know whether it would or not. The mere division of an acreage into construction cost is not a measure of feasibility at all, so I would not want to say that that is a fair question.

Senator DOWNEY. Probably you are right in your criticism of my question, Mr. Debler. But so far, at least, as the law is concerned, there is no reason that either New Mexico or Nevada—and I suppose Utah—are they not entitled to present proposals for a greater amount of water than you have entitled them to?

Mr. DEBLER. No, not whatever. As to Nevada, however, I would say the item of 300,000 acre-feet mentioned in the Boulder Canyon Project Act would have a little effect, I suppose.

Senator ANDERSON. This item (b) on the very first page of your presentation, this reads:

The upper basin in article III (d) is obligated to deliver at Lee Ferry a minimum of 75,000,000 acre-feet in any 10-year period.

We all agree on that—

and in addition one-half of the deficiency, if any, by which the resulting lower basin waters fail to fill the apportionment of 8,500,000 acre-feet to the lower basin and to supply 1,500,00 acre-feet to Mexico.

I understand the obligation to Mexico. I do not understand the deficiency in the 8,500,000.

Mr. DEBLER. The first part is III (d) and the second part is III (c). It reads:

If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraph (a) and (b); and if such surplus shall prove insufficient for this purpose, then the burden of such deficiency shall be equally borne by the upper basin and the lower basin.

Senator ANDERSON. I said I had no question on the Mexican end of it. You have added 1,000,000 acre-feet and got your total to 8,500,000, which is in the compact, and then say that out of our 75,000,000 acre-feet in 10 years or 7,500,000 in each year, roughly, if there is any deficiency in the lower basin we are obligated to make up that deficiency.

Mr. DEBLER. One-half of it.

Senator ANDERSON. I probably could go back and read it, but what section is that in?

Mr. DEBLER. That deficiency is covered in section III (c).

Senator ANDERSON. Perhaps you better read that.

Mr. DEBLER (reading):

If such surplus shall prove insufficient for this purpose—

that is, to meet the Mexican one-half.

Senator ANDERSON. I recognize the Mexican. I desire to get off that.

Mr. DEBLER. Well, that is the deficiency.

Senator ANDERSON. No, your statement is that we have to deliver half of any deficiency you may have on this 8,500,000 acre-feet.

Mr. DEBLER. Yes. Well, that is the result of it. In other words, the deficiency does not all fall on the 8,500,000; it has to be divided between the upper and lower basins.

Senator MCFARLAND. I think if you would let him read all of the provisions, the situation would be plain.

Mr. DEBLER. Here is the point, Senator: Suppose the upper basin is delivering 7,500,000. And then you figure it this way: If Mexico gets out of the surplus 1,000,000 acre-feet, there is no more surplus until the lower basin has 8,500,000, then we will say Mexico gets a million acre-feet and short a half-million, then that half-million has to be made up half by the upper basin, in addition to its 75,000,000, and the other half has to come out of the lower basin.

Senator ANDERSON. If it is clear to the chairman I will be glad to stop.

The CHAIRMAN. In my judgment the statement is not at all clear.

Senator ANDERSON. If we deliver every 10 years 75,000,000 acre-feet at Lee Ferry and that does not, however, produce 8,500,000 acre-feet every year——

Mr. DEBLER. Plus one and a half to Mexico.

The CHAIRMAN. Read the provision of the compact from which you draw that conclusion. That is what Senator Anderson wants you to do.

Senator ANDERSON. I understand the Mexican part of it thoroughly.

The CHAIRMAN. Let him read it.

Mr. DEBLER. The deficiency under the compact falls on Mexico, the deficiency that has to be made up.

The CHAIRMAN. Won't you read the compact, please?

Mr. DEBLER. Article (c):

If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraph (a) and (b)—

that is, 8,500,000, for the lower basin—

and if such surplus shall prove insufficient for this purpose—

to supply Mexico—

then the burden of such deficiency shall be equally borne by the upper basin and the lower basin, and whenever necessary the States of the upper division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d)—

Paragraph (d) being the 75,000,000.

The CHAIRMAN. Where would the other half come from?

Mr. DEBLER. From the lower basin.

The CHAIRMAN. And would it not come out of the 8,500,000?

Mr. DEBLER. Yes.

The CHAIRMAN. That is not what you stated here, and that is what gave Senator Anderson the concern. Your statement is quite different on page 1, under paragraph (b). You say:

The upper basin in article III (d) is obligated to deliver at Lee Ferry a minimum of 75,000,000 acre-feet in any 10-year period, and in addition one-half the deficiency, if any, by which the resulting lower basin waters fail to fill the apportionment of 8,500,000 acre-feet to the lower basin and to supply 1,500,000 acre-feet to Mexico.

That is not what the compact says. I am sure you did not mean that.

Mr. DEBLER. It is not the exact wording of the compact, but the effect is the same.

The CHAIRMAN. Oh, not at all. The purpose of the compact was to divide the deficiency 50–50 between the upper and the lower.

Mr. DEBLER. That is right.

The CHAIRMAN. And it is the deficiency occasioned by the demand in Mexico.

Mr. DEBLER. That is right.

The CHAIRMAN. It is not a division which guarantees to the lower basin 8,500,000 feet.

Mr. DEBLER. I do not know about that, Senator.

The CHAIRMAN. We will not argue that, that is clear.

Mr. DEBLER. The deficiency spoken of in article III (c) is the deficiency to Mexico.

The CHAIRMAN. What you are saying is the lower basin will have its cake and eat it, too, and that is not what the compact says.

Senator ANDERSON. I thought that was it, but I was not sure.

Mr. DEBLER. The deficiency is on Mexico, that is where the deficiency falls.

Senator ANDERSON. I did not make myself clear, I guess.

If we deliver 75,000,000 acre-feet every 10 years at Lee Ferry and for evaporation losses, or anything else, you do not have 8,500,000 acre-feet in the lower basin, there is no surplus for Mexico, is there?

Mr. DEBLER. That is right.

Senator ANDERSON. Now, if you had a deficiency of a million acre-feet——

Mr. DEBLER. Let us finish with that one.

Senator ANDERSON. May I just finish, please?

Mr. DEBLER. All right.

Senator ANDERSON. If you had a deficiency of a million and a half acre-feet there would naturally be no surplus. Then Mexico gets a million and a half acre-feet; that is 3,000,000. We understand we are to put up half of this million and a half that goes to Mexico.

Mr. DEBLER. That is right.

Senator ANDERSON. But we do not understand we have to put up a million and a half of that other deficiency, and this says we do.

Mr. DEBLER. No.

Senator ANDERSON (reading):

And in addition one-half the deficiency, if any, by which the resulting lower basin waters fail to fill the apportionment of 8,500,000 acre-feet.

Mr. DEBLER. And——

Senator ANDERSON. I want to get in the record first.

Mr. DEBLER. There is no period there.

Senator ANDERSON. I realize that.

Mr. DEBLER. All right. It says:

8,500,000 acre-feet to the lower basin and to supply 1,500,000 acre-feet to Mexico.

Senator ANDERSON. As long as you only intended to say that we have to take our portion of the deficiency to Mexico that is all right.

Mr. DEBLER. That is right.

Senator ANDERSON. Why introduce the 8,500,000 feet?

Mr. DEBLER. It is only until after you have no deficiency that you fill the lower basin apportionment of 8,500,000 and then attempt to supply Mexico out of the balance.

Senator ANDERSON. But if we don't fill that we don't have to.

Mr. DEBLER. You first have to fill it.

Senator ANDERSON. How do we have to fill it?

Mr. DEBLER. You have to fill it one-half out of the upper basin.

Senator ANDERSON. The deficiency of 8,500,000 we have to fill that first?

Mr. DEBLER. No; there is never a deficiency on the 8,500,000.

The CHAIRMAN. He agrees with us, Senator.

[Laughter.]

Senator ANDERSON. As long as he agrees with us, Mr. Chairman, I quit, because I never believe in overselling a job.

Senator DOWNEY. Mr. Debler, I understood it was your best legal opinion as an engineer that the Gila water in New Mexico was III (a) water. Is that what you told Senator Anderson?

Mr. DEBLER. He was referring primarily to where that water was being used, and the water already was used, and was used at the time of the compact, as I understand it, comes out of III (a).

Senator DOWNEY. Do I understand that you are expressing your opinion the Gila water in New Mexico is III (a) water?

Mr. DEBLER. It is certainly III (a) water, so far as I see it, to the extent that it was in use at the time of the compact.

Senator DOWNEY. Do you apply the same rule to the Gila water in Arizona that was in use at the time of the compact?

Mr. DEBLER. As an engineer I would.

Senator DOWNEY. That is your opinion?

Mr. DEBLER. That is my offhand opinion.

Senator DOWNEY. Is there some dispute about that among the Arizona people?

Mr. DEBLER. I do not know that we really discussed that in any great amount. We have only been talking about the 8,500,000 for the lower basin, and we were not very much concerned whether it was III (a) or III (b) water.

Senator DOWNEY. Mr. Debler, in your statement on page 5, in its conclusion, the results seem rather dismal to me as the Senator from California. Maybe I do not entirely understand your conclusions as far as California is concerned. But assuming the accuracy of your figures here and your various assumptions, how much water would be left for California?

Mr. DEBLER. With this division of water—do you have in mind the middle of page 4?

Senator DOWNEY. No, page 5, your final summation.

Mr. DEBLER. Well, it would be about the same as the middle of page 4, it would be about 3,800,000 of divertible water.

Senator DOWNEY. As a matter of fact, about 3,700,000?

The CHAIRMAN. May I interrupt Senator?

Senator DOWNEY. Please do.

The CHAIRMAN. Look to the middle of page 4. Your statement is the available mainstream water for further use is 6,516,000 acre-feet.

Mr. DEBLER. Yes.

The CHAIRMAN. Arizona's share, 37⅓ percent of that, which you figured would be 2,432,000. Now, if you subtract that from 6,516,000, you get 4,084,000. To whom does that belong?

Mr. DEBLER. That belong to California and Nevada.

The CHAIRMAN. And to Nevada you assign how much?

Mr. DEBLER. The 4 percent, which would be about 260,000.

The CHAIRMAN. So that your conclusion is there is left for California 3,824,000?

Mr. DEBLER. If your subtraction is correct, that is right.

The CHAIRMAN. Well, assuming that it is. I subtracted as well as a lawyer can.

[Laughter.]

The CHAIRMAN. It comes to 3,824,000. I assume if the Senator from California will accept that, we can close these hearings.

[Laughter.]

Senator DOWNEY. The only difficulty is that I could not go back to California, Mr. Chairman, so I would not want to close them, I would rather stay here.

Mr. Debler, you spoke about the moral effect of some statement in one of the congressional acts by which Nevada was bound to 300,000 acre-feet. That was in the proposed contract which was never accepted.

Mr. DEBLER. Yes; that was a figure I put down as the suggested division.

Senator DOWNEY. It is not your suggestion that that has any legal or moral binding effect, does it?

Mr. DEBLER. When you ask for a legal opinion you have to ask somebody else. But, as I recall it, Senator, that was the impression, as of that time, of a fair division of the mainstream water. Whether under today's conditions somebody might have a different idea, I do not know. But at that time that represented what you might call a compromise division of water.

Senator DOWNEY. But it is not in any way legally binding on Nevada?

Mr. DEBLER. That is my understanding.

Senator DOWNEY. I think that is all I will ask, Mr. Chairman.

The CHAIRMAN. Any further questions? Senator McFarland?

Senator MCFARLAND. I don't think I have any questions.

The CHAIRMAN. Do you have another witness?

Senator MCFARLAND. Mr. Carson. Oh, I beg your pardon, I just wanted to make one statement.

There was brought out here the limitation of development in New Mexico. As to that, there is the additional feature that there is a judicial decree on the Gila River; so that, whether proper or not, the decree is there, and it generally establishes water rights on the Gila River?

Well, you are not a lawyer, I should not have asked you that.

Mr. DEBLER. I know that there is such a decree, but I am not sufficiently familiar with it to answer you.

Senator ANDERSON. We could say that we do not like it, either.

Senator MCFARLAND. Well, I credited it to that.

The CHAIRMAN. Will Mr. Carson come forward, please.

STATEMENT OF CHARLES A. CARSON, CHIEF COUNSEL, ARIZONA INTERSTATE STREAMS COMMISSION

The CHAIRMAN. Mr. Carson, you may proceed.

Mr. CARSON. Mr. Chairman, my name is Charles A. Carson. I am chief counsel of the Arizona Interstate Streams Commission. I have prepared and would like to have appear in the record at this point a statement, which I would then like to go through and skip portions as I go along.

This carries out the Arizona idea of the questions and the history of the controversy from the beginning. I do not think it is necessary for me to read it all but I would like it to go in the record as a whole, and then skip over and eliminate a lot of the early history of this matter, and get down to the questions that have come before the committee.

The CHAIRMAN. Is that satisfactory, Senator?

Senator DOWNEY. That is entirely satisfactory.

The CHAIRMAN. Without objection, it will be so ordered.

(The statement referred to is in full as follows:)

STATEMENT OF CHARLES A. CARSON, CHIEF COUNSEL OF ARIZONA INTERSTATE STREAMS COMMISSION

My name is Charles A. Carson. I practice law in, and my home is in, Phoenix, Ariz. I am a member of the firm of Cunningham, Carson, Messinger, and Carson, and have been a member of that firm, formerly known as Cunningham and Carson, for more than 22 years. I have practiced law in Phoenix, Ariz., for more than 25 years. I have served as deputy attorney of Maricopa County, Ariz.; as

city attorney of the city of Phoenix; as a special assistant attorney general of the State of Arizona; and as counsel for the Colorado River Commission of Arizona. I have also served as a special attorney in the Lands Division of the Department of Justice, in connection with acquisition of properties in Arizona for the United States during the war. I also served as a member of the enemy alien hearing board of Arizona during the war. I also served as a member of the board of bar examiners of Arizona, as a member of the commission appointed by the Supreme Court of Arizona to integrate the State bar of Arizona; and I served for some 14 years as a member of the board of governors of the State bar of Arizona, and was twice president of the State bar of Arizona. I am now, and have been since 1934, admitted to practice in the Supreme Court of the United States; I have served on various committees for revision of rules of procedure in Federal and State courts, and on various committees of the American Bar Association.

I began the practice of law in Phoenix in the offices of Judge John C. Phillips, who later became Governor of Arizona, and of Judge W. S. Norviel, who was Arizona's compact commissioner and who signed on behalf of Arizona the Colorado River Compact in 1922. I became very much interested in the Colorado River question at that time; but I was not employed in a professional capacity on the matter until early in 1933. I served as a special assistant attorney general and as counsel for the Colorado River Commission of Arizona from 1933 to 1935. While I was not thereafter employed professionally until the latter part of 1941 or early 1942, I was during all those years at various times called upon for advice to the Colorado River Commission, to the Governor, and to the legislature of Arizona. I was employed by the Colorado River Commission from 1942 until it was abolished by act of the legislature in 1945. Thereafter, I was retained directly by the Governor's office until the present Arizona Interstate Streams Commission was created early in 1948. Since that time, I have been and now am chief counsel for the Arizona Interstate Streams Commission and special attorney for the State of Arizona on Colorado River matters and adviser to the Governor of Arizona on Colorado River matters. However, I am paid for such service only by the Arizona Interstate Streams Commission.

Of course, I have very carefully studied the history of the Colorado River question, and have been active in it since 1933.

I believe it would be helpful if I very briefly reviewed the history of the matter, dividing that history into four periods; first, prior to 1922, when the Colorado River Compact was signed; second, from the signing of the Colorado River Compact to the passage of the Boulder Canyon Project Act in December 1928; third, from the passage of the Boulder Canyon Project Act in 1928 to March 1939, when the Arizona Legislature offered to California and Nevada a compact in the terms prescribed by the Boulder Canyon Project Act; and fourth, from 1939 to date.

Prior to 1900, when Arizona was a sparsely inhabited territory, the California Development Co. obtained rights, good under California law, to divert 10,000 cubic feet per second of the waters of the Colorado River for use in Mexico and the Imperial Valley of California, through the Alamo Canal, which ran through Mexico and back into the Imperial Valley.

The development of the Imperial Valley of California and adjacent portions of Mexico was undertaken by the same promoters as one project. However, in Mexico they were required to organize a Mexican corporation known as the Sociedad de Irrigacion y Terrenos de las Baja California, S. A., all of the stock of which was owned by the original promoters of irrigation in Mexico and the Imperial Valley, and all of the stock of which was later transferred to the officers of the Imperial Irrigation District of California when that district upon its organization took over the property and rights of the California Development Co. Such stock was so held in 1945 by the officers of the Imperial Irrigation District, as testified to by them in the hearings on the treaty with Mexico, which were held before the Committee on Foreign Relations of the United States Senate early in 1945. That company was required by the Mexican Government to and did enter into an agreement with that Government which provided that half of the water carried through the Alamo Canal to which the water rights had been established for diversion in California of 10,000 cubic feet per second, would be delivered for use to irrigate all lands susceptible to irrigation in Lower California in Mexico. Assuming continuous flow, the water thus contracted by the promoters of the Imperial Valley, the obligations and rights of which were taken over by the Imperial Irrigation District of California, required delivery for use in Mexico of 3,600,000 acre-feet of the waters of the Colorado River. The Im-

perial Irrigation District of California, and its predecessors, charged varying sums through the years for rental of the diversion works at Rockwood heading and Hanlon heading and so much an acre-foot for the water delivered for use in Mexico.

That practice continued at least until early 1945, as testified to by Mr. Hewes, the president of the Imperial Irrigation District; Mr. M. J. Dowd, at that time chief engineer and manager of the irrigation district and now a consulting engineer for that district; and Mr. Phil Swing, who was then an attorney representing California interests and who had been attorney for the Imperial Irrigation District.

The provisions concerning the contract with Mexico were presented by Mr. Frank Clayton, attorney for the United States section of the International Boundary Commission, on page 178 of part 1 of the hearings on the treaty with Mexico in 1945, and are matters of record. The testimony of Mr. Swing concerning the sale of water to Mexico is set forth at pages 401, 402, 483 of part 2, of the same hearings.

At that hearing Mr. Hewes produced a copy of the proposal that the Imperial Irrigation District had made to the Mexican Government to sell water to Mexico, by delivery to Mexico through the All-American Canal, which proposal is in the record of the hearings on the Mexican water treaty at pages 1644–1646 of part 5.

The proposal was made in the year 1941; and Mr. Hewes testified that unless the treaty was made reducing Mexico's claim to the waters of the river the Imperial Irrigation District proposed to make some such arrangement with Mexico (p. 1648, pt. 5, Mexican Water Treaty).

In the Arizona Enabling Act, under which Arizona was admitted as a State, the United States reserved all dam sites and rights of way on both sides of the Colorado River across Arizona; and the State, in the constitution adopted, agreed to such reservation.

In 1922, the Colorado River Compact was signed at Santa Fe, N. Mex., with its terms as set out.

HISTORY, 1922–28

Following the signing of the Colorado River Compact, Arizona tried to work out with California and Nevada a tristate compact which would carry out the understanding that had been reached between them before Mr. Norviel signed the compact for Arizona, that immediately after its signing a tri-state compact between California, Nevada, and Arizona would be executed, providing that the million acre-feet of III (b) water set forth in the compact was for the exclusive beneficial consumptive use of Arizona to compensate Arizona for the inclusion of the Gila system in the over-all definition of the Colorado River system, which agreement California refused to make. It is only fair to say that Arizona at that time, and I submit with justification, believed that Arizona was entitled to the use of the waters of the Gila River, and in addition thereto to the use of an amount equal to the use in California of the main stream of the Colorado River. This they believed to be true, and I submit with justification, for the reason that Arizona then had and now has a great deal of excellent land that could be irrigated if the water were available; and in view of the further fact that California contributes practically no water to the Colorado River, and has only some 3,500 square miles in the natural basin of the Colorado River, whereas Arizona contributes large quantities to the Colorado River, and has some 103,000 square miles, practically the entire State, in the natural basin of the Colorado.

During that period various attempts were made to negotiate, and all attempts failed. Then in 1927 at a meeting of the governors of the seven States of the basin, in Denver, Colo., Governor Young of California suggested an informal arbitration between Arizona, California, and Nevada. The four governors of the upper division States, Adams of Colorado, Emerson of Wyoming, Dillon of New Mexico, and Dern of Utah, undertook such informal arbitration; and they made a finding which is set out at page 232 in my testimony on S. 1175, which is a part of the record of this committee, and at page 378 of part 2 on the hearings on H. R. 5434. They recommended settlement, but their recommendation was not accepted by California. It has always been my understanding that it was accepted by the Arizona representatives at that conference. The recommended settlement provided that Nevada should have 300,000 acre-feet, California 4,200,000 acre-feet, and Arizona 3,000,000 acre-feet from the main stream of the Colorado River, and that Arizona should have the exclusive beneficial consumptive use of the Gila River, in addition to the quantities mentioned from the main stream of the River.

It will be noted that the proposed settlement cut down Arizona's claim to main stream water from 3,60,000 acre-feet to 3,000,000 acre-feet. It has been testified in some of these hearings by California witnesses that Arizona agreed to accept that award conditioned only upon a further provision that the waters of the Gila should never be subject to diminution by any treaty demands of Mexico. If that be true, however, that condition was incorporated in the Boulder Canyon Project Act and was accepted by the Congress.

The provisions of section 4 (a) of the Boulder Canyon Project Act were adopted by the Congress from the recommendations made by the four governors of the upper-division States, except that Congress took 200,000 acre-feet from Arizona and added it to California, making the congressional apportionment 300,000 acre-feet to Nevada, 4,400,000 acre-feet to California, and 2,800,000 acre-feet to Arizona. I submit that the provisions of 4 (a) make it clear that such was the intent of Congress, and that Congress required California to accept such division by requiring California as a condition to the effectiveness of the Boulder Canyon Project Act and the construction of the works therein authorized, to adopt the California Self-Limitation Act, which California did adopt in March 1929, by act of its legislature, irrevocably and unconditionally agreeing with the United States, and I say with the Congress of the United States, since the reciprocal legislation amounted to a legislative compact for the benefit of the other States of the basin, made through the agency of the Congress of the United States, "That the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of the act, and all water necessary for the supply of any rights which may now exist, shall not exceed 4,400,000 acre-feet of the waters apportioned to the lower-basin States by paragraph (a) of article III of the Colorado River Compact, plus not more than one-half of any excess or surplus water unapportioned by said compact, such uses always to be subject to the terms of said compact."

HISTORY, 1928–39

Following the passage of the Boulder Canyon Project Act, Arizona filed an action in the Supreme Court of the United States attacking the constitutionality of that act. No allegations concerning the waters of the Gila River were material in that action, and, indeed, California had not at that time, and did not until approximately 1944, to my knowledge, make any claim that beneficial consumptive use of water was not measurable by the resulting depletion of the main stream of the Colorado; so any allegations made in that action or statements in briefs in that action by either side were not material to any questions here presented, and were made without any consideration being given to the questions now raised by California as to whether or not III (b) water is apportioned water to the lower basin, and as to whether or not consumptive use should be measured by depletion of the main stream of the Colorado River, and were not considered in either connection. It is therefore entirely unfair for California now to claim that they relied upon such irrelevant, immaterial, and inadvertent statements on either side.

The Supreme Court upheld the constitutionality of the act, and also specifically upheld the constitutionality of the provisions of section 13 (c) and (d), which provided that all rights-of-way across Federal lands, and remember, that in the Enabling Act and in the Constitution of Arizona the United States had reserved all rights-of-way clear across the State of Arizona on both sides of the Colorado River, for the use of which such rights-of-way were necessary or convenient to the use of the waters of the Colorado River, or for the generation or transmission of electrical energy generated by the Colorado River, should be on the express condition and with the express covenant that the rights of the users of such waters should be subject to and controlled by the Colorado River Compact, and that such conditions and covenants attach and run with the right to use water and attach as a matter of law whether set out or referred to in the instrument evidencing such right-of-way and other privileges from the United States or not.

The Boulder Canyon Project Act is also unique in another particular in that it provided in section 13 (b) that the rights of the United States as well as the rights of those claiming under the United States in or to waters of the Colorado River and its tributaries, shall be subject to and controlled by the Colorado River Compact.

The act is also unique in another respect in that section 5 provides that no person shall have or be entitled to have the use for any purpose of any waters stored in Lake Mead except by contract with the Secretary of the Interior. Section 5 authorizes the Secretary of the Interior, under such general regulations as he may prescribe, to contract for the storage of water in Lake Mead and for the delivery thereof to such points on the river as may be agreed upon.

In 1929 and 1930 further attempts were made to negotiate a compact between Arizona, California, and Nevada, but failed. It is my understanding, although I did not participate in those negotiations and have no personal knowledge thereof, that the only claim there asserted, and which is here asserted by California contrary to the Arizona position, was that the million acre-feet mentioned in article III (b) of the Colorado River compact was unapportioned or surplus water. Another interesting fact in connection with the case that was filed by Arizona attacking the constitutionality of the Boulder Canyon Project Act, 283 U. S. 423, is that notwithstanding the fact that Arizona at that time was disputing the constitutionality of the Act and opposed appropriation for the construction of Hoover Dam, and that California, Arizona, and Nevada had been unable to agree to the terms of the tri-state compact as set out in the Boulder Canyon Project Act, and notwithstanding the fact that Arizona had filed the suit attacking the constitutionality of the act, and California's right to the water set out in the act, the California agencies proceeded to negotiate the California Intrastate Priorities Agreement and negotiated contracts with the Secretary of the Interior, Mr. Wilbur, with his assistant, Northcutt Ely (who now represents California interests), without waiting for the decision of the Court in that case, and moved to dismiss the case.

In my judgment, the Court properly dismissed the case; and the reason it dismissed the case would still prevail in any such case as California now desires to bring. I quote from the decision, next to the last paragraph appearing on page 463 of 283 U. S.:

"When the bill was filed, the construction of the dam and reservoir had not been commenced. Years must elapse before the project is completed. If by operations at the dam any then perfected right of Arizona, or of those claiming under it, should hereafter be interfered with, appropriate remedies will be available. Compare *Kansas* v. *Colorado*, 206 U. S. 46, 117. The bill alleges, that plans have been drawn and permits granted for the taking of additional water in Arizona pursuant to its laws. But Wilbur threatens no physical interference with these projects; and the act interposes no legal inhibitions on their execution. There is no occasion for determining now Arizona's right to interstate or local waters which have not yet been, and which may never be, appropriated. *New Jersey* v. *Sargent*, 269 U. S. 328, 338. This Court cannot issue declaratory decrees. Compare *Texas* v. *Interstate Commerce Commission*, 258 U. S. 158, 162; *Liberty Warehouse Co.* v. *Grannis*, 273 U. S.—: *Willing* v. *Chicago Auditorium Assn.*, 277 U. S. 274, 289–90. Arizona has, of course, no constitutional right to use, in aid of appropriation, any land of the United States, and it cannot complain of the provision conditioning the use of such public land. Compare *Utah Power & Light Co.* v. *United States*, 243 U. S. 389, 403–05."

Following the failure in 1929 and 1930 to reach any agreement with California, and following the decision of the Supreme Court of the United States in 283 United States, Arizona appropriated and spent considerable sums of money in making engineering investigations and studies and reports, the people of Arizona having reached the conclusion prior to that time that it was essential to divert water from the main stream of the Colorado River into central and southern Arizona.

When I was first retained as a lawyer by the Colorado River Commission of Arizona in 1933, I was requested to and did write legal opinions on Arizona's rights to water of the main stream of the Colorado River and possible courses of action to secure those rights. California had for the first time in the negotiations in 1929 and 1930 made the claim that the million acre-feet of III (b) water mentioned in the Colorado River compact was unapportioned by that compact and was hence part of the surplus that could be used in California. I was requested for an opinion, and gave it as my opinion that under the Colorado River compact and the California self-limitation statute, which had been enacted in 1929, California was precluded from claiming any rights in the million acre-feet of III (b) water by the terms of the California self-limitation statute, because in my opinion the million acre-feet of III (b) water was apportioned to the lower basin, although not specifically to Arizona alone.

It will be remembered that California had refused to carry out the understanding of the original compact commissioners that a tri-State compact between California, Nevada, and Arizona would provide that the million acre-feet of III (b) water was for the exclusive beneficial use of Arizona in compensation for the inclusion of the Gila River in the over-all definition of the Colorado River system. The Colorado River Commission of Arizona, while it agreed with my opinion, wanted, if possible, to have that point settled and determined authoritatively by the Supreme Court of the United States. Accordingly, I prepared and filed a bill asking leave to perpetuate testimony of the understanding which had been reached at Santa Fe, N. Mex., before the Colorado River Compact was signed. The Court in the sixth ground of its opinion set forth at pages 358–359 of *Arizona* v. *California*, 292 U. S. 341, held that the III (b) water was apportioned to the lower basin. I quote the sixth ground of the opinion:

"*Sixth.* The considerations to which Arizona calls attention do not show that there is any ambiguity in article III (b) of the compact. Doubtless, the anticipated physical sources of the waters which combine to make the total of 8,500,000 acre-feet are as Arizona contends, but neither article III (a) nor (b) deal with the waters on the basis of their source. Paragraph (a) apportions waters 'from the Colorado River system,' i. e., the Colorado and its tributaries, and (b) permits an additional use 'of such waters.' The compact makes an apportionment only between the upper and lower basin; the apportionment among the States in each basin being left to later agreement. Arizona is one of the States of the lower basin and any waters useful to her are by that fact useful to the lower basin. But the fact that they are solely useful to Arizona, or the fact that they have been appropriated by her, does not contradict the intent clearly expressed in paragraph (b) (nor the rational character thereof) to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone. It may be that, in apportioning among the States the 8,500,000 acre-feet allotted to the lower basin, Arizona's share of waters from the main stream will be affected by the fact that certain of the waters assigned to the lower basin can be used only by her; but that is a matter entirely outside the scope of the compact.

"The provisions of article III (b), like that of article III (a) is entirely referable to the main intent of the compact which was to apportion the waters as between the upper and lower basins. The effect of article III (b) (at least in the event that the lower basin puts the 8,500,000 acre-feet of water to beneficial uses) is to preclude any claim by the upper basin that any part of the 7,500,000 acre-feet released at Lee Ferry to the lower basin may be considered as surplus because of Arizona water which are available to the lower basin alone. Congress apparently expected that a complete apportionment of the waters among the States of the lower basin would be made by the subcompact which it authorized Arizona, California, and Nevada to make. If Arizona's rights are in doubt it is, in large part, because she has not entered into the Colorado River compact or into the suggested subcompact."

It is held that there was no ambiguity and that it was apportioned water to the lower basin by the express language of the compact and the Boulder Canyon Project Act.

It is therefore clear that it is not any part of the unapportioned or surplus water, and that California by adopting her Self-Limitation Act has forever excluded herself from claiming any part of it.

During that period of 1933–35 I was also requested for a legal opinion as to whether or not Arizona could maintain an action in the Supreme Court of the United States seeking an equitable apportionment of the waters available to the lower basin. I gave it as my opinion that Arizona could not do so because she was not making use of any waters upon which the jurisdiction of the Court might rest. In other words, Arizona could not allege any injury or threatened injury to any existing use of water: and hence there was no justiciable controversy. I therefore advised against and did not participate in the case of *Arizona* v. *California* reported in 298 U. S. 558. In that case California objected to the filing of the bill on two grounds. As stated by the Court:

"* * * The returns raise numerous objections to the sufficiency of the proposed bill of complaint, only two of which we find it necessary to consider. One is that the proposed bill fails to present any justiciable case or controversy within the jurisdiction of the Court. The other is that the United States, which is not named as a defendant and has not consented to be sued, is an indispensable party to any decree granting the relief prayed by the bill.

"The relief sought is: (1) That the quantum of Arizona's equitable share of the water flowing in the Colorado River, subject to diversion and use, be fixed by this

Court, and that the petitioner's title thereto be quieted against adverse claims of the defendant States. (2) That the State of California be barred from having or claiming any right to divert and use more than an equitable share of the water flowing in the river, to be determined by the Court, and not to exceed the limitation imposed upon California's use of such water by the Boulder Canyon Project Act, 45 Stat. 1057, and the act of the California Legislature of March 4, 1929, Ch. 16, Stats. of Calif., 1929, p. 38. (3) That it be decreed that the diversion and use by any of the defendant States of any part of the equitable share of the water decreed to Arizona pending its diversion and use by her shall not constitute a prior appropriation or confer upon the appropriating State any right in the water superior to that of Arizona. (4) That any right of the Republic of Mexico to an equitable share in any increased flow of water in the Colorado River made available by works being constructed by or for California, shall be supplied from California's equitable share of the water, and that neither petitioner nor the defendant States other than California shall be required to contribute to it from their equitable shares as adjudicated by the Court.

"The proposed bill thus, in substance, seeks a judicial apportionment among the States in the Colorado River Basin of the unappropriated water of the river, with the limitation that the share of California shall not exceed the amount to which she is limited by the Boulder Canyon Project Act and by her statute, and with the proviso that any increase in the flow of water to which the Republic of Mexico may be entitled shall be supplied from the amount apportioned to California. Our consideration of the case is restricted to an examination of the facts alleged in the proposed bill of complaint and of those of which we may take judicial notice."

The Court upheld both grounds of the motion to dismiss referred to in the above quotation; that is, the Court held that there was no justiciable controversy because there was no injury or threat of injury. And it also held that in that character of action seeking an equitable apportionment for future use the United States is an indispensable party defendant and was not joined. The Court in the course of its opinion said (p. 570):

"The decree sought has no relation to any present use of the water thus impounded which infringes rights which Arizona may assert subject to superior but unexercised powers of the United States. Cf. *Wisconsin* v. *Illinois*, 278 U. S. 367; see *Arizona* v. *California*, supra, 464; *United States* v. *Arizona*, supra, 183, * * *"

In the meantime, Hoover Dam was rapidly nearing completion, and we in Arizona were very much concerned over the increase in the use of waters in Mexico made possible with the encouragement, assistance, and to the financial benefit of the Imperial Irrigation District of California.

Arizona had tried in 1925 and 1927 to get the United States to notify Mexico that the United States would never recognize any right in Mexico to use any greater quantity of water of the Colorado River than Mexico was then using. California refused to join in that effort.

Again in 1933, Arizona made an effort to persuade the United States to notify Mexico that no greater use of the waters of the Colorado River than Mexico was then making would be recognized by the United States. Again California refused to join in the effort, and Arizona was on both occasions unable to persuade the State Department to give Mexico any such notice.

Finally, the people of Arizona recognized that Arizona was in grave jeopardy, mainly from the increasing and potentially very large uses of water which would be made in Mexico to the financial profit of the Imperial Irrigation District of California, and also by virtue of the fact that Arizona had been unable to secure the construction of any works in Arizona for the use of any water of the Colorado River and California was building works to take more than the 4,400,000 acre-feet of apportioned water to which California had forever limited herself. We realized that by virtue of the decision of the Supreme Court of the United States in 292 U. S. 341, the million acre-feet of III (b) water had been held to be apportioned water and hence no part of the surplus. Therefore, by the California Self-Limitation Act California was precluded from claiming any part of it. Arizona recognized that it would not be able to get any water or to utilize water from the main stream of the Colorado River under conditions laid down by Congress until it ratified the Colorado River compact. Arizona desired to make the tri-State compact between Arizona, California, and Nevada authorized by the Boulder Canyon Project Act. Accordingly, I helped write chapter 33 of the session laws of Arizona of 1939, which was adopted by the legislature and approved by the Governor March 3, 1939.

By that time California had begun to assert, for the first time so far as I am aware, that the word "and" in the second paragraph of section 4 (a) of the Boulder Canyon Project Act was not a conjunction, and therefore did not mean "in addition to." So in the 1939 act we made it clear that in our opinion the word "and" in the second paragraph of section 4 (a) of the act did mean "in addition to."

For purposes of comparison, the provisions of article III of the tri-State compact offered by the Legislature of Arizona to California and Nevada is here set out as follows:

"Article III

"(a) The aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the state of California, including all uses under contracts made under the provisions of the Boulder Canyon Project Act and all waters necessary for the supply of any rights which may now exist, shall not exceed four million, four hundred thousand acre-feet of the waters apportioned to the Lower Basin States by paragraph (a) of Article III of the Colorado River Compact, plus not more than one-half of any excess or surplus waters unapportioned by said Colorado River Compact.

"(b) Of the seven million, five hundred thousand acre-feet annually apportioned to the Lower Basin by paragraph (a) of Article III of the Colorado River Compact, there is hereby apportioned annually to the state of Nevada three hundred thousand acre-feet and annually to the state of Arizona two million, eight hundred thousand acre-feet for the exclusive beneficial consumptive use by said states of Nevada and Arizona, respectively, in perpetuity.

"(c) The state of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River Compact.

"(d) In addition to the water covered by paragraphs (b) and (c) hereof, the state of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of the state of Arizona in perpetuity.

"(e) The waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico, but if, as provided in paragraph (c) of Article III of the Colorado River Compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said Colorado River Compact, then the state of California shall and does mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the Lower Basin.

"(f) Neither the states of Arizona, California, nor Nevada will withhold water nor require the delivery of water which cannot reasonably be applied to domestic and agricultural uses.

"(g) All the provisions of this compact or agreement shall be subject in all particulars to the provisions of the Colorado River Compact."

I next set out the exact language of section 4 (a) of the Boulder Canyon Project Act, which is as follows:

"SEC. 4. (a) This act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this act, and no water rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claim to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River Compact, mentioned in section 13 hereof, and the President by public proclamation shall have so declared, or (2) if said States fail to ratify the said compact within six months from the date of the passage of this act then, until six of said States, including the State of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and shall have approved said compact without conditions, save that of such six-

State approval, and the President by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this act and all water necessary for the supply of any rights which may now exist, shall not exceed 4,400,000 acre-feet of the waters apportioned to the lower basin States by paragraph (a) of Article III of the Colorado River Compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

"The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (*a*) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (*c*) of article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which can not reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada."

I leave it to the committee that the "and" before (3) as set out in the act and hereinbefore quoted means that it was the intent of Congress that Arizona should have the use of 2,800,000 acre-feet of main stream water plus one-half of any excess or surplus waters unapportioned by the Colorado River compact which might be available in the lower basin, and in addition thereto that the State of Arizona should have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State.

The legislature of Arizona made a firm offer of such compact setting out its terms and provided that if it were approved within a total of 2 years thereafter the Colorado River compact should thereupon be and become by the terms of the said chapter 33 ratified for and on behalf of the State of Arizona.

I did not participate in any negotiations with California following the passage of that act, but I am informed that California refused to make such compact, and that no question of any claim that beneficial consumptive use of water should be measured in any way other than by the resulting depletion of the Colorado River, and no question of any claim that California should not bear pro rata share of evaporation losses were brought up, which points are urged by California witnesses now.

1939 TO DATE

Following California's refusal to make such compact, I was requested by the Colorado River Commission of Arizona and by the Governor of Arizona, under an act of the legislature authorizing it, to attempt to negotiate with the Secretary of the Interior a contract for the delivery of Arizona's share of main stream water for use in Arizona, which act provided that upon the ratification of such a contract the Colorado River compact would be ratified by Arizona. I had attempted to negotiate such a contract in 1933–35. But California and the other basin States had opposed it on the ground that Arizona was not a party to the Colorado River

compact. California did not advance any theory as to the measurement of beneficial consumptive use other than by the resulting depletion of the Colorado, nor did it advance any claim that it should not bear the proportionate share of evaporation losses caused by storage of water for her benefit.

After long negotiations in the committees of 14 and 16, which at that time represented all seven States of the Colorado River Basin, and at all of the meetings at which California interests were well represented, the contract to be executed by the State of Arizona and the Secretary of the Interior was approved by all of the States of the basin except California. Nevada aided Arizona in negotiating that contract as did the other States of the basin, and Arizona helped Nevada negotiate with the approval of the other States the Nevada contract.

That contract is in evidence before you and is incorporated in the hearings on S. 1175 at page 240. It was signed on February 9, 1944; and during the same month it was ratified by the legislature of the State of Arizona. The Colorado River compact was also ratified by that legislature.

THE MEXICAN WATER TREATY

The Mexican Water Treaty was negotiated by the State Department and Mexico after numerous conferences with the committees of 14 and 16 representing the seven States of the Colorado River Basin; and it was signed February 3, 1944. The States of Colorado, Wyoming, Utah, New Mexico, and Arizona supported the treaty. California opposed, and was joined by the State of Nevada after the signing of the treaty.

In 1943 Mexico had increased her uses of the waters of the Colorado River, with the encouragement and aid, and to the financial profit of the Imperial irrigation district of California, to 1,800,000 acre-feet per annum. Our engineers stated that there are approximately a million acres of land in Mexico which could be readily irrigated with the water of the Colorado River; and we felt that unless an over-all all-time limit to the Mexican claims of the Colorado River to the lowest possible limit, could be fixed by treaty with Mexico immediately Mexico might increase her uses to some 5 or 6 million acre-feet of water, and then invoke the provisions of the Inter-American Treaty of Arbitration, which had been ratified in 1935. We felt that unless immediate settlement was made by treaty and agreement with Mexico, Mexico might at some future time assert claim to the quantity of water which she was using at such future time.

By the year 1940 Hoover Dam had been completed and was filled. In 1941, according to the engineers of Arizona, the Colorado River waters flowed across the Mexican border in the quantity of 12,891,900 acre-feet. In 1942 it was in the amount of 11,748,900 acre-feet; and in 1943, 10,667,200 acre-feet. It was back up close to the run-off prior to the construction of Hoover Dam, and Mexico was rapidly increasing her uses.

I testified for Arizona on the treaty hearings before the Foreign Relations Committee in 1945 (pp. 248–307). I filed in that hearing a condensed statement of Arizona's position, which appears on pages 301–307 of volume 1. During that same hearing Mr. Phil Swing, representing California interests, testified on pages 401, 402, and 438 of volume 2. Mr. M. J. Dowd, chief engineer and manager of the Imperial irrigation district at that time, testified on page 713, volume 3, of that hearing; and Mr. Evan T. Hewes, president of the Imperial irrigation district, testified on pages 1644–1652 of volume 5 of the hearings, as to the revenues that the Imperial irrigation district and its subsidiary in Mexico obtained through the delivery of water of the river to Mexico. Mr. Hewes produced and there is in the record at page 1644 of volume 5 a proposal made by the Imperial irrigation district to the Mexican Government on its own behalf, and on behalf of its subsidiary in Mexico, dated June 11, 1941, for a further arrangement for the delivery by the Imperial irrigation district and its Mexican subsidiary of water of the Colorado River for use in Mexico. On page 1652 of volume 5, Mr. Frank Clayton, attorney for the United States section of the International Boundary Commission (now the International Boundary and Water Commission) gave a translation and analysis of the proposal, which indicated that under the plan set out in the proposal the Imperial irrigation district would receive an annual payment, for 20 years, of approximately $470,000, and thereafter in perpetuity approximately $340,000 a year; and that under plan No. 2 in the proposal of the Imperial irrigation district it would receive approximately $628,000 a year.

Mr. Hewes stated on page 1648 of volume 5 of the hearings, in answer to question by Senator Austin, that if the Mexican Water Treaty were not ratified the Imperial irrigation district would make some such arrangement with Mexico.

In the Seventy-ninth Congress and in the Eightieth Congress California interests introduced bills, which, in my judgment and in the judgment of the Colorado River Basin States Committee and I believe in the judgment of the State Department and of the Interior Department, would have the effect of rendering nugatory and abrogating the Mexican Water Treaty, and thus releasing Mexico from the all-time limit placed upon her claim to the waters of the river by that treaty.

I do not know whether such a bill has been introduced in the Eighty-first Congress; I am informed, however, that the Imperial irrigation district is trying to secure by other means the control of the running of water through the All-American Canal to Mexico.

In 1944 before the committee of 14 and 16 and in the hearings on the Mexican treaty before the Senate Foreign Relations Committee in 1945, it was openly argued by some of the representatives of southern California interests that if that treaty were ratified they would bring an action in the Supreme Court of the United States to set aside the Colorado River compact and the California Self-Limitation Act. None of the representatives of the other States believed that they could be successful in any such action.

In the hearings on the Gila reauthorization bill before the House Committee on Irrigation and Reclamation, California still persisted, in spite of the opinion of the Supreme Court of the United States in 292 U. S. 341, to state that the million acre-feet of III (*b*) water was unapportioned and hence part of the surplus, in which California could have an interest, notwithstanding the provisions of the California self-limitation statute. California also presented its argument that resulting depletion of the Colorado River was not the proper method of measuring beneficial consumptive use of the water as between States, and further presented its argument that California should not bear its proportionate share of the reservoir losses caused by the storage of water for its benefit.

In 1946 shortly after the hearings on the Gila reauthorization bill, California withdraw from the committees of 14 and 16, which for many years had been the forum for discussion of the Colorado River matters between the States of the basin; and California severed diplomatic relations with the States of the basin. The name of the committee was changed to the Colorado River Basin States Committee. Shortly thereafter, Nevada followed California by withdrawing from the committee severing diplomatic relations with the remaining five States of Arizona, Colorado, Wyoming, Utah, and New Mexico.

It was true that from 1933 to 1937, when the Colorado River Board of California was created, that southern California men representing one or another of the California agencies of southern California which claimed rights in the Colorado River, appeared at all interstate meetings concerning the river; and spoke in the interests of their respective agencies.

In 1937 the Legislature of California created the Colorado River Board of California, and restricted its membership to representatives of the California agencies. The agencies were the Palo Verde irrigation district, the Imperial Valley district, Coachella Valley County water district, the metropolitan water district of southern California, the department of water and power of the city of Los Angeles, and the city of San Diego. It is my understanding that the representatives of those agencies who signed the intra-State priorities agreement in California, are still acting in the interests of their respective agencies and trying to carry out their interagency priorities agreement which was signed by them on August 18, 1931; and that they feel bound to each other by that agreement, although they do not apparently feel bound by the California self-limitation statute.

Later, after having, in my opinion, somewhat belatedly determined that they should not bring an action attacking the validity of the Colorado River compact and the California self-limitation statute they gave lip-service to those documents; and yet by strained constructions and twisting of words, they tried to avoid their plain meaning. Therefore, they have thought up the strained constructions and distortions which are now being presented to Congress as substantial controversies requiring immediate adjudication, in spite of the solemn agreements of their State and the plain meaning of those agreements.

The late Gov. Sydney P. Osborn, who was Governor of Arizona from 1941 until the last of May 1948 when he died, told me that he many times during the course of his gubernatorial career tried to talk to Gov. Earl Warren, of California, about Colorado River matters, but that he was always informed in those oral conversations with Governor Warren that he would not discuss it, that Arizona

would have to see the Colorado River Board of California, every member of which represents one of the southern California agencies—which apparently feel bound to one another rather than by the solemn agreements of the State of California.

I myself tried to talk to Governor Warren as the representative of Arizona one time at the Governors conference in Seattle, but he would not discuss the Colorado River or the position of California or of Arizona.

California witnesses have called attention to two letters, one by Gov. Earl Warren to Governor Osborn, and the other Governor Osborn's answer thereto. They fail to refer to the whole series of letters exchanged between our two Governors. There were six letters in the series, which are set forth on pages 229–233 of the hearings on S. J. Res. 145 before a subcommittee of this committee in May of last year and on pages 467–472 of the hearings on H. J. Res. 225. I request that the committee read the whole correspondence where Governor Warren himself, over his own signature, completely refutes the statements in the press and the inferences of representatives of these southern California interests, that Governor Osborn would not talk with Governor Warren.

Governor Osborn and Governor Warren had worked together in many matters of mutual interest to their respective States at numerous Governors' conferences; and I believe the two men were personal friends and respected one another. I am sure that Governor Osborn liked, respected, and had confidence in the ability and fairmindedness of Governor Warren.

So when he received Governor Warren's letter of March 3, he hoped that it meant that Governor Warren was proposing to reassert the perogatives of the office of Governor of California, and take a personal interest in and endeavor to work out the California-Arizona situation which, as we see it, has been created by the failure of the representatives of the southern California agencies to respect the commitments made by the good people and the sovereign State of California.

Governor Osborn was fairminded, a student of Colorado River matters, and a great Governor. Neither he nor the people of Arizona had, nor have, any desire to hurt California or its people. Arizona and California are neighbors; they are part of the same trade territory. California furnishes our best market, and Arizona is one of California's best customers.

Governor Osborn was always forthright, frank, and honest in his dealings.

On account of his personal relations with Governor Warren and his confidence in Governor Warren, in spite of the fact that Governor Warren had not set forth the basis of any claim that he intended to make for California, Governor Osborn believed that he owed Governor Warren the duty of frankness, and that if they could get to discussing the matter on the high level of Governors, he could show Governor Warren that Arizona's position was correct. Accordingly, he anwsered Governor Warren's letter of March 3, 1947, on March 12, 1947. Governor Warren did not answer Governor Osborn's letter until May 16, 1947. Governor Osborn answered that letter on May 23, 1947, but received no reply. Governor Osborn wrote Governor Warren again after waiting until October 10, and Governor Warren answered under date of October 16. In order to make this matter clear, I desire now to read to you those letters. They appear in the hearings on S. J. Res. 145 at pages 228 to 233, and in the hearings on H. J. Res. 225 at pages 467–472. These southern California gentlemen present to these respective committees only the first two of these letters.

You will note that Governor Warren never did take issue with any fact, statement, or conclusion of Governor Osborn's, or set forth the quantity of water that California claimed or intended to claim; or the basis for such claim.

The committees of 14 and 16 had been organized as a governors' committee to be composed of two men from each State, named by and representing directly their respective governors. So I was surprised when the letters withdrawing California representatives from the committee was presented by the Colorado River Board of California. The committee immediately changed its name to the Colorado River Basin States Committee, and requested Governor Warren, of California, to persuade the California men who had been participating in the work of the committee to return to the committee; or if they refused, to appoint to the committee other California representatives. Governor Warren declined.

At the hearings on S. 1175 in the summer of 1947 these representatives of Southern California agencies enlarged upon the arguments they had made in the hearings on H. R. 5434 the preceding year. I, for Arizona, presented the questions raised by California to the Colorado River Basin States Committee. After long and mature consideration, the Colorado River Basin States Com-

mittee at a meeting at Salt Lake City, Utah, on the second day of October unanimously adopted the statement which appears on page 155 of the hearings on Senate Joint Resolution 145, and which I would like to read to you at this time.

The Upper Colorado River Basin Compact Commission had been negotiating since July 1946 and it adopted the principles enunciated in the statement which I have just read to you. The Upper Colorado River Basin Compact was signed in late 1948, and has now been ratified by each of the five States and consent thereto has been given by the Congress. The Colorado basin committee in the statement of principles I have just read to you found unanimously that the million acre-feet mentioned in article III (b) of the Colorado River compact is apportioned to the lower basin, making the total apportionment to the lower basin 8,500,000 acre-feet; and the lower basin is entitled to deplete the flow of the Colorado River at the international boundary by 8,500,000 acre-feet. It was adopted by the committee on the principle that evaporation and reservoir losses should be divided on a ratable and proportionate basis among projects served by such reservoir. Water stored for future use is on the some basis as diverted water.

In the brief filed in opposition to Senate Joint Resolution 145, appearing in the printed record of those hearings at pages 157–179, and at pages 265–287 of hearings on House Joint Resolution 225, the Colorado River Basin States Committee, composed of Judge Clifford Stone and Frank Delaney, for the State of Colorado; L. C. Bishop and H. Melvin Rollins, for the State of Wyoming; William R. Wallace and Grover R. Giles for the State of Utah; Fred E. Wilson and John H. Bliss for the State of New Mexico; and Nellie T. Bush and Charles A. Carson for the State of Arizona, with additional members on the subcommittee to oppose litigation, including Judge J. A. Howell for the State of Utah; Martin A. Treet for the State of New Mexico; Norman B. Gray, attorney general of Wyoming; and Jean S. Breitenstein for the State of Colorado, made the flat statement:

"* * * Taking into consideration that Arizona is entitled to all the uses of the Gila River as set out in this paragraph (meaning the second paragraph of sec. 4 (a) of the Boulder Canyon Project Act), this necessarily means that Arizona is entitled in addition thereto to 2,800,000 acre-feet per annum. Which means, further, that there is ample water for the central Arizona project because California does not and cannot assert that that project will take more water than that."

I would like to read a few paragraphs of that brief, beginning on page 174 of the hearings on Senate Joint Resolution 145 and on page 282 of the hearings on House Joint Resolution 225:

"So far as the Lower Basin States are concerned, as we have already shown, the United States by the enactment of the Boulder Canyon Project Act has already determined that two out of the three principal contentions now made by California cannot be successfully made and that the United States cannot now countenance California making them. So far as the United States is concerned they are settled as fully and completely as if there were an express compact as to them between the Lower Basin States and the United States and between those states. By virtue of Section IV (a) of the Boulder Canyon Project these are—

"'(1) That of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of Article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Coolrado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico.'

"As already pointed out, these provisions of IV (a) dispose completely of California's contention with respect to III (b) water and what is meant by the beneficial consumptive use of water so far as the Gila River is concerned. Taking into consideration that Arizona is entitled to all the use of the Gila River as set out in this paragraph, this necessarily means that Arizona is entitled in addition thereto to 2,800,000 acre-feet per annum which means, further, that there is ample water for the Central Arizona Project because California does not and cannot assert that that project will take more water than that. In

other words, by virtue of Section IV (a) of the Boulder Canyon Project act the United States has said to the Lower Basin States that these four items are so settled that there need be no compact concerning them, and if you do make any compact as to any other differences there may be between you, if any such exist, such compact must contain these provisions and be subject to these limitations. This so far as the Nevada-California brief is concerned, and as we have before stated, it must be assumed that that brief states as strongly as can be stated California's position, leaves only one dispute of any consequence as between California and Arizona, namely, whether California shall be required to bear its proportionate share of the evaporation loss in Lake Mead.

"As we have already shown, that cannot now give rise to a justiciable controversy before the Court, * * *"

It seems to me that the arguments here advanced by California are fully, completely, and devastatingly answered by that portion of that brief which I have read.

I testified very fully before this committee and its subcommittee on S. 1175 and Senate Joint Resolution 145, and before the House committee on House Joint Resolution 225, and I do not believe it is necessary here to repeat its arguments, because I understand that the full and complete record of the hearings on Senate Joint Resolution 145 and S. 1175 are before this committee for consideration without reprinting. I do believe that the statements made by the witnesses in favor of S. 1175 in opposition to Senate Joint Resolution 145 are full, complete, and unanswerable.

PRESENT HEARINGS

It has been argued by the representatives of the southern California agencies in the hearings before this committee on S. 75 and more fully in the hearings before the Public Lands Committee on H. R. 934 and H. R. 935, which have been proceeding simultaneously, that Congress does not have the power or jurisdiction, for any purpose, to construe or interpret the Colorado River compact; and therefore that Congress is helpless to determine the question whether or not, in its judgment, there is water legally available for the central Arizona project, for the purpose of the authorization bill. They have argued that consideration of that question by the Congress is precluded and barred, and that the only tribunal having jurisdiction to determine the question of the availability of water for the project is the Supreme Court of the United States.

However, while some of their witnesses have been pressing such arguments in the legislative committees, Mr. James H. Howard, general counsel for the Metropolitan Water District of Southern California, presented a statement before subcommittee No. 3 of the House Committee on the Judiciary in a hearing on House Joint Resolution 3 and similar resolutions, all of which are companion to Senate Joint Resolution 4, being considered by your committee, in which he conceded that Congress did have such power to determine the availability of water for a project for the legislative purpose of authorizing a project. Mr. Howard stated that in making contracts with the Secretary of the Interior the southern California agencies had relied upon immaterial and irrelevant allegations in the bill and statements in the pleadings in *Arizona* v. *California*, 283 U. S. 423. I thought that Mr. Howard was too careful a lawyer to rely upon such statements, and I checked dates. I find that he must be in error because the bill was not filed in that case until October 13, 1930. I find in the Hoover Dam contracts, by Wilbur and Ely, published in 1933, copy of a contract for electrical energy executed by the United States and the Metropolitan Water District of Southern California on April 24, 1930, and that on April 26, 1930, it executed a contract for the delivery of water by the United States to it. Both of said contracts were executed nearly 6 months before the Arizona bill of complaint was filed; so Mr. Howard must be mistaken. It is Arizona's view that the questions raised by California are completely and conclusively settled by the Boulder Canyon Project Act, the California self-limitation statute, the Colorado River compact, and the Arizona contract, with the one possible question of who shall bear reservoir losses.

In that connection, it should be remembered that that question cannot arise probably for 100 years, or until the upper basin has completely utilized all of its water and all surplus has disappeared and there occurs a shortage of water available for delivery from Lake Mead. If that time should ever arise, it is in the far, dim, and distant future; and as is the universal practice in the West, deliveries would be curtailed proportionately. In any event, it cannot now give rise to a justiciable controversy, because it may never happen. If there should be such a shortage, and it may never happen, that California should use all of the

water conceivably usable by her, and Arizona and Nevada should use all of the water set aside for them, deliveries to them would necessarily be reduced proportionately, in accordance with well-recognized principles of equity.

SITUATION AS TO UTAH AND NEVADA

I would like to touch briefly upon the situation of Utah and Nevada and their utilization of their shares of the waters of the Muddy River, the Virgin River, and Kanab Creek, in the lower basin. The Virgin River rises in Utah, flows through Arizona, thence through Nevada where it enters Lake Mead. The Muddy River is, as I understand it, entirely within the State of Nevada. Kanab Creek rises in Utah, and flows into Arizona in the lower basin. It appears to us in Arizona that insofar as Nevada and Utah are concerned, and their rights to use water of those tributaries is concerned, their best interests require that the beneficial consumptive use of water be measured by the resulting depletion at the mouths of those tributaries, as Arizona contends that it should be measured and as Utah has agreed that it should be measured in the Upper Colorado River Basin Compact. Of course, Utah cannot properly take one position in the upper basin and a contrary position in the lower basin. However, all the tributaries are wasting streams, as is the Gila River in Arizona and New Mexico. By measuring beneficial consumptive use by the resulting depletion at the mouths of the various tributaries, all users of waters from those tributaries can use greater quantities of water than they could under the California theory of measurement of beneficial consumptive use at points of use, without regard to the effect upon the streams. Therefore, under the Arizona theory that is given above, they can use more water than they could under the California theory.

It appears to us that Nevada's best interests require that Nevada stand with Arizona upon the proposition that reservoir losses should be borne ratably and proportionately by those benefiting from the storage of water for future use, which makes possible such evaporation losses.

The Boulder Canyon Project Act and the California Self-Limitation Act provide "that the aggregate annual consumptive use (diversions less returns to the river) of and from the Colorado River for use in the State of California * * * shall not exceed 4,400,000 acre-feet.

It will be noted that the Boulder Canyon Project Act and the California Self-Limitation Act do not say water diverted into California but diverted for use in the State of California.

Section 5 of the Boulder Canyon Project Act authorized the Secretary of the Interior, under such general regulations as he may prescribe, to contract for the storage of water in the reservoir and the delivery thereof.

The Secretary did provide in the metropolitan water district contract and in the San Diego contract for storage of water in Lake Mead and delivery thereof to such agencies. In their contracts giving them the right of such storage, it is provided as follows:

"* * * *Provided*, That accumulations shall be subject to such conditions as to accumulation, retention, release, and withdrawal as the Secretary of the Interior may from time to time prescribe in his discretion, and his determination thereof shall be final; *Provided further*, That the United States of America reserves the right to make similar arrangements with users in other States without distinction in priority, and to determine the correlative relations between said district and/or said city and such users resulting therefrom."

It therefore seems clear to me that the California agencies and the Secretary contemplated in such provisions in accordance with equity, which would require, as is the practice throughout the West, that reservoir losses be shared ratably and proportionately, if that should ever become necessary.

Arizona in the water-delivery contract has by contract with the United States, for the benefit of Nevada, recognized the right of Nevada to use 300,000 acre-feet of water; and for the benefit of Utah has recognized the right of Utah to equitable shares of the water in the lower basin tributaries to which Utah has access. That share has not yet been agreed upon; so for the purposes of this bill Arizona, in her calculations, has calculated that Utah might be able to use all the water which the Bureau of Reclamation estimates is the total ultimate possible use in Utah, and has deducted the quantities calculated by the Bureau for use in Utah and 300,000 acre-feet for use in Nevada, from the total of the water apportioned to the lower basin, before calculating the quantity available to Arizona.

Arizona has advised both Utah and Nevada that when they are ready to do so Arizona is prepared to negotiate a compact with them, apportioning the water of the Virgin River and Kanab Creek, and if Nevada desires, the waters of the Big Muddy for use in the States through which such tributaries flow, in such a manner that all of the water of said tributaries, to the greatest extent possible, would be utilized in such tributary basins without regard to the effect of such utilization on the flow of the main stream of the Colorado River, whether or not California should join in such a compact.

No parts of the three States through which such tributaries flow have access to any water except that flowing in such tributaries.

SITUATION AS TO NEW MEXICO

Likewise, Arizona has contracted with the United States to recognize the rights of New Mexico to equitable shares of the water apportioned and unappropriated in the lower basin. Those shares have not yet been fixed in amount; but for the purpose of calculating its water supply for the central Arizona project, Arizona has deducted from the quantity of water apportioned to the lower basin the ultimate possible uses in New Mexico, as estimated by the Bureau of Reclamation. That estimate, of course, is not binding on either of the States; but it is the closest approximation available to us at this time.

The water rights of the Gila River, as between Arizona and New Mexico, have been established by a Federal court decree, over which, of course, the State of Arizona has no control. The waters of the Gila River affected by that decree are fully appropriated, and rights are definitely settled, so that, as Arizona sees it, the only chance for an adequate supplementary supply of waters to lands now or heretofore irrigated along the Gila River, in either New Mexico or Arizona, is by the authorization of the central Arizona project; the bringing in of waters from the main stream of the Colorado River to supply lower lands, mainly in Pinal County, Ariz.; and by an exchange, to release waters of the Gila River to which those lands have decreed rights to lands upstream in New Mexico and the upper valleys of Arizona, and then to provide for storage for storage in the upper Gila River in New Mexico to store a sufficient quantity of the waters of the Gila River to provide the adequate supplementary supply for lands now or heretofore irrigated in the upper valleys of Arizona and below the dam site in New Mexico.

The best interests of New Mexico in the lower basin coincide with the interests of Arizona, because all the tributaries in the lower basin are wasting streams. If beneficial consumptive use is measured by the resulting depletion at the mouths of those tributaries, larger quantities of water could be used in New Mexico than if beneficial consumptive use of the waters were attempted to be measured at points of use, as contended by California.

REBUTTAL

I would like very briefly to rebut some arguments here made by spokesmen for California interests, very much as I did in the hearings on S. 1175, beginning at page 481.

1. It is argued that the 1,000,000 acre-feet of water mentioned in article III (b) of the Colorado compact is not apportioned to the lower basin.

I submit that the compact itself shows it is apportioned water; that the evidence in this record, including the testimony of Mr. Meeker, the statements of Mr. Carpenter, Mr. Hoover, Mr. Norviell, Mr. Lewis, and Governor Campbell, clearly disclose that the negotiators of the compact so regarded it and that the Members of Congress so regarded it when they approved the compact; and that the Supreme Court of the United States has held it to be apportioned water (*Arizona* v. *California*, 292 U. S., p. 341).

The particular ground of the decision to which I desire to call attention is the sixth ground of the decision reported on page 358.

2. It is argued that beneficial consumptive use is not measured by depletion of the Colorado River.

I submit that the negotiators of the compact were dealing solely with water flowing in a surface stream and that there is no way to measure beneficial consumptive use of water flowing in a surface stream except by the resulting depletion.

I further submit that article III (d) of the compact shows that the negotiators of the compact used depletion as the measure of consumptive use.

I further submit that the Boulder Canyon Project Act, the California Limitation Act, and the Arizona contract measure consumptive uses by the resulting depletion of the Colorado River.

The Arizona contract is in this record.

3. It is argued that reservoir evaporation losses are chargeable solely to Arizona; that California bears no part of them.

I submit that when water is stored in on-stream reservoirs or off-stream reservoirs, it is in equity diverted from the stream, and I further submit that equity requires that all parties benefiting from storage of the water should bear ratably evaporation losses caused by such storage.

I further submit that section 8 of the contract between the United States and the metropolitan water district of southern California is as follows:

"SEC. 8. So far as the rights of the allottees named above are concerned, the Metropolitan Water District of Southern California and/or the City of Los Angeles shall have the exclusive right to withdraw and divert into its aqueduct any water in Boulder Canyon Reservoir accumulated to the individual credit of said district and/or said city (not exceeding at any time 4,750,000 acre-feet in the aggregate) by reason of reduced diversions by said district and/or said city: *Provided*, That accumulations shall be subject to such conditions as to accumulation, retention, release, and withdrawal as the Secretary of the Interior may from time to time prescribe in his discretion, and his determination thereof shall be final: *Provided further*, That the United States of America reserves the right to make similar arrangments with users in other States without distinction in priority, and to determine the correlative relations between said district and/or said city and such users resulting therefrom."

There is incorporated in the appendix of the hearings on S. 1175 the contract between the United States and the metropolitan water district of southern California, pages 209 to 306, inclusive, of the Hoover Dam contracts by Wilbur & Ely of 1933.

It is, therefore, clear that both the metropolitan water district and the Secretary of the Interior anticipated ratable sharing of such evaporation losses.

Mr. CARSON. With that understanding, I have shown on the first page my experience as a lawyer and my employment by the Arizona Interstate Streams Commission. I am also now special attorney for the State of Arizona on Colorado River matters and adviser to the Governor of Arizona on Colorado River matters. However, my sole compensation for services comes from the Arizona Interstate Streams Commission.

I have carefully studied the history of this Colorado River question and have been active in it since 1933. So I hope the committee will believe that I recognize my responsibilities and duties, not only to the people of Arizona but to the Congress of the United States, and that I firmly believe everything that is here stated in this statement, and that I will state orally, is true.

Skipping then, down to the Colorado River compact, beginning on page 5, and with the signing of the Colorado River compact at Santa Fe, N. Mex., in November 1922, which compact was signed on behalf of Arizona by Mr. W. S. Norviel, who was then the commissioner.

I might parenthetically add that I began the practice of law in Arizona in the office of Judge Norviel and Judge John C. Phillips, who later became Governor of Arizona. At that early date I was associated somewhat closely in the discussion of these matters with Senator McFarland, who also was beginning the practice of law at that time.

I, of course, then got very much interested in this. I studied its history and the questions involved.

At the Santa Fe Conference, at which the Colorado River Compact was negotiated, there was a gentleman's understanding as between

California, Arizona, and Nevada that the million acre-feet mentioned in article III (b) of the Colorado River Compact was for the sole and exclusive use of Arizona to compensate Arizona for the inclusion of the Gila River in the over-all definition of the Colorado River system. That is set out in the record of these former hearings on S. 1175, in which the statements and the testimony of former Governor Campbell, of Arizona, is set forth; of Judge Norviel; of Mr. C. C. Lewis; and the letter from Mr. Herbert Hoover, dated 2 days after this compact negotiation was over; and his picture sent to Mr. Norviel with a notation in his own handwriting.

The CHAIRMAN. Do I understand your statement to be that the waters were divided 7,500,000 to the upper basin, 7,500,000 to the lower basin, and an extra 1,000,000 for Arizona?

Mr. CARSON. To the lower basin.

The CHAIRMAN. For Arizona?

Mr. CARSON. Not specifically to Arizona, but to the lower basin. There was a gentleman's understanding that as soon as that compact was signed a tri-State agreement would be made between California, Arizona, and Nevada assigning that 1,000,000 to Arizona to compensate Arizona for inclusion of the Gila River in the over-all definition of the Colorado River system.

The CHAIRMAN. I am just trying to determine, Mr. Carson, directly from your testimony whether in your opinion the compact that was desired among the Lower Basin States was in effect to assign to Arizona 1,000,000 acre-feet because of the Gila River, and then to divide the 7,500,000 acre-feet among the States in whatever way the States would agree.

Mr. CARSON. Yes; I think that is my understanding. That was never done, however. The tri-State agreement between California, Nevada, and Arizona was never executed or ratified. I will come to that a little bit later.

The CHAIRMAN. The point is that it is of great importance in solving this, as I see it, to have clearly in mind whether the compact was intended to divide the 7,500,000 acre-feet as it did in the upper basin, or whether it was intended to divide 8,500,000 acre-feet.

Mr. CARSON. I think that is completely answered that there was apportioned to the lower basin 8,500,000 acre-feet, which was made up of 7,500,000 acre-feet deliverable at Lee Ferry by the upper basin and by 1,000,000 acre-feet of the water of the Gila River. So that the entire apportionment, as stated by Mr. Hoover, to the lower basin was 8,500,000 acre-feet.

Now, following the signing of that compact many efforts were made to negotiate the tri-State compact which had been agreed upon and which later was incorporated in the Boulder Canyon Project Act, but no such compact has as yet been made directly between these States.

During those negotiations, up until the fall of 1927, the Arizona negotiators believed Arizona was entitled to the 1,000,000 acre-feet of Gila River water and one-half of the main-stream water that would be available to California and Arizona. I submit that thought was not without justification, because California contributes no water to the river. They have approximately 3,500 square miles of land within the natural basin of the river; Arizona has some 103,000 square miles in that natural basin, which includes nearly all of Arizona and which

contributes a very substantial quantity of water to the flow of the river.

But no such agreement could be made.

Then in the fall of 1927, at a Governors' conference in Denver, Colo., a conference of all the Governors of all the seven States, it was suggested then, as it has been suggested since, that perhaps this matter might be arbitrated. The four Governors of the upper division States——

Senator DOWNEY. Mr. Chairman, if I might intervene. Mr. Carson, are you testifying to a conversation at which you were present or about a record, or what?

Mr. CARSON. I am testifying as to the record I put in the record on S. 1175, with the finding of the four Governors of the Upper Basin States. It is printed in the record of hearings on S. 1175.

The four governors of the upper division States, Governor Adams of Colorado, Governor Emerson of Wyoming, Governor Dillon of New Mexico, and Governor Dern of Utah, undertook such informal arbitration and constituted themselves an arbitration committee. They made a finding or recommendation which is set on page 232 in my testimony on S. 1175, which is a part of the record of this committee, and at page 378 of part 2 on the hearings on H. R. 5434, which was the Gila project reauthorization bill before the House committee.

They recommended settlement as between California, Arizona, and Nevada. It has always been my understanding from the history of this—I was not in it—that their recommendation was accepted by the Arizona representatives at that conference.

I have heard it testified here by people who might know that Arizona attached a condition to its acceptance that there be an additional provision that the waters of the Gila River should never be subject to any diminution on account of any quantities that might be granted to Mexico. I consider that matter now to be immaterial because, as I will show, Congress accepted the findings of these governors, with one exception. They took 200,000 acre-feet off the quantity the governors had recommended for Arizona and added it to California. The governors had recommended for California 4,200,000 acre-feet and for Arizona 3,000,000 acre-feet from the main stream of the Colorado River.

When Congress enacted the Boulder Canyon Project Act in section 4 (a) they took 200,000 off Arizona as recommended by the governors and added it to California.

The CHAIRMAN. Can you place in the record at this point the citations of the governors' recommendation so that those who read the record may turn to it readily?

Mr. CARSON. Yes; I have already cited it, page 232 in my testimony on S. 1175, and page 378 of part 2 on the hearings on H. R. 5434.

In accepting that the Congress added what some of these California men said was an Arizona condition and put it in the act that the waters of the Gila River should never be subject to any diminution on account of any supply of water to Mexico, except return flow after it entered the main stream of the Colorado River.

Now, up until then Arizona's claim had been for 3,600,000 acre-feet of main stream water.

I would also like to submit to this committee that Congress having already determined on this division among the States of the lower basin, 4,400,000 acre-feet, 300,000 acre-feet to Nevada and 2,800,000 acre-feet to Arizona, required that California agree to that division by requiring the enactment by California and its self-limitation statute as a condition precedent to the taking effect of the Boulder Canyon Project Act and the construction of the works therein authorized. California did so agree in March 1929, by an irrevocable and unconditional act of its legislature providing that the total beneficial consumptive use of waters diverted from the Colorado River for use in California, should never exceed 4,400,000 acre-feet of this apportioned water, plus not more than one-half of the surplus.

Under the compact surplus cannot be apportioned and nobody can acquire a permanent right to its use until after 1963, and then only by agreement among all seven States after either basin has reached its total of beneficial consumptive use permitted by the compact. That would be after the upper basin is using 7,500,000 acre-feet, or after the lower basin is using 8,500,000 acre-feet.

Following the enactment of the Boulder Canyon Project Act—and this is the history from 1928 to 1939, beginning on page 8 of my written statement—Arizona brought a suit in the Supreme Court of the United States which has been referred to, to test and object to the constitutionality of the Boulder Act. Because, as I say, Arizona was not yet ready to accept the division which had been made by Congress.

The Boulder Act is also peculiar and unique in a couple of other respects that I would like to call to the attention of the committee.

The Supreme Court upheld the constitutionality of the act and also specifically upheld the constitutionality of the provisions of 13 (c) and (d), which provided that all rights-of-way across Federal lands—and I would like to call the attention of the committee to a preceding statement in here, that the enabling act under which Arizona is admitted as a State, and the constitution of Arizona, reserve to the United States all rights-of-way clear across the State of Arizona on both sides of the Colorado River. Then in the Boulder Act they put in the condition that all such rights-of-way, for the use of which such rights-of-way were necessary or convenient to the use of the waters of the Colorado River, or for the generation or transmission of electrical energy generated by the Colorado River, and the waters so used, should be on the express condition and with the express covenant that the rights of the users of such waters should be subject to and controlled by the Colorado River compact, and that such conditions and covenants attach and run with the right to use water and attach as a matter of law whether set out or referred to in the instrument evidencing such right-of-way and other privileges from the United States, or not.

The Supreme Court in upholding the constitutionality of the act said that Arizona could not complain of that condition.

Further, the Boulder Canyon Project Act is also unique in another respect in that in section 13 (b) it provides that the rights of the United States, as well as the rights of those claiming under the United States, in or to waters of the Colorado River and its tributaries, shall be subject to and controlled by the Colorado River compact.

So, the rights of the United States are subject to that compact. The rights of every State in the basin are subject to that compact so it is the controlling document.

The act is unique in another respect, that in section 5 it provides that no person shall have or be entitled to have the use for any purpose of any waters stored in Lake Mead except by contract with the Secretary of the Interior. It authorizes the Secretary, under such general regulations as he may prescribe, to contract for the storage of water in Lake Mead and for the delivery thereof to such points on the river as may be agreed upon.

In 1929 and 1930, following the enactment of the act, further attempts were made to negotiate a compact between Arizona, California, and Nevada, but failed. I did not participate in those negotiations but it is my understanding that the only claim there asserted and which is here asserted by California, contrary to the Arizona position, was that the million acre-feet mentioned in article III (b) of the Colorado River compact was unapportioned or surplus water.

Another interesting fact in connection with the case which is reported in 283 U. S. 423, is that notwithstanding the fact that Arizona was disputing the constitutionality of that act and had opposed and was opposed to appropriations for the construction of Hoover Dam, and that California, Arizona, and Nevada had been unable to agree to the terms of the tri-State compact as set out in the Boulder Canyon Project Act, and notwithstanding the fact that Arizona had filed the suit attacking the constitutionality of the act and California's right to the water set out in the act, the California agencies proceeded to negotiate the California intrastate priorities agreement and negotiated contracts with the Secretary of the Interior, through Mr. Wilbur, with his then assistant, Mr. Northcutt Ely, who here now represents California, without waiting for the decision of the court in that case, and moved to dismiss the case.

In my judgment the court properly dismissed the case; and the reason it dismissed the case would still prevail in any such case as California now desires to bring. I quote from the decision, next to the last paragraph appearing on page 463 of 283 U. S. This is on page 11 of my statement and this is the language of the court:

> When the bill was filed, the construction of the dam and reservoir had not been commenced. Years must elapse before the project is completed. If by operations at the dam any then perfected right of Arizona, or of those claiming under it, should hereafter be interferred with, appropriate remedies will be available. Compare *Kansas* v. *Colorado* (206 U. S. C. 46, 117). The bill alleges that plans have been drawn and permits granted for the taking of additional water in Arizona pursuant to its laws. But Wilbur threatens no physical interference with these projects; and the act interposes no legal inhibitions on their execution. There is no occasion for determining now Arizona's rights to interstate or local waters which have not yet been, and which may never be, appropriated.

Parenthetically, California admits that they are not using approximately 1,000,000 acre-feet of their admitted share of water. There is no assurance that it will be used. There is as yet no authorized project in Arizona to use our share of the water that is represented as necessary here for the central Arizona project.

Then the court cites *New Jersey* v. *Sargent* (269 U. S. 328, 338) and proceeds with its opinion:

> This court cannot issue declaratory decrees.

Citing cases, and then adds this in connection with the rights-of-way about which I spoke:

Arizona has, of course, no constitutional right to use, in aid of appropriation, any land of the United States, and it cannot complain of the provision conditioning the use of such public land.

Citing authorities.

Senator DOWNEY. Mr. Carson, would it divert you from your manuscript if I should ask——

Mr. CARSON. I would prefer to finish and then I should be happy to answer any questions. I think I may answer them in the manuscript.

Senator DOWNEY. Probably you will, Mr. Carson.

Mr. CARSON. If I do not I would be glad to come back and answer them.

Following the failure to reach an agreement in 1929 and 1930, and the decision of the Supreme Court in 283 U. S., the State of Arizona spent considerable sums of its money in making engineering investigations and studies and reports, the people of Arizona having already at that time reached the conclusion that it was essential to divert water from the main stream of the Colorado River into central and southern Arizona.

When I was first retained as a lawyer by the Colorado River Commission of Arizona in 1933, I was requested to and did write legal opinions on Arizona's rights to water of the main stream of the Colorado River. California had for the first time, so far as I know, in the negotiations in 1929 and 1930, made the claim that the million acre-feet of III (b) water mentioned in the Colorado River compact was unapportioned by that compact and was hence part of the surplus, a part of which could be used in California.

I was requested for an opinion and gave it as my opinion that under the Colorado River compact and the California Self-Limitation Statute, which had been enacted in 1929 by California, that California was forever precluded from claiming any rights to any use of any part of the million acre-feet of III (b) water by the terms of the Colorado River compact, the Boulder Canyon Project Act, and the California Self-Limitation Act, because in my opinion that was apportioned to the lower basin, although not specifically to Arizona alone.

California had, of course, refused to carry out the agreement set out in the compact providing that that million acre-feet should be used exclusively in Arizona, and the commission requested that that matter be made definitely clear. So I prepared and filed a bill in the Supreme Court of the United States seeking to perpetuate the testimony of the understanding which had been reached at Santa Fe, N. Mex., before the Colorado River compact was signed, to which I have already referred.

The court accepted jurisdiction but refused to permit the testimony to be perpetuated and, as set forth on pages 358 to 359 of that case, *Arizona* v. *California* (292 U. S. 341), the court held that the III (b) water was apportioned to the lower basin. I quote the sixth ground of the opinion:

Sixth. The considerations to which Arizona calls attention do not show that there is any ambiguity in article III (b) of the compact. Doubtless, the anticipated physical sources of the waters which combine to make the total of 8,500,000 acre-feet are as Arizona contends, but neither article III (a) nor (b)

deals with the waters on the basis of their source. Paragraph (a) apportions waters from the Colorado River system, that is, the Colorado and its tributaries, and (b) permits an additional use "of such waters." The compact makes an apportionment only between the upper and lower basins; the apportionment among the States in each basin being left to later agreement. Arizona is one of the States of the lower basin and any waters useful to her are by that fact useful to the lower basin. But the fact that they are solely useful to Arizona, or the fact that they have been appropriated by her, does not contradict the intent clearly expressed in paragraph (b) (nor the rational character thereof) to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone. It may be that, in apportioning among the States the 8,500,000 acre-feet allotted to the lower basin, Arizona's share of waters from the main stream will be affected by the fact that certain of the waters assigned to the lower basin can be used only by her; but that is a matter entirely outside the scope of the compact.

The provision of article III (b), like that of article III (a), is entirely referable to the main intent of the compact which was to apportion the waters as between the upper and lower basins. The effect of article III (b) (at least in the event that the lower basin puts the 8,500,000 acre-feet of water to beneficial uses) is to preclude any claim by the upper basin that any part of the 7,500,000 acre-feet released at Lee Ferry to the lower basin may be considered as "surplus" because of Arizona waters which are available to the lower basin alone. Congress apparently expected that a complete apportionment of the waters among the States of the lower basin would be made by the subcompact which it authorized Arizona, California, and Nevada to make. If Arizona's rights are in doubt it is, in large part, because she has not entered into the Colorado River compact or into the suggested subcompact.

California had refused to do so.

It is held by the court that there was no ambiguity and that it was apportioned water to the lower basin by the express language of the compact and the Boulder Canyon Project Act, and that it was no part of any surplus.

It is therefore clear that it is not any part of any unapportioned or surplus water and that California by adopting her Self-Limitation Act has forever excluded herself from claiming any part of it.

During that same period I was requested for a legal opinion as to whether or not Arizona could maintain in the Supreme Court of the United States a suit for an equitable apportionment of the waters. I gave it as my opinion that we could not because we were not then making use of any water, the use of which was threatened by California.

I therefore advised against and did not participate in the case of *Arizona* v. *California*, reported in 298 U. S. 558.

In that case California objected to the filing of the bill on two grounds, as stated by the court. I am quoting now from the opinion on page 15 of my statement:

The returns raise numerous objections to the sufficiency of the proposed bill of complaint, only two of which we find it necessary to consider. One is that the proposed bill fails to present any justiciable case or controversy within the jurisdiction of the court. The other is that the United States, which is not named as a defendant and has not consented to be sued, is an indispensable party to any decree granting the relief prayed by the bill.

The relief sought is: (1) That the quantum of Arizona's equitable share of the water flowing in the Colorado River, subject to diversion and use, to be fixed by this court, and that the petitioner's title thereto be quieted against adverse claims of the defendant States; (2) That the State of California be barred from having or claiming any right to divert and use more than an equitable share of the water flowing in the river, to be determined by the court and not to exceed the limitation imposed upon California's use of such water by the Boulder Canyon Project Act (45 Stat. 1057), and the act of the California legislature of March 4, 1929 (ch. 16, Stats. of Calif., 1929, p. 38); (3) That it be decreed that the

diversion and use by any of the defendant States of any part of the equitable share of the water decreed to Arizona pending its diversion and use by her shall not constitute a prior appropriation or confer upon the appropriating State any right in the water superior to that of Arizona; (4) That any right of the Republic of Mexico to an equitable share in any increased flow of water in the Colorado River made available by works being constructed by or for California, shall be supplied from California's equitable share of the water, and that neither petitioner nor the defendant States other than California shall be required to contribute to it from their equitable shares as adjudicated by the court.

The proposed bill thus, in substance, seeks a judicial apportionment among the States in the Colorado River Basin of the unappropriated water of the river, with the limitation that the share of California shall not exceed the amount to which she is limited by the Boulder Canyon Project Act and by her statute, and with the proviso that any increase in the flow of water to which the Republic of Mexico may be entitled shall be supplied from the amount apportioned to California. Our consideration of the case is restricted to an examination of the facts alleged in the proposed bill of complaint and of those of which we may take judicial notice.

The court upheld both grounds of the motion to dismiss referred to in the above quotation; that is, the court held that there was no justiciable controversy because there was no injury or threat of injury. And it also held that in that character of action seeking an equitable apportionment for future use the United States is an indispensable party defendant and was not joined. The court in the course of its opinion said (p. 570):

The decree sought has no relation to any present use of the water thus impounded which infringes rights which Arizona may assert subject to superior but unexercised powers of the United States. (Cf. *Wisconsin* v. *Illinois*, 278 U. S. 367. See *Arizona* v. *California*, *supra*, 464; *United States* v. *Arizona*, *supra*, 183).

In the meantime, Hoover Dam was rapidly nearing completion, and we in Arizona were very much concerned over the increase in the use of waters in Mexico made possible with the encouragement, assistance, and to the financial benefit of the Imperial Irrigation District of California.

Arizona had tried in 1925 and 1927 to get the United States to notify Mexico that the United States would never recognize any right in Mexico to use any greater quantity of water of the Colorado River than Mexico was then using. California refused to join in that effort. This is my information. I did not participate in that but I am informed to this effect.

Again in 1933—and of this I do have personal knowledge—Arizona again made an effort to persuade the United States to notify Mexico that no greater use of the waters of the Colorado River than Mexico was then making would be recognized by the United States. Again California refused to join in the effort, and Arizona was on both occasions unable to persuade the State Department to give Mexico any such notice.

Finally, the people of Arizona recognized that Arizona was in grave jeopardy, by virtue of the fact—not only from California but from the Mexican uses that were rapidly building up—that Arizona had been able to secure the construction of any works in Arizona for the use of any water of the Colorado River, and California was building works to take more than the 4,400,000 acre-feet of apportioned water, to which California had forever limited herself.

We also realized, of course, that the Supreme Court of the United States in 292 U. S. 341, had held that the 1,000,000 acre-feet of III (b) water was apportioned water and hence not part of the surplus; that

by the California Self-Limitation Act, California was precluded from claiming any part of it.

We recognized that we could not get the project authorized in Arizona until we had ratified the Colorado River Compact, by virtue of the conditions imposed by Congress upon rights-of-way across the United States property. We desired to make the tri-State compact between Arizona, California, and Nevada, authorized by the Boulder Canyon Project Act.

In 1939 I helped write what is now chapter 33 of the Session Laws of Arizona of 1939, adopted by the legislature and approved by the Governor on March 3, 1939.

By that time California had begun to assert, for the first time so far as I am aware, that the word "and" in the second paragraph of section 4 (a) of the Boulder Canyon Project Act—I believe it is before subdivision III of that act—was not a conjunction and therefore did not mean "in addition to." So in the 1939 act we made it clear that in our opinion the word "and" in the second paragraph of section 4 (a) of the act did mean "in addition to."

For the purposes of comparison here I have set out the provisions of article III of that compact which was, by the statute of Arizona, offered to California. And for the purpose of comparison I have also set up, beginning on page 20, the exact language of the Boulder Canyon Project Act. The "and" which was in controversy appears on page 22 of my statement where it says, "and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State."

They say that that "and" is not a conjunction and thus does not mean "in addition to." But I will leave that to the committee.

We thought we were complying completely and fully with the congressional authorization.

California, however, in spite of that firm offer—and that act also provided that when and if the tri-State compact set out was signed by California, Nevada, and Arizona, by the Governors of those States and ratified by their legislatures, that by that act the Colorado River compact would be fully ratified on behalf of Arizona. California refused to make such a compact within the 2 years provided by the act and has ever since refused to make that compact.

Now, Mr. Chairman, they come to these congressional committees and have the nerve to suggest to us that we should negotiate or arbitrate. We have negotiated a compact. We are both parties to the Colorado River compact; we are bound by it. We attempted to arbitrate in 1927 and they refused to accept it. In 1939 by act of our legislature we offered to California and Nevada the compact which we were authorized to make by act of the Congress of the United States.

Now, following the refusal of California to make that compact in 1939 the Legislature of Arizona authorized the negotiation of a contract with the United States. We realized California never did intend to settle with us on any equitable or fair basis. We proceeded to negotiate a contract with the United States for delivery and use in Arizona of our share of the main stream Colorado River water set out in the Boulder Canyon Project Act, and to which Congress had required California to agree by the adoption of the California Self-Limitation Act. I had the honor to represent Arizona in those nego-

tiations through the committees of 14 and 16, which at that time were organized as committees representing the governors of the seven States of the basin and which had been and were very helpful in all matters of interstate concern on the Colorado River.

During the course of those negotiations Arizona was finally joined with support by all of the States of the basin, except California. Nevada supported us in our effort to get that contract, which is set out in my testimony on S. 1175 at page 240, and approved it with the Secretary of the Interior, as did Colorado, New Mexico, Utah and Wyoming, and all of the States of the basin, except California who actively opposed it.

Arizona, at that time, 1944, helped negotiate and approved the Nevada contract for 300,000 acre-feet. That quantity of water for Nevada had been agreed on by Senator Key Pittman at the time of the enactment of the Boulder Canyon Project Act. It was never questioned by the Nevada representative in these negotiations, that they desired any more water than that. They agreed to our contract for the 2,800,000 and to the Nevada contract for 300,000 acre-feet.

The next matter in my oral statement I think I can skip. It relates largely to the Mexican water treaty, by which of course, we are all bound.

Then after the signing of the Arizona contract which was signed early in 1944, we had hearings in the summer of 1946 on the Gila reauthorization bill. Perhaps we in Arizona were somewhat naive. We thought when the over-all all-time limit on the Mexican claim was fixed and that we had a contract with the United States to deliver 2,800,000 acre-feet of mainstream water for use in Arizona, in accordance with the congressional intent as expressed in the Boulder Canyon Project Act, that maybe we were through with the California fight.

So, we abolished the Colorado River Commission of Arizona and turned interstate relations directly over to the Governor's office, and the water files and records of the commission went to the water commissioner's office and all power matters were turned over to the Arizona Power Authority which was created early in 1944. We thought we were through with these things.

But in 1946, when we came to a hearing before the House Public Lands Committee on the Gila reauthorization bill, California witnesses persisted, in spite of the opinion of the Supreme Court of the United States to the contrary, in saying that the 1,000,000 acre-feet of III (b) water was unapportioned and hence was part of the surplus, and that they could have an interest in this water, although by the express language of the compact it is called apportioned water, and the Supreme Court had held it to be apportioned water.

Also, they began to assert—perhaps it had been mentioned before but never seriously contended—that beneficial consumptive use was not to be measured by the resulting depletion of the stream.

It is clear to us in our reasoning from the Colorado River Compact itself, particularly article III (d), that the depletion in the upper basin is measured at Lee Ferry because it provides that the States of the upper division will not cause the flow at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet every 10 years.

It is also provided, as we read it, in the Boulder Canyon Project

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Act and the California Self-Limitation Act, where it uses the words "diversions less returns to the river," which can mean nothing except depletion. It is also provided and carried forward in the Arizona water delivery contract which provides that Arizona's right to withdraw water from Lake Mead storage shall be diminished to the extent that uses in Arizona above Lake Mead diminish the flow into Lake Mead.

But that was asserted very strenuously in 1946 at the Gila bill hearing.

I want to call your attention to one other thing here. I do not want to be misunderstood. It is none of Arizona's business where California uses this 4,400,000 acre-feet of water. It is none of our business whom they designate to represent them in interstate negotiations, but it is very interesting to me to know that from 1933 to 1937, when the Colorado River Board of California was created, that the representatives of the southern California agencies appeared in all the interstate negotiations or hearings without anybody directly, so far as I know, being authorized to speak for the State of California as a whole.

Then in 1937 the Legislature of California created the Colorado River Board of California, which is its present agency, and restricted its membership to representatives of these same southern California agencies with whom we have never had any agreement and with whom we know we can never make any agreement by virtue of their past acts.

But nobody else can be appointed on that board except their designated representatives.

I have here, if you would be interested in it, copies of that act of the California legislature creating the Colorado River Board of California. I would like to leave them with the committee if they would be of any worth, without having them printed in the record. Or, to have them printed if you see fit to do so.

The agencies to which the membership of that board are restricted are the Palo Verde irrigation district, the Imperial Valley District, the Coachella Valley County Water District, the Metropolitan Water District of Southern California, the Department of Water and Power of the city of Los Angeles, and the city of San Diego.

It is my understanding that the representatives of those agencies who signed the intrastate priorities agreement in California, under which they claim 5,362,000 acre-feet of water, are still acting in the interests of their respective agencies and trying to carry out their interagency priorities agreement, which was signed by them on August 18, 1931; and that they feel bound to each other by that agreement, although they do not apparently feel bound by the California Self-Limitation Statute, which they did not sign.

In 1943 and 1944 before the Foreign Relations Committee of the Senate on the Mexican Treaty hearing, it was almost openly argued by gentlemen representing the southern California agencies, that they proposed to bring an action to set aside the Boulder Canyon Project Act, the Colorado River Compact, and the California Self-Limitation Statute; that they would no longer feel bound by that.

But later apparently they decided that would not be good policy and now they give lip service to those documents. Yet, by strange constructions and twisting of words they try to avoid their plain meaning.

Also in 1946, at the Gila hearing for the first time of which I have any recollection, they began to assert that they were not chargeable with any evaporation losses and that they should be charged solely against Arizona.

Gentlemen, the Boulder Canyon Project Act and the first paragraph of section 4 (a) makes it pretty clear that their quantity of water is not water diverted into California, but diverted for use in California and that the 4,400,000 acre-feet is not a minimum but is a maximum.

I submit to you that any water diverted from the flowing stream of the river, stored in a reservoir for their benefit, whether it be an on-stream reservoir or an off-stream reservoir, is water diverted from the flow of that stream and that equity would require the people who benefit from that storage to share ratably any evaporation losses that might occur through the storage of the water for their benefit.

Let me divert again for a moment—and I would like for the committee to remember this—to the fact that the California agencies are talking about things that may never happen, and so far as these engineers can estimate time, are very unlikely to happen for a hundred years.

The only time in the world when the question of who would share evaporation losses would become material, would be when and if the upper basin has entirely burned up its 7,500,000 acre-feet and all surplus has disappeared from the river, so that there would not be enough water in Hoover Dam to supply then existing rights below Hoover Dam; it would be necessary to curtail deliveries.

Well, we all know that all over the West, when that condition occurs—subject, of course, to priorities within States—deliveries would be curtailed proportionately and ratably. We have recognized that as the equitable principle.

They have introduced into some of these records two letters between Governor Warren and Governor Osborn of Arizona. I do not like to take the time of the committee on this but I do feel a tremendous loyalty to Governor Osborn, who is now dead. So, with your permission I would like to call attention to these letters and to what they actually say and provide and refute the inferences that have here been made. I think they have a direct bearing on this question.

Governor Osborn told me many times that during the course of his gubernatorial career he and Governor Warren had worked together on many matters of common interest to our two States. I am sure that Governor Osborn, at any rate, liked Governor Warren and had a respect for him. He many times tried to talk to Governor Warren about these Colorado River matters.

He told me that Governor Warren had always told him that he could not talk to him about that, he would have to see the Colorado River Board of California.

The California people in these hearings put in two letters. I would like to call your attention to the fact that there are six letters between them, appearing on pages 229 to 233 of the hearings on S. J. Res. 145, which I understand are now before your committee.

The first letter from Governor Warren was addressed to Governor Osborn and Governor Pittman of Nevada. Governor Pittman answered shortly after it was received by him, but we did not know

anything about his answer until more than 2 months later. We did not know that Governor Pittman had answered it.

Senator DOWNEY. Mr. Chairman, before Mr. Carson proceeds I have to withdraw from the committee now because of an imperative engagement I must keep in another matter. What will be the pleasure of the chairman?

The CHAIRMAN. How much longer do you have, Mr. Carson?

Mr. CARSON. I have about 10 pages here. I do not mean to read it all, I will skip over some of it. I should say I could probably be through in another 15 minutes.

The CHAIRMAN. Would it be agreeable for us to finish with Mr. Carson tonight? You have the complete text and you may examine him in the morning.

Senator DOWNEY. Yes.

Does this conclude Arizona's witnesses?

The CHAIRMAN. Senator Hayden has requested that he be permitted to make a statement.

Senator DOWNEY. We have witnesses we are going to put on in rebuttal, Mr. Chairman.

Mr. CARSON. May this be off the record?

The CHAIRMAN. Yes.

(Discussion off the record.)

The CHAIRMAN. You may proceed.

Mr. CARSON. The first letter of this series was from Governor Warren to Governors Osborn and Pittman. As I said, Governor Pittman apparently answered in a very few days but we had no knowledge of his answer until some few months later.

The first letter was dated March 3, 1947. It sets forth no basis for any California claim, of quantity or under what right it is claimed, but merely suggests, "the only methods that occur to me are, 1, the negotiation of a contract; 2, arbitration; and, 3, judicial determination." Will you please remember we have negotiated a compact. We have submitted to an informal arbitration and we have now finally accepted it. It was also accepted by the Congress; and judicial determinations have been attempted in the court three times on this matter and California has opposed such determination every time.

Governor Warren sets forth no claim to any specific quantity of water or any basis of right.

Governor Osborn was always a forthright and frank man, very honest and fair in his dealings. He was a great governor. This letter was dated March 3.

On March 12, 1947, he replied to Governor Warren as follows, and I would like to read this to emphasize the frankness of it:

MY DEAR GOVERNOR WARREN: I have your letter of March 3, addressed to Governor Vail Pittman and myself, concerning the report of the Bureau of Reclamation on the development of the water resources of the Colorado River Basin.

He referred to the Colorado River report of the Bureau of Reclamation.

I presume from your letter that you have completed and sent to the Bureau your comments on the above-mentioned report. I, too, have furnished the Bureau with my comments, and am enclosing a copy to you herewith. It will be appreciated if you will furnish me with a copy of your report.

Ever since I have been Governor of Arizona I have endeavored to cooperate with all other States in the Colorado River Basin in all matters of common interest. Arizona has at all times been represented on the committee of 14 and 16, whose name has not been changed to the Colorado River Basin States Committee. Arizona is now represented on the Colorado River Basin States Committee, which committee as presently constituted and as heretofore constituted, has been very helpful in all matters affecting the interests of the respective States in the Colorado River.

Senator ANDERSON. Mr. Chairman, if I might interrupt. I do not know what the significance of these letters is but he is reading from a printed hearing. Some of us have been, I think, reasonably patient. Could we not have them in the record by reference?

Mr. CARSON. I have them noted in my statement. They appear in the record at pages 229 to 233.

The CHAIRMAN. I would suggest you state the substance of them.

Mr. CARSON. There are a few of these things, if I might emphasize for just a moment, Senator. I will not read them all if you will bear with me for a minute.

I will be pleased to meet with you, or with you and Governor Pittman, or with the Governors of other interested States, to discuss all matters of common interest to our respective States.

Then Governor Osborn called attention to the fact "All seven of the Colorado River Basin States" are parties to the compact and that the compact contains provisions which make utilization of water over and above the apportionment made by the compact of interest to all of the States of the basin; that in the lower basin Utah and New Mexico are also interested.

Then he calls attention to the fact that in the California Limitation Act, California limits herself. He then goes ahead with our position on all these matters.

The CHAIRMAN. What is your purpose in citing the letters, Mr. Carson?

Mr. CARSON. I want to show that the inference drawn is not correct. He sets forth entirely and frankly all of the Arizona position, as I have here stated, and then asks Governor Warren to point out any error. He also stated he would be glad to meet with him and the other governors, either separately or jointly, anybody he wanted to bring.

No answer was received to that until May 16, 1947, when Governor Warren answered and did not point out any disagreement with anything in Governor Osborn's letter, but stated that he supposed it now might be a little late to negotiate or arbitrate, and therefore suggested litigation.

To that letter Governor Osborn replied on May 23, 1947. The other letter was dated May 16; Governor Osborn's letter May 23, in which he calls attention to the comments of the State of California on this report, that he had then received; that they purported to make a list in that report of relevant statutes, decisions and instruments. That was in the California comments, but no mention was made of the California Self-Limitation Act, chapter 16, California Statutes, 1929.

Then he calls attention to his prior letter and asks Governor Warren to again review it and see if there is anything in there with which he was not in agreement. He heard nothing more from Governor Warren until under date of October 10 that year, Governor Osborn wrote him

and said that newspaper reports were appearing stating that he had refused to meet with him, and repeating his prior invitation to come over, to which Governor Warren answered under date of October 16. He said:

> I have not seen the items that you mention but if there is any statement in them to the effect that you have refused to meet and discuss matters with me they are wholly without foundation. No one has been more willing to discuss our mutual problems than yourself and I am sure you know that I would never make any expression to the contrary.

. I will not read the other parts but they are set out as here noted.

Governor Osborn had thought that maybe in spite of the refusal of Governor Warren to discuss these matters with him at these various conferences, that upon the receipt of that letter perhaps Governor Warren would meet with him and discuss them with him and that they could work them out together. In other words, he thought maybe Governor Warren was going to reassert the prerogatives of his office to try to understand these matters himself and direct the course of California respecting them, but that did not result.

After the Gila bill hearings in 1946 California representatives who had participated for many years in the work of the committees of 14 and 16, withdrew from that committee. They have broken diplomatic relations with all the other States of the basin.

I was surprised to note that those withdrawals came not from the governor—this was supposed to be a governor's committee—but from the Colorado River Board of California. The committee has kept the door open for California and has written to Governor Warren asking him to send representatives and to persuade these men to come back if he could, otherwise to send other representatives.

Shortly after the committee was reorganized under the name of the Colorado River Basin States Committee, and in which reorganization meeting the representatives of Nevada participated, they likewise withdrew and have not since the late summer of 1946 met with any of these other State committees.

Following the hearing before the House committee in 1946 on the Gila reauthorization bill, and the hearings before this subcommittee in 1947 when there California arguments were again vigorously presented, I took the matter up with the Colorado River Basin States Committee. In October 1947, they unanimously adopted the statement, after careful consideration and study, which appears on page 155 of the hearings on Senate Joint Resolution 145, which is pertinent and direct to the point on all of the contentions here made by California as an expression of the Colorado River Basin States Committee.

The Upper Colorado River Basin Compact Commission and the compact which has now been ratified adopted the principle that beneficial consumptive use is measured by depletion and also the principle that reservoir evaporation losses should be prorated among the people benefited by the storage of that water.

In the brief filed in opposition to Senate Joint Resolution 145, appearing on pages 157 to 179, and at pages 265 to 287 of the hearings on House Joint Resolution 225, the Colorado River Basin States Committee, composed of Judge Stone, Frank Delaney for Colorado; L. C. Bishop and H. Melvin Rollins, for the State of Wyoming; William R. Wallace and Grover R. Giles for the State of Utah;

Fred E. Wilson and John H. Bliss for the State of New Mexico; and Nellie T. Bush and Charles A. Carson, for the State of Arizona, with additional members on the subcommittee to oppose litigation, including Judge J. A. Howell for the State of Utah; Martin A. Threet for the State of New Mexico; Norman B. Gray, attorney general of Wyoming; and Jean S. Breitenstein for the State of Colorado, made the flat statement, and I quote this little bit from the brief:

> Taking into consideration that Arizona is entitled to all the uses of the Gila River as set out in this paragraph this necessarily means that Arizona is entitled in addition thereto to 2,800,000 acre-feet per annum. Which means, further, that there is ample water for the central Arizona project because California does not and cannot assert that that project will take more water than that.

I desire to call your attention to the particular statements in that brief which are more full than I have indicated here, appearing on page 174 of the hearings on Senate Joint Resolution 145.

It seems to me that the arguments here advanced by California are fully, completely, and devastatingly answered by that portion.

All of this is set out pretty well in the records that are here so I am going to skip over it just as fast as I can.

It has been argued in the House committees and during the course of this present hearing, that Congress is without power to interpret or construe, even for the purpose of its own act, the Colorado River compact or the Boulder Canyon Project Act.

However, Mr. Howard refuses to join in that position and testified during the course of these hearings before the House Judiciary Committee, that in his opinion, of course, Congress had a right to determine whether or not there was available water for this project and therefore to construe the compact.

It is our view that all these questions are completely and conclusively settled by the Boulder Canyon Project Act, the California Self-Limitation Statute, the Colorado River compact and the Arizona contract, with the one possible question of who shall bear reservoir losses. But that cannot arise for a hundred years, as I have already stated.

Now, I would like to divert for a moment to the physical condition in the lower basin, as to Utah and Nevada.

Utah's only chance to get water in the lower basin is out of the Virgin River and to a lesser degree Kanab Creek which is also an interstate tributary. Their right to divert water can only be supplied from those tributary streams. Nevada, of course, has a right to divert from the Virgin River when it flows through that State, from the Muddy River and also from the storage at Lake Mead.

You cannot just say there is so much water in the lower basin. You have to take account of how much there is in these tributaries where the people want to use the water. We have no binding agreement with Utah and likewise, Senator, with New Mexico as to any quantities of water they might use.

We take the best figures available to us which are the Bureau of Reclamation figures, but we recognize they are binding neither on Utah—as to tributary waters—nor on Nevada, nor Arizona, nor on the Gila and Little Colorado for either New Mexico or Arizona. But you are limited in those tributary basins by the quantities which are there at the points of use.

Under the authority of the Arizona Interstate Streams Commission I have informed both Nevada and Utah that as to those tributary streams we are ready to make a compact whenever they are ready.

Senator ANDERSON. Which States were they?

Mr. CARSON. Utah and Nevada; and designed, too, for making use of the waters of those tributaries in the basins of those tributaries in the three States that are concerned.

Some reference has been made to the question of Nevada's right to water. I call your attention to the fact that it was agreed in the Boulder Act to be 300,000 acre-feet. It was agreed at the time of this Arizona contract and the Nevada contract to be 300,000 acre-feet. We put that in the Arizona contract and recognize that as their use.

I had never heard any higher figure mentioned until it was mentioned in the course of these hearings now.

Again I would like to call your attention to the fact that in the Blue Book, July 1947, the State of Nevada forwarded its comments to Mr. William E. Warne, Acting Commissioner of Reclamation, under date of February 6, 1947. To me this is very significant as to these later contentions.

In reviewing the Colorado River report—

I am skipping here to save time, but it is on page 69 of this Blue Book—

In my opinion the report is a splendid piece of work. Everyone who is interested should realize that it does not set up any projects, but is merely an inventory of all possible projects, regardless of their respective merits. That is the view we take of it. We feel that several of the Nevada projects, all of which are comparatively small, should be listed if and when that time comes with fairly early priority. We are also interested in joining with the State of California in promoting an early priority and appropriation for the early construction of the Bridge Canyon project, because of its great value and necessity for additional power very much needed throughout the area capable of being served by it.

It is signed "Yours very truly, Albert Merritt Smith, State Engineer of Nevada."

Some information has been given here that Nevada might have an interest in this because the Bridge Canyon Dam might interfere with the production of power at Hoover Dam.

I would like to call your attention to the fact, Mr. Chairman, that Nevada is a party to the Colorado River compact. So is California. The United States has subjected its rights to the Colorado River compact.

It is provided in article 4 (b) of that compact:

Subject to the provisions of this compact water of the Colorado River system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of water for agricultural and domestic purposes, and shall not interfere with or prevent use for such dominant purposes.

Now, the situation as to New Mexico on the Little Colorado and the Gila Rivers. On the Gila River the water rights as between New Mexico and Arizona are controlled by the Gila River decree which was entered in a suit brought by the United States, over which we as a State have no control. The waters in that part of the river are subject to the priorities and rights set out in that decree.

Senator ANDERSON. Would you mind stating what the basis of that was? Did the Indian question get into it?

Mr. CARSON. Yes. The United States brought the suit on account of the Indian rights in Pinal County, Ariz., and also up on the Apache Reservation.

Senator ANDERSON. If that was followed all over the United States would the Indians get all the water?

Mr. CARSON. No; I would not think so, but let me go ahead.

Senator ANDERSON. They got all of the Gila water, did they not?

Mr. CARSON. No; you have some rights that are good under the Gila River decree. Those waters there locally, available in the tributary, are decreed rights under that decree and we have no control over that decree.

So, the only thing we can figure to do is to get new water from the Colorado River into the lower reaches of the Gila, particularly Pinal County. We can release by an exchange of water part of the present flow of the Gila River for use upstream in Safford and Duncan Valleys in Arizona, and Virden and Redbluff and Cliff in New Mexico, all below the site of the Hooker Dam, which is a part of this project. We have to do that so that water can be released, regardless of this Gila decree. That is, the people below will have to release water to which they have decreed rights under that decree. They have assured us we can work it out and I believe we can.

Senator ANDERSON. Who assured you, the Indian service?

Mr. CARSON. The San Carlos irrigation district, which includes the Indian lands, and they have told me the Indian service would be willing to do that. We have set out in the Arizona contract our recognition of the right of Nevada, New Mexico, and Utah in the waters of the lower basin and we expect to carry that out.

The quantities we have used in these figures are not binding upon either of those States or upon us, but I submit they are the best available to us. They are subject to such adjustment as we might find necessary or equitable, but they do not affect the availability of water for this project.

The only way we can give any relief to the lands in New Mexico is by the authorization of this project in obtaining main stream water so that those lower basin rights can be released.

Again I would like to call to the attention of all three States of the lower basin, New Mexico, Utah, and Nevada, so far as they want to use water out of these tributary streams of the lower basin, that it would appear to me their interests require that they stand with Arizona and the other States of the Colorado River Basin; that the proper measure of beneficial consumptive use is depletion at the mouth of the tributary streams.

Under that definition each one of them could use more water than they could if they tried to follow the impossible formula of California that you have to measure at points of use.

And, of course, so far as Utah and New Mexico are concerned they are parties to the upper Colorado River Basin compact and have so agreed there. You cannot expect that they would agree in one basin to one thing and in another basin to another.

That, I think, applies equally to Nevada, so far as tributary use is concerned. And, again, so far as Nevada is concerned, to the 300,000 acre-feet which they have a right to use, most of which will have to come out of Lake Mead, it would seem to me that Nevada's real interest insofar as they want to use water in Nevada, would require that Nevada stand with Arizona; that reservoir losses should be borne ratably

and proportionately. Otherwise, California can throw all of those reservoir losses on Arizona and on Nevada. If we took the California position and tried to throw them all on Nevada Nevada might not be able to get any water whatever out of the storage at Lake Mead.

So it seems to me that so far as all the States of the lower basin, and all of the States of the Colorado River Basin—aside from California—are concerned, insofar as they want to use water within those States, their interests are identical with Arizona's interests.

Now, if I might just take another moment, Mr. Chairman.

Where California uses their water is no concern of ours. Whom they designate to deal with us is no concern of ours, except that we can never make agreements with the southern California agencies, and we do not claim to have any with them. We do claim to have an agreement binding on and made by the sovereign State of California.

If that group of southern California agencies would recognize the binding effect of the California Limitation Act upon them and rearrange their intrastate priority system, by cutting down the priority to Imperial Irrigation District, we believe—and we may be in error—that they could serve with an adequate supply of water every acre of land now irrigated in California, and serve to the Metropolitan Water District and its agencies and to San Diego all the water they claim for domestic use.

I would think it would be that sometime, somewhere that they would realize that situation, that the State of California would realize that situation and make a sincere and determined effort to live up to that self-limitation act.

It seems to me it would be easier to do right now by virtue of the fact that the Secretary of the Interior, based upon reports of the Department of Agriculture, the Department of the Interior, and the University of California, has definitely stated he will not permit the irrigation of the East Mesa in Imperial Valley in any considerable quantity.

With that one thing cut out of the Imperial Irrigation District, I believe it could be true that the rest of all their users could be supplied and they could still with honor live within their 4,400,000 acre-feet limitation on use.

Senator McFARLAND. Just one question, if I may.

Mr. Carson, you may have covered this, but I would like to ask you if Arizona has ever offered to enter into a compact with California, carrying out the provisions of the compact approved by Congress in the Boulder Canyon Act, and if so, when, and please give us a reference record.

Mr. CARSON. Chapter 33 of the Session Laws of 1939, to which I referred in my statement.

Senator McFARLAND. Did you give that in your oral statement?

Mr. CARSON. Yes.

Senator McFARLAND. I must have stepped out. I beg your pardon.

Mr. CARSON. There is one other matter I should bring to the attention of the committee.

Since this new suit resolution was introduced, the Colorado River Basin States Committee held a meeting in Denver on April 14, at which time they adopted a resolution opposing the present suit resolution, to which is attached a statement which is in the form of a brief, very brief and condensed. I would like to leave copies of that with the committee and have it incorporated in the record.

The CHAIRMAN. Without objection it is so ordered.
(The document is as follows:)

RESOLUTION OF THE COLORADO RIVER BASIN STATES COMMITTEE RELATING TO HOUSE JOINT RESOLUTION 3 AND ALLIED RESOLUTIONS AND STATEMENT OF THE COLORADO RIVER BASIN STATES COMMITTEE RELATING TO HOUSE JOINT RESOLUTION 3 AND ALLIED RESOLUTIONS, ADOPTED APRIL 14, 1949

Colorado River Basin States Committee:
- Arizona:
  - Charles A. Carson.
  - Wayne M. Akin.
- Colorado:
  - Clifford H. Stone.
  - Frank Delaney.
- New Mexico:
  - Fred E. Wilson.
  - John H. Bliss.
- Utah:
  - William R. Wallace.
  - Clinton Vernon.
- Wyoming:
  - L. C. Bishop.
  - H. Melvin Rollins.

Special Subcommittee on Suit Resolution:
- Utah: J. A. Howell, chairman, Ogden, Utah.
- Arizona: Charles A. Carson, Phoenix, Ariz.
- Colorado: Jean S. Breitenstein, Denver, Colo.
- New Mexico: Fred E. Wilson, Albuquerque, N. Mex.
- Wyoming: Arthur H. Kline, Cheyenne, Wyo.

RESOLUTION

Whereas House Joint Resolution 3, and allied resolutions have as their declared purpose the granting of consent to joinder of the United States as a party to interstate Supreme Court litigation involving the use of water of the Colorado River system; and

Whereas such litigation is of vital interest to the Colorado River Basin States because of the effect thereof upon the development of water use projects dependent upon the Colorado River system for a water supply; and

Whereas the general welfare of the United States and of the affected States requires that each Colorado River Basin State make use of its equitable share of the water of the Colorado River system in order that a great natural resource be beneficially utilized rather than wasted: Now, therefore, be it

Resolved by the Colorado River Basin States Committee consisting of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming and open to the States of California and Nevada, That House Joint Resolution 3 and allied resolutions should not be enacted by the Congress of the United States for the following reasons:

1. There is no justiciable controversy.
2. Congressional consent to suit aids the proponents of litigation by wrongfully implying that this is a justiciable controversy.
3. The proposed litigation imperils the Colorado River Basin development essential to national welfare and national defense: Be it further

Resolved, That the attached statement is approved as expressing the views of this committee and that the chairman of the committee is directed to forward a copy of this resolution with the accompanying statement to any and all congressional committees which may give consideration to H. J. Res. 3 and allied resolutions.

STATEMENT OF COLORADO RIVER BASIN STATES COMMITTEE IN OPPOSITION TO H. J. RES. 3

I. There is no justiciable controversy

(*a*) A justiciable controversy may not be based upon an inchoate or contingent claim. For there to be a justiciable controversy within the purview of article III, section 2 of the United States Constitution there must be an existing or immediately threatened injury of serious magnitude established by clear and convincing evidence. (See *Nebraska* v. *Wyoming*, 325 U. S. 607, 608; *Colorado* v. *Kansas*, 320 U. S. 383, 391–392; *New York* v. *New Jersey*, 256 U. S. 296, 309; *Washington* v. *Oregon*, 297 U. S. 517, 529; *Missouri* v. *Illinois*, 200 U. S. 496, 521.)

(*b*) No Colorado River Basin State is now suffering any injury resulting from the action of any other basin State with respect to the use of the waters of the Colorado River system.

(*c*) The lack of injury conclusively appears from the fact that 8 to 9 million acre-feet of Colorado River water is annually wasted into the Gulf of California. (S. Ex. Rept. No. 2, 79th Cong., 1st sess., p. 4; H. Doc. 419, 80th Cong., 1st sess., p. 13, par. 29.)

(*d*) Neither California nor Nevada can show a present injury because there is a large margin between the present uses of water in each State and the quantity of use of water which each of those States admittedly may make. (Testimony of Chief Engineer Matthew of California River Board of California in summer of 1947 was that total consumptive use in California of Colorado River water was 3,230,000 acre-feet annually. See hearings on S. 1175, 80th Cong., 1st sess., p. 412. H. Doc. 419 supra (p. 184) gives as present annual Colorado River depletions in California 145,000 acre-feet consumed in basin and 2,535,000 exported or a total of 2,680,000. These amounts are far below the 4,400,000 acre-feet of annual use mentioned in sec. 4 of the Boulder Canyon Project Act and the 1929 California Self-Limitation Statute. H. Doc. 419 supra (p. 184) gives the present annual Colorado River depletions in Nevada as 43,800. This is far below the 300,000 acre-feet of annual use mentioned in the Nevada water contract.)

(*e*) California may not claim a present injury when that State permits about 1,000,000 acre-feet of Colorado River water to be wasted annually into the Salton Sea. (See testimony of Senator McFarland presenting Bureau reclamation table as to flow into Salton Sea, hearings before House Judiciary Committee on H. J. Res. 225, 80th Cong., 2d sess., p. 262.)

(*f*) There is no threatened injury to any Colorado River Basin State because there is no water use project under construction or authorized for construction which would utilize more than the equitable share of the State in which the project is located.

(*g*) The United States Supreme Court will not render declaratory judgments or give advisory opinions in interstate litigation. (See *Massachusetts* v. *Missouri*, 308 U. S. 1, 16; *United States* v. *Appalachian Electric Power Co.*, 311 U. S. 377, 423; *United States* v. *West Virginia*, 295 U. S. 463; *Alabama* v. *Arizona*, 291 U. S. 286, 291.)

(1) In no interstate water case has the United States Supreme Court ever acted in the absence of an existing or threatened injury.

(2) In each interstate water case in which the United States Supreme Court has granted relief that relief has taken the form of an injunction to prevent existing or threatened injury.

(*i*) In *New Jersey* v. *New York*, 283 U. S. 336, the Court entered an injunctive decree limiting exportation of water from basin in order to protect downstream areas from injury to municipal water supplies, industrial uses, agricultural uses, recreation and fisheries.

(ii) In *Wisconsin* v. *Illinois* (278 U. S. 367, 281 U. S. 179) the operations of the Chicago drainage canal were limited to prevent the lowering of the level of the Great Lakes.

(iii) In *Wyoming* v. *Colorado* (259 U. S. 419) the exportation of water from the basin was limited to prevent injury to downstream senior rights in Wyoming.

(iv) In *Nebraska* v. *Wyoming* (325 U. S. 589) upstream uses were limited to protect downstream uses.

(*h*) The decision in *Nebraska* v. *Wyoming* is no precedent for the claim that the United States Supreme Court will declare rights in the absence of existing or threatened injury because in that suit the Court found out-of-priority diversions in the upper States to the detriment of the lower States which constituted an existing injury and because the authorization and construction of the Bureau of Reclamation's Kendrick project in Wyoming constituted a threat of injury to Nebraska.

II. Congressional consent to suit aids the proponents of litigation by wrongfully implying that there is a justiciable controversy

(*a*) While Congress may not add to or detract from the jurisdiction of the United States Supreme Court (*Ex parte Yerger*, 75 U. S. 85), Congress is presumed to know the tests which have been announced by that Court as determinative of the question as to the existence of a justiciable controversy.

(*b*) The passage of a resolution granting the consent of the United States to suit would probably be sufficient in and of itself to cause the Court to permit the filing of a bill of complaint and to prevent the early disposition of the case by the Court on a motion to dismiss.

(*c*) The consequence will be that the case will follow the pattern of presentation of evidence to a master appointed by the Court with the delay and expense incident thereto.

(*d*) Under the existing factual situation such a hearing before a master can only result in the ultimate dismissal of the case upon the ground no justiciable controversy exists under the tests applied by the Court.

III. The proposed litigation imperils the Colorado River Basin development essential to national welfare and national defense

(*a*) A balanced national economy requires the utilization of substantial quantities of the water of the Colorado River for domestic purposes, for irrigation, and for hydroelectric power generation within the interior of the country.

(*b*) The 1947 report of the Bureau of Reclamation on the Colorado River (H. Doc. 419, supra) and the recently effective Upper Colorado River Basin Compact furnish the basis for such development.

(*c*) It is fair to assume that the pendency of the proposed litigation will be used by those opposing such development as an objection to the Federal authorization of Colorado River water use projects upon the theory that until the litigation is settled the share of water use available to each basin State will not be fixed.

(*d*) Plans for the development of the Colorado River are based upon the documents constituting the law of the river, viz, the Colorado River Compact, the Boulder Canyon Project Act, the California Self-Limitation Statute, the Mexican Water Treaty, and the Upper Colorado River Basin Compact. Congress should not, by granting the requested consent, raise any question as to the integrity of these documents.

(*e*) Experience has shown that interstate water litigation in the United States Supreme Court is time consuming and costly.

(1) There was litigation on the Arkansas River between Kansas and Colorado from 1901 to 1943 (*Kansas* v. *Colorado*, 185 U. S. 125; *Colorado* v. *Kansas*, 320 U. S. 383).

(2) Litigation between Wyoming and Colorado over the Laramie River lasted from 1911 to 1940. (See *Wyoming* v. *Colorado*, 259 U. S. 419, 455; 309 U. S. 572.)

(3) The Great Lakes drainage case—*Wisconsin* v. *Illinois*—was begun in 1925 (269 U. S. 527), a decree was entered in 1930 (281 U. S. 279) and the parties have returned repeatedly to the Court since then (see citations assembled by Justice Roberts in his dissenting opinion in *Nebraska* v. *Wyoming* (325 U. S. 589, 664)).

(4) The North Platte suit, *Nebraska* v. *Wyoming* was filed in 1934 (269 U. S. 527) and decree was entered in 1945 (325 U. S. 665). Commissioner of Reclamation Page in testifying before the Senate Committee on Irrigation and Reclamation on S. 649, Seventy-eighth Congress, first session, testified that the cost of that suit to the United States at that time amounted to half a million dollars. A conservative estimate is that the North Platte suit cost the four litigants at least $1,500,000.

(*g*) The States represented by this committee can ill afford to participate in the proposed litigation. Also, they cannot afford to postpone their needed development until the judicial processes have finally come to an end.

Mr. CARSON. I will not take the time now to read it, but I think you will find it very clearly and simply stated.

The CHAIRMAN. Very well, Mr. Carson.

Are there any other questions?

(No response.)

The CHAIRMAN. Does that complete your statement, Mr. Carson?

Mr. CARSON. Yes, sir.

The CHAIRMAN. The committee is indebted to you.

Mr. CARSON. Thank you very much.

The CHAIRMAN. You will return to the session tomorrow morning at 10 o'clock, if you would be good enough to do so, Mr. Carson?

Mr. CARSON. Yes, sir; I will be there.

This is off the record, if you please.

(Discussion off the record.)

The CHAIRMAN. I think if you are going to continue this discussion it should be on the record.

Mr. CARSON. We wind up then not claiming that the compact or the act gives the full amount of 2,800,000 acre-feet. Our contract pro-

vides, "subject to its availability under the act and the compact," so we take first from the full amount the full estimated ultimate possible uses in New Mexico and Utah, and I think we wind up as claiming from the main stream and a total of possibly 2,670,000 acre-feet.

The CHAIRMAN. Did you see the statement of Mr. Debler before he put it in?

Mr. CARSON. Yes.

The CHAIRMAN. Do you have a copy of it there?

Mr. CARSON. No; but I can get one in a minute; yes, sir.

The CHAIRMAN. On page 4. You will observe the resulting division. Out of the apportionment of 8½ million for the lower basin, 1 million is deducted for the Gila River use as contemplated at the time of the Boulder Canyon Project Act, leaving 7½ million acre-feet. From that you deduct the total of the use by New Mexico above Hoover Dam in the amount of 13,000 acre-feet, by Utah in the amount of 101,000 acre-feet, and of main stream reservoir evaporation of 870,000 acre-feet, or a total of 984,000.

Mr. CARSON. Yes, sir.

The CHAIRMAN. This deduction is made not from the 8½ million, but from 7½ million. Then the mainstream water available for further use is only 6,516,000, of which you claim 37⅓ percent for Arizona.

Mr. CARSON. Yes, sir.

The CHAIRMAN. Leaving 2,432,000.

Do you agree with that calculation?

Mr. CARSON. I think it requires some explanation from a legal point of view.

The CHAIRMAN. What is your explanation from the legal point of view?

Mr. CARSON. My explanation is this, Senator: Remember these questions of what is III (a) water, or what is III (b) water, become entirely immaterial when you conceive of this compact as being made by sovereign States dealing with one another; none of them surrendering any extraterritorial jurisdiction within their borders to any other State. So then it becomes a question of apportioning in the lower basin, among the States of the lower basin, 8½ million feet to determine the respective quantities of each State within its borders. Each State's share is handled, delivered and administered under its own law, without regard to the right of any other State. The only purpose here is to fix quantities by States.

Under that explanation, the argument Mr. Debler was drawn into as to what is III (b) water or what is III (a) water, entirely disappears and is no longer material.

Mr. Debler in answering assumed that these uses of water in New Mexico and Utah were of III (a) water. So the result of that assumption is to leave in the main stream of the river a surplus which comes from the 7½ million acre-feet delivered at Lee Ferry, in the amount which these States might use in these tributary basins.

That reduces the apportionment among the States of Arizona, California, and Nevada of the water deliverable to them.

The CHAIRMAN. This is the position in which you leave the calculation: That 2,432,000 acre-feet constitute Arizona's share out of 6,516,000, leaving 4,084,000 for other distribution. How much of that goes to New Mexico, if any?

Mr. CARSON. New Mexico is to receive 13,000 acre-feet from the Little Colorado River.

The CHAIRMAN. Above Hoover Dam?

Mr. CARSON. Above Hoover Dam; yes. He has in here later under "utilization," deducted the estimated uses in New Mexico from the Gila in excess of the million acre-feet so it thereby reduced us again until he winds up with 2,294,000 acre-feet of main stream water available for our use. That is at the bottom of the same page 4. "Main stream water available for Arizona use, 2,294,000 acre-feet."

Senator ANDERSON. Let us see if we can start it this way——

The CHAIRMAN. Let me ask it this way: You see, under "utilization" there is the contemplated Gila River depletion by Arizona and New Mexico.

Mr. CARSON. Yes.

The CHAIRMAN. That is not broken down. You have not told us what New Mexico is going to get and what Arizona is going to get of the 1,138,000.

Mr. CARSON. I am talking about engineering now, Senator.

The CHAIRMAN. Is it assumed?

Mr. CARSON. If I am in error, please correct me.

The CHAIRMAN. Well, let us get the legal view of the facts.

Mr. CARSON. Whatever New Mexico is entitled to use out of the Gila River is included within that 1,138,000 acre-feet. That quantity is not yet fixed by any agreement by Arizona and New Mexico. It cannot be fixed until we know whether we can get main-stream water in there to the lower lands.

But we are now using, as I get it from these figures—and that is where I want to be corrected, if I am wrong—24,000 acre-feet as estimated by the Bureau of Reclamation as the total possible ultimate use in New Mexico of Gila River water.

The CHAIRMAN. That brings me to the precise point I have in mind. It is clear from what you state that this is just an estimate. And since there is no agreement, no compact between Arizona and New Mexico, how are we going to form a judgment with respect to how great a demand we shall create by authorization legislation in Arizona, without having created a demand by New Mexico?

Mr. CARSON. Well, let me go back a moment, if I may.

The CHAIRMAN. Let me say this: The Department of the Interior was never willing to contemplate the approval of any bill for the construction of works in the upper basin until the basin States made a compact.

Mr. CARSON. I do not think there is any argument between either Utah or New Mexico and Arizona in the lower basin. I do not think we will have any difficulty there.

We recognize this is an estimate; that it is not binding on either Utah, New Mexico, or Arizona, but it is the best now available to us, and that it is subject to such adjustment as may be required, limited always, Senator, by the water available in the tributary basins.

The CHAIRMAN. I am forced to interrupt and to recess the session because they are voting up on the floor.

Could you save your questions until morning? I think you would want to vote, too.

Senator ANDERSON. Yes.

The CHAIRMAN. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 5:01 p. m., a recess was taken until 10 a. m. of the following day, Thursday, April 28, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

THURSDAY, APRIL 28, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:30 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney, chairman, presiding.

Present: Senators O'Mahoney, Murray, Downey, McFarland, Kerr, Millikin, Ecton, Anderson, Cordon.

The CHAIRMAN. The hearing will be in order.

Mr. Carson, will you be good enough to take the stand.

STATEMENT OF CHARLES A. CARSON—Resumed

The CHAIRMAN. Senator Downey, you desired to ask a question or two.

Senator DOWNEY. Mr. Carson, in your opinion, would a justiciable cause of action presently exist in favor of Arizona against California, centering on the waters of the Colorado River, by virtue of which Arizona would be entitled to seek relief in the Supreme Court of the United States if the presence of the Federal Government could be assured?

Mr. CARSON. No, sir.

May I have that 283 U. S., please?

Senator DOWNEY. Mr. Carson, I would like to make this as short as possible.

Mr. CARSON. Well, I would, too.

Senator DOWNEY. All I am seeking is an understanding of your position. You read from that at some length yesterday. I just want to find out your ultimate conclusions, your own opinion.

Mr. CARSON. No, sir; I think Arizona would not. If I could have figured any way to enjoin California from making these arguments they now make, I would have done it before now, but there is no justiciable issue at present, in my opinion.

Senator DOWNEY. You understood my question. It was whether or not a justiciable cause of action would exist in favor of Arizona if she desired to press her suit in the Supreme Court.

Mr. CARSON. Yes, sir. In my opinion there is not.

Senator DOWNEY. California now holds contracts from the Secretary of the Interior, that at least on their face, according to you, invade the rights of Arizona in the Colorado River, is that right?

Mr. CARSON. Yes, sir.

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Senator DOWNEY. And California has built the physical works that would permit the diversion of water from the Colorado River that, according to you, would invade the rights of Arizona, is that correct?

Mr. CARSON. That is correct, and in excess of that permitted in California by the California self-limitation statute.

Senator DOWNEY. Now, Mr. Carson, if we could just keep to this one point. You have made that point repeatedly already and we understand it.

At the request of the chairman, I am trying to limit my cross-examination as much as I can.

Mr. CARSON. Yes, sir.

Senator DOWNEY. Then, Mr. Carson, would you express to the committee when, in your opinion, a justiciable cause of action might exist on the part of California as against Arizona?

Mr. CARSON. Not unless and until this authorization bill is passed on behalf of either State, and then I very seriously doubt that a justiciable cause of action could be alleged by California against Arizona, because they have not yet put to use the full amount of 4,400,000 acre-feet. And under the language of the Supreme Court they will not entertain suits unless a presently existing use is threatened, and I doubt if California could allege that the central Arizona project would threaten any existing use in California. Nor by virtue of the limitation act that it would exist as to that 962,000 acre-feet which California claims, and which must of necessity be a part of surplus water to which no State can acquire a right until after 1963; and then only if either the upper basin or the lower basin has put to beneficial use all the water apportioned, that is, 7,500,000 acre-feet in the upper basin and 8,500,000 acre-feet in the lower basin.

Senator DOWNEY. Then, Mr. Carson, as I understand you, from the latter part of your statement, you do not believe that the passage of an authorization act by Congress for the central Arizona project would give justiciable cause on the part of California to proceed in the Supreme Court?

Mr. CARSON. My opinion is well formed, Senator, that there could be no justiciable issue unless and until that authorization bill is passed. If it is passed, then it would become a question, but in my judgment California then could not state a justiciable issue in the United States Supreme Court. I think that opinion is joined in by the Colorado River Basin States Committee and the representatives of Utah, Wyoming, New Mexico, and Colorado.

Senator DOWNEY. Then you would further be of the opinion that even the building of the physical works by Arizona to divert the 1,200,000 acre-feet of water out of the Colorado River, would not give a justiciable cause of action to California, so long as California still has water in the river that it could use?

Mr. CARSON. Well, if they thought it would give rise to a justiciable issue after this authorization bill is passed, by the threatened diversion of water into central Arizona, then of course California would be at liberty to try to state a justiciable issue. But I doubt if it would be sufficiently clear or within their power to allege a justiciable issue that the United States Supreme Court would accept jurisdiction of, for the reason I have just given.

Senator DOWNEY. Mr. Carson, we still leave this rather ambiguous.

Mr. CARSON. I do not think so.

Senator DOWNEY. Well, at least my mind is not clear on what your opinion is. You are here representing Arizona, as I understand.

Mr. CARSON. Yes, sir.

Senator DOWNEY. And as such official representative, I want your opinion, which, of course, we highly regard.

Mr. CARSON. I thought I had made it clear, but if I have not, I will try.

Senator DOWNEY. Your best considered opinion is that California would not have any justiciable cause of action as long as the amount of water that she was using continued to be there in the river for her, and it was only when she actually lacked water that a justiciable cause of action would arise?

Mr. CARSON. Senator, I am trying to be as clear as I can. I do not believe that California could state a justiciable issue unless they could allege that this water could be diverted into central Arizona and would in some way infringe upon their right to the 4,400,000 acre-feet, to which they are forever limited by the limitation act. If they believe they could make such an allegation, then it would become a question of whether they could so clearly state it that it would be a justiciable issue within the determination, at that time, of the Supreme Court of the United States.

Senator DOWNEY. But you, under those conditions, are not even sure then, in your own opinion, that a justiciable cause of action would be in existence; is that right?

Mr. CARSON. No; and the reason I am not is because I do not believe that any of this water for the central Arizona project would in any way impair California's right to the use of the 4,400,000 acre-feet to which they are forever limited.

Senator DOWNEY. But I understood you to say, Mr. Carson—and I am very sure you did—that so long as California was not using its 4,400,000, assuming, for example, that it was only using 3,500,000 and that 3,500,00 was there in the river in spite of the fact that Arizona might be diverting under this project, then, under that condition California would not have a justiciable cause of action, in your opinion. Did you not express that opinion?

Mr. CARSON. They might possibly, if they could allege that they had the works built and that we were getting into their 4,400,000 acre-feet. I could not give a legal opinion on that without seeing the allegations they might make in a bill.

Senator DOWNEY. Are you expressing to the committee that you believe even under the last hypothesis we have been discussing that a justiciable cause of action might not exist?

Mr. CARSON. It might exist.

Senator DOWNEY. Or might not exist?

Mr. CARSON. It might exist, Senator, if California could allege that the central Arizona project would in any way cut down the California use of the 4,400,000 acre-feet, the quantity to which they are limited by the limitation act.

Senator DOWNEY. Under the controversies here existing, and under the admitted facts, Mr. Carson, is it your opinion that the passage of

the authorization act for the central Arizona project would create a justiciable cause of action in California?

Mr. CARSON. It would supply one phase of the justiciable controversy by making it clear that Arizona had an authorized project and was intending to divert from the river the 1,200,000 acre-feet for that project. Now, that part of the question would be supplied by an authorization act.

Beyond that, however, in my opinion, California would have to be able to allege that the diversion of that water from the river, the 1,200,000 acre-feet, would in some way interfere with California's right to the use of the 4,400,000 acre-feet to which they are limited by the limitation act.

Senator DOWNEY. Of course, California is not admitting that it is limited to that 4,400,000, our claim is that we are entitled to the 4,400,000, plus one-half of the surplus.

Mr. CARSON. Yes, which we concede, Senator, but the surplus cannot be acquired in any permanent way until after 1963, and then by agreement among all seven States.

Senator DOWNEY. Then are you stating that a justiciable cause of action might exist after 1963 that could not exist before 1963?

Mr. CARSON. No. I think California is bound and we are bound, and every State in the basin is bound by the agreement in the compact that the excess or surplus water is subject to further apportionment by agreement among the seven States after 1963.

Senator DOWNEY. Mr. Carson, I am still somewhat in doubt about your own opinion concerning when this justiciable cause of action would exist. That is not in any way critical of your clarity or your opinion.

Mr. CARSON. I can tell you what it is based on.

Senator DOWNEY. That is what you read yesterday, it is not?

Mr. CARSON. It is one of them that I read yesterday. But I think that is as clearly stated by the Court as I am trying to state it now.

Senator DOWNEY. Mr. Carson, before reading that, I thought you did express the opinion, at least tentatively, that the justiciable cause of action would not exist until actually there was a failure of water supply available for California; so long as she could get the water out of the river she could not show that she was injured.

Mr. CARSON. No. Let me go over that again, Senator. The authorization bill would supply one part of the question of a justiciable issue, if California could then allege that Arizona was threatening to divert from the river 1,200,000 acre-feet of water. In my judgment, until that authorization bill is passed, they cannot so allege. But the threat to divert would be supplied by the authorization bill.

Then when you go on beyond that to determine whether or not California could state a justiciable controversy, then they have got not only to allege that Arizona is threatening to divert that water from the river, but also further to allege that the diversion of that water would interfere with California's use of the 4,400,000 acre-feet of apportioned water to which they are forever limited by the compact.

Senator DOWNEY. I think those are all the questions I have.

Senator KERR. You said "limited by the compact."

Mr. CARSON. By the California Self-Limitation Act and the Boulder Canyon Project Act.

Senator MILLIKIN. Mr. Chairman, may I ask a question:

Would you boil that all down this way, that if California has a justiciable issue it will mature by the authorization?

Mr. CARSON. Yes; that is all right. I do not want to go back over this, unless you want me to.

Senator DOWNEY. Mr. Carson, I do not think it is necessary. Some of your statements have not been clear to me, but I think they have been cleared now.

Senator MCFARLAND. I think Senator Millikin's question pretty well cleared it up.

Mr. CARSON. Yes.

Senator MCFARLAND. That is the whole thing boiled down, as I understand it. But your position is, Mr. Carson, that of course it is already settled that Arizona is entitled to the 1,200,000 acre-feet of water, and for that reason you say there may never be a justiciable issue?

Mr. CARSON. That is right.

Senator MCFARLAND. But if there ever should be such an issue, the passage of the authorization for the project would be the element maturing the issue?

Mr. CARSON. That is right.

The CHAIRMAN. No other questions?

Senator DOWNEY. No other questions.

The CHAIRMAN. Thank you very much, Mr. Carson.

Senator Hayden, we will be very happy to hear from you.

STATEMENT OF HON. CARL HAYDEN, A UNITED STATES SENATOR FROM THE STATE OF ARIZONA

Senator HAYDEN. Mr. Chairman, I sincerely regret that pressure of duties in other committees has prevented me from attending the hearings, much as I would like to have done.

The CHAIRMAN. I think all the members of the committee understand the pressure under which the Senator from Arizona is working.

Senator HAYDEN. But I am glad to have an opportunity to appear before you this morning.

One of the questions raised in connection with this authorization bill is the cost of the central Arizona project, which has been estimated by the Bureau of Reclamation to be $738,408,000, a considerable sum of money. However, I think it is fair to mention other appropriations for similar purposes, particularly those made for the State of California, that are comparable to the cost of the central Arizona project.

I have before me a list of the authorized flood-control projects in the State of California, which list was supplied to me by the Corps of Engineers of the Army.

Authorized flood-control projects in the State of California

Project	Total estimated Federal cost	Amount appropriated to date
Bear Creek	$503,000	$20,000
Black Butte Reservoir	11,079,000	
Cherry Valley Reservoir	6,200,000	610,000
Farmington Reservoir	3,729,000	395,000
Folsom Reservoir	50,792,000	1,582,000
Hogan Reservoir	11,264,000	105,000
Isabella Reservoir	14,300,000	3,858,000
Los Angeles County drainage area (exclusive of Whittier Narrows Reservoir)	301,605,600	89,231,200
Merced County stream group	2,700,000	1,555,000
New Melones Reservoir	38,127,000	100,000
Pajaro River	714,000	714,000
Pine Flat Reservoir	51,121,000	6,700,000
Sacramento River and minor and major tributaries	21,520,000	1,035,000
Salinas River	3,515,000	30,000
Santa Ana River Basin (including San Antonio Dam)	44,805,900	19,479,700
San Joaquin River and tributaries	4,005,000	45,000
Santa Clara River	4,956,000	
Stewart Canyon debris basin and channel	880,000	36,000
Success Reservoir	11,144,000	295,000
Table Mountain Reservoir	55,229,000	615,000
Terminus Reservoir	13,395,000	275,000
Ventura River	1,510,000	1,350,000
Whittier Narrows Reservoir	26,880,000	1,194,100
Eel River	280,000	
Napa River	65,000	
Sacramento River flood-control project	42,600,000	36,195,000
Total	722,919,500	165,450,000

There have been authorized for construction by congressional enactment, flood-control projects in the State of California aggregating a total of $722,919,500. The principal items authorized are the Los Angeles County drainage area, exclusive of the Whittier Narrows Reservoir, $301,605,600. There are five other important projects: Folsom Reservoir costing $50,792,000; Pine Flat Reservoir costing $51,121,000; Santa Ana River Basin, including San Antonio Dam, $44,805,000; Table Mountain Reservoir, $55,229,000; and the Sacramento River flood-control project, $42,600,000, which five projects aggregate something more than $244,000,000.

Now, not a soul—at least a sensible soul—in Arizona begrudges the appropriation by Congress of that $722,919,000 for use in the State of California.

Each one of these projects has been approved for construction after careful investigation by the Corps of Engineers. The cost is less than the benefits that would accrue to the property owners in the several areas. These are not all the flood-control projects that are to be constructed in California; others are under investigation at this time and undoubtedly there will be future authorizations by Congress for additional sums of money.

It is true that the local interests are required to acquire the rights-of-way and make substantial constributions in a number of instances, but none of this $722,919,000 is actually reimbursable to the Federal Treasury. It is a gift, a subsidy. In one sense, you might say the Congress would not be justified in making such appropriations. However, when broadly and fairly viewed, I say that that money will all be returned to the Treasury of the United States, with good interest, because when valuable farm lands are protected, when manufacturing establishments and business enterprises in cities and towns are pro-

tected, Congress is preserving taxable wealth. By constructing these flood-control projects, Congress creates additional wealth; and when the wealth is created it becomes subject to Federal income and profits taxation.

Out of the prosperity that will ensue in California the Federal Government will get its money back, all of it, without waiting very long. In my judgment the Federal Treasury will be fully reimbursed.

As far as we are concerned in Arizona, our people like to have prosperous neighbors. It does not make any difference whether a steer is fattened on one side of the Colorado River or the other, he goes to the Los Angeles market. Our mining products and agricultural products are all in greater demand because there are more millions of people living in California who are prospering. They make a better market for everything we produce. We are all in one economic unit. The people of Arizona are not at all jealous of the development of the resources of California.

I would also like to direct the attention of the committee to another set of figures which should be of interest; namely, the Federal reclamation appropriations which have been authorized in the State of California. Up to the present time Congress has passed authorizing acts amounting to $694,981,137. The amount that has actually been appropriated to construct those projects is $354,808,274. That is not all that will be done by Congress. There is now under investigation by the Reclamation Service additional irrigation developments in the Central Valley Basin that are estimated to cost between $300,000,000 and $400,000,000.

Federal reclamation developments in California

Projects authorized for construction	Estimated total cost	Funds appropriated through June 30, 1948
All-American Canal project	$76,448,670	$53,070,162
Central Valley project	440,069,000	272,803,972
Central Valley project irrigation distribution systems	72,500,000	
Klamath project (California portion)	5,873,583	8,155,000
Orland project	2,448,670	2,500,000
Parker Dam and power plant project	16,272,466	[1] 15,676,392
Santa Barbara project	34,189,000	[2] 1,000,000
Solano County project	45,577,000	
Yuma project (California portion)	1,602,748	1,602,748
Total authorized	694,981,137	354,808,274

[1] Exclusive of $7,256,553 of trust funds contributed by Metropolitan Water District of Southern California and transmission line system in Arizona.
[2] Contract authorization, $1,600,000.

There are other proposed reclamation developments in California, all of them worthy, that will in time undoubtedly be authorized by Congress.

Now, these sums of money for reclamation and for flood control in California are comparable to the amount of money we have asked for in Arizona. It makes no difference whether the appropriations are divided up into different units, since the sum total is a quantity of money that is to come out of the Treasury of the United States. It is either taxpayers' money, or borrowed money, as the case may be.

But my contention again is that every one of these reclamation or irrigation projects in California is fully justified. The sums expended

on them will be directly reimbursed to the reclamation fund and to the Treasury of the United States; but even more important, they all create new wealth which becomes taxable wealth. From the taxation angle alone, the Federal Government will again get its money back. Each one of these reclamation projects in California is a good investment, so far as the United States is concerned. And nobody in Arizona begrudges their development over there.

Now, take the figures that we have with respect to the central Arizona project. The estimated cost, as I stated, is $738,408,000. That sum can be divided into two parts:

First, the irrigation features which would not be required if Colorado River water is not brought into central Arizona. Second, the features of primary value for silt and flood control and for the production and transmission of hydroelectric power, which are fully justified on the basis that has been adopted elsewhere throughout the United States, with respect to flood control and power projects.

DIVISION OF COSTS

The estimated construction cost of the central Arizona project is $738,408,000 which can be divided into two parts.

(1) Irrigation features which would not be required if Colorado River water is not brought into central Arizona:

Havasu pumping plants	$25,973,000
Granite Reef aqueduct	131,716,000
McDowell pumping plant and canal	3,346,000
McDowell Dam and reservoir	16,326,000
McDowell power plant	1,012,000
Salt-Gila Aqueduct	34,585,000
Irrigation distribution system	54,086,000
Total deduction	267,044,000

(2) Features of primary value for silt and flood control and for the production and transmission of hydroelectric power:

Bluff Dam and reservoir	$29,628,000
Coconino Dam and reservoir	7,487,000
Bridge Canyon Dam and reservoir	191,939,000
Bridge Canyon power plant	73,419,000
Horseshoe Dam (enlargement) and reservoir	7,078,000
Horseshoe power plant	2,628,000
Buttes Dam and reservoir	29,037,000
Buttes power plant	1,159,000
Charleston Dam and reservoir	9,270,000
Tucson Aqueduct	6,401,000
Safford Valley improvements	4,090,000
Hooker Dam and reservoir	15,484,000
Drainage system for salinity control	9,973,000
Power transmission system	83,771,000
Total retained features	471,364,000

The above estimates were made by the Bureau of Reclamation during a period of high prices. If a reduction of 15 percent in future construction costs (as recently provided by the House of Representatives in the Interior Department and the War Department civil functions appropriation bills) is justified the present estimated cost of all features of the central Arizona project would be reduced by $110,760,000 to $627,648,000.

If there is to be no water taken out of the Colorado River for the irrigation of lands in central Arizona, then the project cost could be reduced by $267,044,000. There would be no need for Congress to appropriate money for the Havasu pumping plant at $25,973,000 or

for the Granite Reef Aqueduct at $131,716,000. Money for the McDowell pumping plant, the McDowell Reservoir, the McDowell power plant, aggregating some twenty-million-odd dollars, would not be required. The Salt-Gila Aqueduct would not be constructed, and certainly, if there is to be no water to distribute there would be no need for an irrigation distribution system at a cost of $54,086,000.

In the second group of features, the Bluff Dam and reservoir and the Coconino Dam and reservoir, to cost about $38,000,000, are for silt control, which control is approved by everyone in California and Arizona.

Then comes the principal item, the Bridge Canyon Dam and reservoir, at an estimated cost of $191,939,000, to develop power for which there is a crying need in California, in Arizona, and Nevada. It is a plant that simply has to be built because at the present moment there is not enough power for industrial uses and for irrigation purposes in any of the three States.

It is absolutely necessary to build a power plant there, at a cost of $73,419,000. Another large item in this list is $83,771,000 for transmission lines to get Bridge Canyon power to the various places where it is to be used.

In connection with these figures let me state that they are based upon estimates made by the Bureau of Reclamation during the period of high prices. If a reduction of 15 percent in future construction costs, as recently provided by the House of Representatives in the Interior Department and in the War Department civil functions appropriations bills is justified, then the present estimated cost of all the features of the central Arizona project would be reduced by $110,760,000 to $627,648,000.

The House of Representatives has taken that deliberate action on each of those appropriation bills for the fiscal year 1950 on the assumption that the costs of construction have gone down and will go down during the next year by at least 15 percent. I am making no prediction as to the future. All I know is that if this project is adopted by Congress for construction, like all other reclamation projects, it is going to take a number of years to be built; and if construction costs do return to normal, they will not be as high as such costs were at the time these estimates were made by the Reclamation Service.

Another factor to be seriously considered is that the central Arizona project should be included in a series of approved projects upon which engineers are working all over the United States for flood control, hydroelectric power, and irrigation, so that if, unfortunately, our country should go into another economic depression, there could be made available employment for many men on such great public works, which would also provide a market for machinery and large quantities of construction materials.

I have broken these costs down into two parts, because of the very argument to which the committee listened this morning as to whether or not Arizona had a right to obtain water out of the Colorado River. If the Supreme Court of the United States, for example, should decide that Arizona did not have any right to take the required quantity of water out of the Colorado River, then there would not be any sense in asking Congress to appropriate money to build the authorized irrigation works. It is obvious that in the order of construction the irri-

gation works come last, and not first. It will be necessary to build a great dam, a large power plant, and the transmission lines before any water can be pumped out of the Colorado River. So if the whole project is authorized, and those features that had to be built first were under construction, there might be then time to try a lawsuit and see whether Arizona had a right to take water from the Colorado River. If the Supreme Court decided that Arizona did not have that right, we would not have water for the project; that would be an end to it, and the Congress would not appropriate the money for that part of this authorization for which there was no water available.

I am not a lawyer. All the law that I know I acquired as a sheriff when for about 5 years I listened to legal arguments in the Maricopa County courthouse.

The CHAIRMAN. Do you take no credit at all, Senator, for listening to all the legal arguments since you have been a Member of Congress?

Senator HAYDEN. If I had paid strict attention to all the congressional arguments, particularly with respect to the Constitution of the United States, I am afraid that confusion would be worse confounded in my mind. [Laughter.]

I did get it in my head, as sheriff, while listening to the lawyers, that one could not go to court and allege imaginary damages; there had to be something real. The complaining party had to demonstrate that he had lost, or was about to lose, something that really belonged to him.

Now, it is just a sheriff's opinion that if this authorizing act is passed, and work was actually begun with money appropriated by Congress under that authorization, and it looked like Arizona was going to take 1,200,000 acre-feet of water out of the Colorado River, the State of California then would have some standing in court; at least get a start, as Mr. Carson said this morning, toward developing what he called a justiciable issue—and I don't know just exactly what that means—and thereby get a case into court. The validity of the California claim might then be tried out, while the Reclamation Service is constructing the other part of the works which are not directly related to irrigation.

My contention is, and I think it is as clear as a bell from the record, that Arizona is entitled to 2,800,000 acre-feet of water out of the main stream of the Colorado River, out of the 7,500,000 acre-feet apportioned to the lower basin. I know how those figures came about. I was here in Congress at the time.

What happened historically was that the Colorado River, combined with floods from the Gila, broke over into the Imperial Valley and drowned out a lot of valuable agricultural land. All of the river ran into the Salton Sea for a while. To adequately protect people of the Imperial Valley is was necessary to go up somewhere along the river and build a great dam to control the floods, and the Boulder Canyon site was selected.

To build the Boulder Canyon Dam required an authorizing act by Congress. The States of the upper basin, looking the situation over, said, "Before any dam is built on the Colorado River we must have an understanding about how the waters of that river are going to be divided. We want to know what water will be left for us, because California is lower down, has lands that are level and more susceptible

of irrigation, and if nothing is done about dividing the water, they will put it to beneficial use; and once land is irrigated in California we never could take the water away from them. Whatever the future situation may be, it will not be possible to turn existing irrigated farms back into the desert."

It was the upper basin States which insisted that there should be a Colorado River compact. It was at their request that Congress, in the act of August 19, 1921, authorized the making of a compact among the basin States for the apportionment of the water of the Colorado River. The act was conditioned upon the appointment of, and participation in the compact sessions by, a representative of the Federal Government. Herbert Hoover, who was then Secretary of Commerce, was persuaded to be the Federal representative because everyone wanted an engineer of standing and national reputation to be at the head of the Commission.

The commissioners from the seven States negotiated all summer and did not get anywhere. I remember talking to Mr. Hoover one day about it, and he said they just could not agree on anything at all. I said, "What you say is due to your political inexperience; there is an election coming on this fall, and it does not make any difference what a State official should now agree, because his opponent is going to say that he has traded away the heritage of his people. But if you will just wait until after the election and then get the State commissioners together, they will write a compact." And that is exactly what they did.

They went over to Santa Fe and agreed upon the Colorado River compact, which was signed November 24, 1922. It was found impossible at that time to make a division of the water among the seven States; so they agreed to divide the Colorado River Basin into two parts, and that 7,500,000 acre-feet should be allocated to the upper basin and 7,500,000 feet to the lower basin out of the main stream at Lee's Ferry near the Utah-Arizona boundary line.

Then again, having had difficulty with California in getting that State to come together with them on the compact, the representatives of the upper basin States decided that they had better have a further assurance before Congress authorized the construction of the Boulder Canyon project. "We insist that the California Legislature shall meet and irrevocably bind that State for the benefit of the United States and all the other States of the basin; that California will never claim more than 4,400,000 acre-feet out of that 7,500,000 coming down the Colorado River." The Boulder Canyon Project Act accordingly was passed by Congress with the specific provision that it would not be effective until the California Legislature made that irrevocable agreement.

Subtract 4,400,000 acre-feet from 7,500,000 acre-feet, and what is left could go only to two other States, Arizona and Nevada.

The 4,400,000 acre-feet apportionment to California as worked out was in close accord, but not quite identical, with an arbitration award that Arizona accepted at one time in order to get a settlement with California. Arizona submitted to the Governors of the upper basin States and their representatives this question: How should the lower basin water be divided?

The governors came back with a finding that Arizona should get 3,000,000 acre-feet, California 4,200,000, and Nevada 300,000. When the time came to write the Boulder Canyon Project Act, California took another 200,000 acre-feet. That is how it gets up to 4,400,000. I remember the argument made to us during consideration of that act: "Arizona has been allocated under the governors' arbitration 3,000,000 acre-feet; your State is losing less than 10 percent of that amount of water and you had better go along," and that is the way it was done.

Unfortunately, the State of Arizona failed promptly to ratify the Colorado River compact. We then had a group of folks in Arizona who were perfect fanatics about Colorado River water. They would look at a map of the State, see a level place on it somewhere, figure up the number of irrigable acres, and insist that there were millions of acres of desert land in Arizona that could be irrigated. We had one gentleman, Mr. George H. Maxwell, who even argued that, based upon the doctrine of riparian rights, the State of Arizona had the right to have the Colorado River come down its northern border with an undiminished flow.

Approval of the Colorado River compact got mixed up into politics because the defeated Governor of Arizona went over to Santa Fe when the compact was signed, and came back saying that it was a wonderful document. The Governor who had defeated him a few weeks before in the State election, of course, did not like that. So when it came to the ratification of the compact much trouble developed in the Arizona Legislature.

In an effort to straighten out that situation, I addressed a long series of questions to Mr. Hoover as to what the compact meant. All of the questions were asked in order to satisfy people in Arizona who were alleging that somehow or other our State was going to suffer great injury if we ratified the Colorado River compact. The questions were not based upon any fear that California would not do the right thing, or that the other States in the basin would not do right by us, but just simply to satisfy local sentiment at home.

But we did not succeed in that effort, and my recollection is that the Colorado River compact failed of ratification in one house of the Arizona Legislature by about two votes and by one vote in the other. So Arizona was not in the compact when the time came for Congress to pass the Boulder Canyon Project Act. And because Arizona had not approved it, the other six States said, "We are going to fix it so that Arizona cannot get any water out of the Boulder Canyon Reservoir until Arizona joins the compact." If Senators will read through the Boulder Canyon Project Act they will find one place after another where it is in effect provided that unless a State had approved the compact it did not get any water out of the Colorado River.

The bill to authorize the construction of the Boulder Canyon project was reported in the Senate in the spring of 1928. Senator Ashurst and I were there to represent our State. Here was a bill which absolutely deprived Arizona of any benefits whatsoever from the construction of that project. We concluded that our only recourse was to fight the bill. So we tied it up for over a month, toward the close of the summer session of Congress, which was not difficult because the appropriation bills and other business frequently caused it to be set aside.

The bill finally was made the exclusive unfinished business of the Senate, when Congress reconvened on the first Monday in December 1928. Then we started talking again. There were just the two of us——

Senator KERR. Not a filibuster, Senator.

Senator HAYDEN. We did filibuster; there was no fooling about it at all. [Laughter.]

We did it all day long and then when the Senate ran into night sessions we kept on—insisting that there must be some indication in the bill that Arizona had some right to water in the Colorado River.

Finally—I very well remember the last night; I talked until about 11 o'clock when a quorum did not develop; so I went to sleep on a couch. The last of the Senators to make a quorum straggled in just as the sun was coming up. I told all the Senators to go home, get a bath, get breakfast, and take their time, because I was not going to yield the floor until at least half past 10. I knew there were then in progress negotiations to work out something in the bill that would help Arizona.

Senator Pittman of Nevada was the principal negotiator who was trying to get our troubles straightened out. He thoroughly understood our attitude with regard to the legislation.

He had told me the evening before, and then again that morning—I remember I yielded the floor to my colleague and talked to Senator Pittman in the Democratic cloakroom. He said, "We have fixed up an amendment which clearly indicates what water in the Colorado River Arizona is entitled to." That is the provision in the Boulder Canyon Project Act by which Congress authorized in advance the approval of a supplemental compact between the three States of the lower basin for a division of Colorado River water. It gave advance congressional approval. Ordinarily an interstate compact is approved after the States have negotiated it, but this was another way of getting at it.

It is provided in the Boulder Canyon Project Act that:

> The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico. * * *

One of the allegations made by some of the fanatics in Arizona was that if Arizona should ratify the Colorado River compact and a shortage of water occurred in Mexico, we would have to open up the Roosevelt Dam and all the other Arizona reservoirs, turn the water down the Gila River, and let it run to Mexico; that we would have to open up the floodgate and turn the water down, even though it would never get to Mexico, but would be soaked up in the sands.

But that is what some people in Arizona construed the compact to mean. Those words last quoted were used in the act, not for fear of

California or of the other basin States, but to answer the fears of the fanatics in Arizona. That is also why the following language is in the Boulder Canyon Project Act:

> If it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water which cannot reasonably be applied to domestic and agricultural uses, and that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact. * * *

Senator Pittman brought us this solution. I remember very well that Senator Kendrick came to talk to me in the cloakroom and said, "Now, this is what you have been talking about: You want a clear definition of Arizona's rights to water out of the Colorado River. We have given it to you and you ought to abandon this filibuster." We could have kept it up. We were not afraid of cloture. That had been tried once before and failed to get the necessary votes. We could have tied the bill up for good. And I can assure you that I would have been right there talking yet if we had not made this agreement.

Senator McFARLAND. Senator, pardon me just a minute. Did you read the earlier portion of that section of the Project Act which provided for the apportionment of 2,800,000 acre-feet of III (a) water to Arizona, plus the waters of the Gila?

Senator KERR. Yes; he read that.

Senator McFARLAND. Pardon me; I did not hear that.

Senator HAYDEN. There is another provision in the act about an additional million acre-feet allocated to the lower basin.

Senator KERR. That is III (b).

Senator HAYDEN. III (b). Everybody knew that was Arizona water. The California Senators knew it better than anybody else because if you will look at that map the Gila River runs into the Colorado River below any point where California could divert it into that State. It could not be used in any other State. The old Laguna Dam and the present Imperial Dam are above the mouth of the Gila River. So everybody agreed that no other State could have any claim to any water that could be physically used in one State alone. That was the Gila River situation.

But we had to put all that language in the act in order to satisfy a lot of our people that Arizona would not be required to deliver any Gila River water to Mexico and that no one else had any claim to it. That is why it was written.

The language was not adopted, as I say, because any representation had been made at any time by any Senator from any State that Gila River water did not belong to Arizona.

That was thoroughly understood by Senator Johnson and Senator Shortridge, the then Senators from California.

If the representations made with respect to the Gila River in later years, on behalf of the State of California, had been so much as whispered at that time, the Boulder Canyon Project Act would never have been passed. I know that positively, because these later representations are so different from the concept that was in the minds of

all the Senators who had to do with the passage of that act, that such later representations just would not fit the true original situation.

Since that time the intent of that act has been twisted and squirmed and distorted. Sometimes I think the way some people in California, and particularly the groups over in the Imperial Valley, try to twist the meaning of words and to distort the record of history, and to welch on the solemn agreements that the State of California made—the best group I can compare them with is the Politburo in Moscow. That is about as close a comparison as I can summon as to anyone acting to twist and distort the meaning of words and the distinct understanding that we had at the time.

Senator DOWNEY. Mr. Chairman, in view of that very bitter statement that I think is totally uncalled for and that I very much resent, on which specific act does the Senator base that statement? What specific act?

Senator HAYDEN. The assertion, for example, that the State of California could count in the waters of the Gila River as a part of the lower basin waters to which they might lay claim. That is perfectly idiotic. There is not a thing like it in the record. It never was in the mind of Senator Hiram Johnson. It never was in the mind of Sam Shortridge. It never was in the mind of any Senator that any such cockeyed idea could ever be advanced, and yet it has since been seriously advanced by California over and over again.

Senator DOWNEY. Mr. Chairman, I want to say we will certainly endeavor to present very persuasive evidence that the statement just made by the Senator from Arizona is not correct.

Senator HAYDEN. All I can say to the Senator is that no such idea had been advanced at that time by any Senator or Congressman from California, nor were any of these extravagant claims that are now being made, whether based upon a subsequent contract with the Secretary of the Interior for nearly a million additional acre-feet of water out of the surplus or otherwise. That idea was not dreamed of at the time of adoption of the Boulder Canyon Project Act. Nobody even thought it or ever mentioned that California could firm up a contract above the 4,400,000 acre-feet of water by taking water away from Arizona. If that proposal had ever been before the Congress there would not have been a Boulder Canyon Project Act and you could not have gotten a Senator from any State to support it.

Senator Johnson and Senator Shortridge never advocated anything of the kind. I know what I am talking about because I was there.

That is the situation the way I see it, and that is why I have recited this history to the committee.

My mother came to California right after the Union Pacific Railroad was built. She taught school in the San Joaquin Valley. She married my father and moved down to Arizona, where I was born. As a boy I went with her and visited her friends in the San Joaquin Valley. Then as a student at Stanford University and on other occasions I went by there, so I know that country very thoroughly. I know just what happened in that valley. Originally it was a very fine cattle-grazing country. Miller and Lux was the big cattle outfit. Then water was first diverted out of some of the streams for irrigation. Later it was discovered that water was not very far down if one wanted to drill a well.

So there began a great irrigation development with a fine climate and excellent soil. Out of the stream flow and the underground water a wonderful civilization was created. But it so turned out that they attempted to irrigate more land than they had water for, either out of the rivers or out of the underground. The wells had to go lower and lower and lower to get water.

I went into San Joaquin Valley in later years. I saw worried people who said: "What are we going to do? What is our future? We have some of the finest lands, producing enormous crops of extreme value, but the water is gone. We must do something about it."

First they talked about the State constructing a great irrigation and power project. Then they decided it was too big a job for the State of California to undertake, and that the Federal Government had to build it. As a Member of Congress, and out of deep sympathy for those people, I helped to authorize the central California project, which is no less "fantastic" (to use a California expression), than the Arizona proposal now before this committee. That is to say, to build a great dam on the Sacramento River; generate a large quantity of power; let the power pay the major part of the cost; have a regulated flow of water come down the Sacramento River; use the power to pump up the water to irrigate the lower half of the San Joaquin Valley, and thereby make available the San Joaquin River water for use in the upper end of that valley. It was a scheme of enormous cost, as the figures which I have cited show; but it had to be done; it was a must. Congress just could not get away from it. The civilization of the San Joaquin Valley could not be saved in any other way.

I was happy to aid in the authorization of the Central Valley project and in obtaining appropriations for it, because I knew the country intimately and knew that the work had to be done. There was no other way out of it. It was entirely proper that as a Senator I should render every possible assistance in saving a civilization.

Suppose that Congress had taken the view, "This Central Valley project will cost too much money; we just cannot do it." When a farmer starts to pump water for irrigation, if he can get it within 30 or 40 feet, that is easy. But the water in the wells keeps going down and down and down, and finally he comes to a place where he cannot grow alfalfa if he has to pump water at that depth. He has to grow specialty crops, and there is only a limited market for such crops. If he is told that there is no hope at all, he is going to pull out the pumps and abandon the farm. That is all there is left for him to do.

The farmers were given hope in the Central Valley of California, given hope from the very start, and they stayed with their farms. Congress is now appropriating money for that great project; Congress is going to finish it up, and thereby save and insure the prosperity of that great valley. I am glad it turned out this way, and there is nobody in Arizona that is not glad it resulted like this, if for no other reason than it is a perfect precedent for what we are asking. We did the same thing in central Arizona that was done in the Central Valley in California. We built storage reservoirs on the streams and irrigated arid lands. The surface supply was not enough so we started pumping out of the underground waters. As we continued to pump the wells had to go deeper. Wells that were once 40 feet deep now go 200 and 250 feet to water. It is perfectly evident from the well

records that they will take all the water out, and that irrigated lands must go back to the desert unless more water is made available.

There is only one place to obtain the water to replenish the underground loss and to save the civilization that we have built up in central Arizona—and we say it is as fine as there is anywhere in the world—and that is to go to the Colorado River and get it.

We claim we have a perfect title to enough water to do the job. We claim that the project is feasible, both from the angle of reimbursement as provided in this bill; and, second, that if that wealth is preserved we will continue to pay millions of dollars in taxes into the Federal Treasury and be a prosperous community.

To deny us this relief, to simply say, "Congress is never going to do it"—what is sure to happen? If the farmers of Arizona are convinced that there is no hope at any time, they are going to pull the pumps and leave. At least 240,000 acres of land will go back to the desert, and a quarter of a million people will have to move out of there. They would become just as much a class of displaced persons as there is anywhere in Europe. They would have to go because the entire economy of that area cannot live without water. It is a must in central Arizona, exactly as it was in central California.

Congress never has failed to act in any case like this. Congress did not fail to act in authorizing the construction of the Colorado-Big Thompson project. There was a large area of fine land on the eastern slope of the Rockies which ordinarily had enough water during the early part of the year. But irrigation water was wanted to finish out the crops which were lost year after year. What did Congress do? Money was provided to dig a great tunnel through the backbone of the Rocky Mountains. Power was generated and a great agricultural area was supplied with water.

Congress has never failed in these great causes and Congress, in my judgment, is not going to fail in this instance. We ask the help of this committee that there be no failure, that we do get relief by authorizing the construction of the central Arizona project.

I thank you.

Senator DOWNEY. I have a few questions, Mr. Chairman, but I do not want to antecede anybody else.

The CHAIRMAN. Senator Hayden, there has been considerable uncertainty among the minds of some of the members of this committee, with respect to the effects upon other States in the Colorado River system, of the interpretation which may be placed upon the Colorado River compact with respect to the allocation of the waters of the system, as the result of any action that might be taken by the committee on the measures now before it. There has been a good deal of ambiguity, perhaps, in some of the testimony with respect to the meaning of the division of the waters between the upper and lower systems. You have discussed, for example, the 7,500,000 assigned to the upper basin; 7,500,000 to the lower basin, and the 1,000,000 acre-feet extra.

There have been some grounds for believing the testimony of some of the witnesses would lead to the conclusion that the upper basin may be compelled to make contributions to the lower basin which would reduce the 7,500,000 allowed to the upper basin States.

So I ask you, in the light of that situation, what, in your opinion, is the right of the upper basin to the water of the Colorado River, and whether if this project should be allowed, it would create a demand

at some future time which would prevent some of the developments in the upper basin States?

Senator HAYDEN. I want to state right off that Arizona never has claimed, and, so far as I know never will claim, any interest whatsoever in the 7,500,000 acre-feet of water allocated to the upper basin.

The allocations of water made by the Colorado River Compact were based upon a set of stream-flow figures extending back over a series of years. I am sure that the commissioners who negotiated the compact honestly believed there was more water than the records show there has been during this later dry period. There are dry cycles and wet cycles, and we may come into a wet one in another 30 or 40 years which will show the water that they thought was there. But there is not presently as much water in the river as the State commissioners anticipated when they drew up the compact.

But they did believe, and the records will show, that there are substantially some 16,000,000 acre-feet of water as a minimum which is subject to division. That is the best guess, so far as I now know.

The upper basin is entitled to take 7,500,000 acre-feet. There is another provision in the compact that deliveries must be made in 10-year increments——

The CHAIRMAN. That it never shall be less than 75,000,000 for any 10-year period.

Senator HAYDEN. Yes; there is that limitation upon the use of water in the upper basin. But Arizona could not claim, California could not claim, and Nevada could not claim that because in any one particular year 7,500,000 acre-feet did not come down to them, that they could immediately go up and get it—I do not believe the compact could be construed that way.

The CHAIRMAN. Then do you, as a spokesman for Arizona, and as a supporter of this legislation, take the position that the waters which would be allocated or which would be used for the benefit of Arizona, as the result of the construction of this project, would never establish any basis by which a claim could be made for additional contributions of any kind from the upper basin?

Senator HAYDEN. My answer is "Absolutely no." All we are interested in is our share of the water allocated to the lower basin by the Colorado River Compact. If 7,500,000 acre-feet did not come down in any 1 year, we would have to divide the lesser flow with California on a two-eight and four-four basis, that is all we could do.

The CHAIRMAN. So when you say "no," you mean that Arizona would not, under any circumstances, make any such demand?

Senator HAYDEN. Not only would not, but I do not see how Arizona could.

The CHAIRMAN. So that the development of the lower basin, whatever it may be, is development which must be taken out of the 7,500,000 plus the 1,000,000?

Senator HAYDEN. Confined to the lower basin allotment under the compact, absolutely.

The CHAIRMAN. Have you in mind an opinion as to the water which would be assigned to Arizona under this project, how much it would amount to?

Senator HAYDEN. All I have are the engineering estimates of some 1,200,000 acre-feet.

The CHAIRMAN. I understand from your testimony this morning, that you take the position Arizona was allowed 2,800,000 acre-feet in the Boulder Canyon Project Act and that in addition thereto the waters of the Gila.

Senator HAYDEN. Yes; and in addition thereto Arizona will split any available surplus, whatever it may be, equally with California. As I have said, there is not as much surplus water as was anticipated. That is really what is worrying them in California. The quantities of water that have come down past Lee's Ferry have not been as great as was expected at the time when the compact was written. In the meantime California made a contract with the Secretary of the Interior for nearly 1,000,000 acre-feet of water which is supposed to come out of the surplus. If there may not be any surplus and they want to firm up that contract, then there is only place to get that water and that is to take it away from Arizona.

The CHAIRMAN. What about the States of Utah and New Mexico, so far as the lower basin is concerned?

Senator HAYDEN. It does not amount to very much water. Utah has some lower basin water in the Virgin River country. In New Mexico there is not very much except on the headwaters of the Gila. I have always felt there should be storage provided for the irrigation of lands in that part of New Mexico. This bill contemplates aid for such storage and flood control. A dam in New Mexico would be a very material benefit to us also, since there are several towns, Duncan and Safford and others in Arizona, that have been badly damaged by floods in the Gila River.

The CHAIRMAN. This proposed Arizona project, what effect would it have on the development of lands in New Mexico on the upper reaches of the Gila?

Senator HAYDEN. There is an authorization in the bill for the construction of a dam in New Mexico, which I have listed as one which should be built whether or not Arizona gets any water out of the Colorado River. It is desirable both from the point of view of irrigation and flood control, and is as well justified as the flood-control projects I have listed in California which are now authorized by Congress for construction.

The CHAIRMAN. So far as the division of deficiencies that may occur at any time in the future between the upper and the lower basins, what is your opinion of that, speaking out of your intimate knowledge of this whole development?

Senator HAYDEN. The only place that the deficiency question came in, as I remember the original talks, was that if a treaty was made with Mexico requiring a certain amount of water to go there, and if there was not water enough to comply with the treaty, then the upper and lower basins should equally bear the shortage.

The CHAIRMAN. Do you mean by that that the shortage should be deducted 50 percent from the 7,500,000 assigned to the upper basin and 50 percent from the 8,500,000 over-all assigned to the lower basin?

Senator HAYDEN. No. The 50 percent would have to come out of the 7,500,000 acre-feet assigned to the lower basin for the reason that under the treaty the dividing point, where the water for Mexico is regulated, is at Davis Dam, which is above the mouth of the Gila. It is regulated for them at the Davis Dam for delivery at the international boundary.

Senator MCFARLAND. From the Davis Dam?

Senator HAYDEN. From the Davis Dam. Therefore, if the water was let out of the Davis Dam and Reservoir to go down the Colorado River to Mexico and there was a shortage, it would have to be made up from the upper and lower basins, upon the basis of their respective shares of 7,500,000 acre-feet each.

Senator KERR. Doesn't the compact specifically state that?

Senator HAYDEN. No, the compact does not. It simply states that the two basins shall equally share a shortage of water for Mexico. There could be an argument as between California and Arizona as to which State would have to contribute more to Mexico out of the Colorado River. But as between the two basins, the quantity of water would be the same. That is why the provisions appear in the Boulder Canyon Project Act to the effect that Mexico should not claim any water out of the Gila, which was just an imaginary idea, because in time of drought there would not be any water to run out of that river; it could not possibly be delivered. If the whole reservoir at the Roosevelt Dam was emptied out during a dry season in a day or two the water would simply soak up in the sand and none of it could get to Mexico. It is over 200 miles to Mexico from where our storage reservoirs are located in Arizona, through a sandy desert country. It would be necessary to build a concrete conduit for 200 miles to get any water down there. So the only place Mexico can get water physically is out of the mainstream of the Colorado River as provided in the Boulder Canyon Project Act.

The CHAIRMAN. I do not know that I quite understand you, Senator. The Gila empties into the Colorado River?

Senator HAYDEN. Yes.

The CHAIRMAN. And way below the Davis Dam.

Senator HAYDEN. Oh, yes.

The CHAIRMAN. So whatever flow comes out of the Gila into the Colorado cannot be delivered to California, but is necessarily delivered to Mexico?

Senator HAYDEN. That is correct, and that is one reason why the location of the lands to be irrigated under the Gila project was changed. There is a strip of land along the Gila from Yuma up to east of Wellton—fine fertile soil, well drained, with gravel underneath. When that land is irrigated the return flow will go into the Gila and then into the Colorado River where it will be measured as a credit under the Mexican Treaty. The more land irrigated in the lower Gila Valley the better it is for all concerned.

The CHAIRMAN. But we all hope that deficiencies will never arise in any serious proportion. What I am trying to get clear in my mind is whether, in your opinion, since the Gila does empty into the mainstream of the Colorado, whether the 50 percent deficiency must be taken only out of the 7,500,000 coming from above, and will never come out of the Gila, having the result, therefore, of providing that irrigation on the Gila would never have to get along with less than was flowing in the river, while in other areas the projects would have to get along with less.

Senator HAYDEN. Unfortunately we have had very dry years. I believe it has been about 7 years since any water ran out of the Gila into the Colorado. That is why we transferred Colorado River water away from the Yuma Mesa, where the sandy soil is similar to the lands

of the East Mesa of the Imperial Valley where it takes about 10 or 11 acre-feet of water to irrigate a crop because the sand drinks it up. We decided to abandon the Yuma Mesa lands and move up into the lower Gila Valley where there is good soil, and where there can be a return flow. That return flow would contribute to some extent—and we think it will be substantial as the project is developed—toward paying off the amount of water due to Mexico.

There is no specification in the Mexican water treaty as to any particular place from which the water shall come. The physical fact is that the Mexican treaty water is to be regulated up at the Davis Dam, but any water that came into the Colorado River below that dam would be counted in on the total before the two basins would have to divide up a shortage of treaty water for Mexico.

The CHAIRMAN. Are there any other questions from any of the members of the committee?

Senator DOWNEY. Yes; I have questions.

The CHAIRMAN. I though perhaps Senator Anderson might want to ask a question, or Senator Kerr.

Senator ANDERSON. I am sorry I missed the first part of your testimony, but again we have had this testimony that Arizona is entitled to 2,800,000; Nevada, 300,000, which leaves 4,400,000 for California, and the compact to which you refer provided that those three States would enter into an agreement to divide up the 7,500,000 acre-feet, yet the compact names five States. Would, in your opinion, the three-State agreement have been any good under those circumstances? Nevada, California, and Arizona, it says, can divide up the water, but the compact between the seven States says that California, Arizona, Nevada, Utah, New Mexico could divide it up.

Senator HAYDEN. Undoubtedly, to make it a perfect compact, we would have to include New Mexico and Nevada.

Senator ANDERSON. Then this Boulder Canyon Act would not really be very binding, would it?

Senator HAYDEN. The binding part of it is, the thing that induced Senator Ashurst and me to end our filibuster, was the fact that the Boulder Canyon Project Act fixed a limit of 4,400,000 acre-feet for California, which left 2,800,000 acre-feet in the river for Arizona and 300,000 acre-feet for Nevada. That water is all in the main stream below Lee Ferry, where neither Utah nor New Mexico can get at it. The New Mexico part of the lower basin is at the headwaters of the Gila; the Utah part is at the head of the Virgin River. There is the possibility of some storage on the Virgin. But no Colorado River water, no water out of the main stream of the Colorado River, can be diverted into the upper Gila or into the upper Virgin. It is physically impossible to do so. Any water that New Mexico can get out of the lower basin would be waters stored on the headwaters of the Gila; any water that Utah can get out of the lower basin would be water stored on the headwaters of the Virgin.

Senator ANDERSON. Are those waters not taken into consideration in this compact?

Senator HAYDEN. They may be, but the quantity is not great. It is serious to each locality, but not to the basin as a whole.

Senator MCFARLAND. I just had one question because it is on this point.

Senator Hayden, as I understand your testimony, it is that it was the understanding and interpretation of Congress that the California Self-Limitation Act, which was required of California, left this amount of water for the other States.

Senator HAYDEN. It could not go anywhere else.

Senator MCFARLAND. That is, the 2,800,000 acre-fee of water, the 300,000 acre-feet, and the waters of the Gila. It so limited California that the quantity of water I have just named was available for the remaining lower basin States?

Senator HAYDEN. That is right.

Senator MCFARLAND. It was an agreement made by California which forever bound them to give that water to the other States.

Senator HAYDEN. There is no question about that.

I believe, Senator, you have previously placed in the record the extracts of what was said at the time when the Boulder Canyon Project Act was under consideration, so that if anybody wants to check up on what I am now saying they will find it in the record.

Senator MCFARLAND. Yes; I did call attention to those things. We can make reference to them later.

The CHAIRMAN. Any other questions?

Senator DOWNEY. Senator Hayden, you made two statements, among others, that attracted my attention, and the two statements to which I now refer are, first, that you are glad we have the Central Valley project as a precedent for the present Arizona project.

Senator HAYDEN. Yes.

Senator DOWNEY. The second statement was that you do not consider the Central Valley project any more fantastic than the central Arizona project.

Senator HAYDEN. They are based upon the same general principle, exactly. To build a dam, store water, use the power generated from the dam to pump the water to another place.

Senator DOWNEY. As a member of the Appropriations Committee of the Senate of the United States you would not want to say that the element of money or capital has entirely vanished in our considerations, have you?

Senator HAYDEN. Oh, not at all, of course.

Senator DOWNEY. Well, do you not know that the central Arizona project is four, five, or six times as expensive per acre as the Central Valley?

Senator HAYDEN. It may be that the per acre cost is greater, I am not arguing about that. Nevertheless, it is one of those things that has to be done, and regardless of the cost it is worth the money.

Senator DOWNEY. Then you would say that the Central Valley project, because they did spend several hundred million dollars to relieve the overdraft and underground pumping, would justify central Arizona even though that would cost five or six times as much per acre? Then would you go a step further and say that the next project could cost four or five times as much per acre as central Arizona?

Senator HAYDEN. All I know is that wherever we have a civilization based upon agriculture, fully developed, we have got to save it. When we do, we save it on the basis of direct reimbursement which goes as far as it can. All a farmer can do is take so much of the proceeds from his crops each year and pay for irrigation. If he cannot pay

it in 10 years he has to have 20. If he cannot pay in 20, he has to have 40. He has got to have a greater length of time, and I think you will find from now on that the period of repayment will vary with different projects, according to their cost, which is all right.

But on top of that we must never forget—and certainly they should not forget it in California—the enormous sums of money that have been paid into the Federal Treasury because you do have a going concern in that State with respect to agriculture.

I say if the Central Valley project was a gift, just as this $722,000,000 for flood control was a gift, it would still be a good investment for the United States to keep California going as a paying enterprise.

Senator DOWNEY. Well, Senator Hayden, I want to say as far as southern California is concerned, it certainly is not a gift because the tax money paid in from the State of California to the Federal Treasury exceeds on any proportionate basis the amount of money we get back. The State of California pays the tax money to do that flood control, so it is not a gift from anybody.

Senator HAYDEN. I said it was not. I said if it were considered a gift, as some people would—if they look at this 722,000,000 for flood-control projects in California, they would say there is no reimbursement; all that is done by local interests is to provide some rights of way and make some more local contributions of one kind or another. But that money is appropriated out of the Treasury of the United States without a string to it, so far as reimbursement is concerned.

But the Government is going to get every cent of it back, and more, because it is to keep California prosperous and a good tax-paying State. I say it is a good investment; I am glad it was made.

Senator DOWNEY. Let us explore that further. You yourself have stated very emphatically in several different ways that you consider the Central Valley project of California as a precedent of the central Arizona project. Undoubtedly there will be arguments before this committee, and if this issue ever gets out on the floor of the Senate we will have extensive arguments on this, because I think you will agree with me, will you not, Senator Hayden, that this is by far the most expensive reclamation and irrigation proposal that has ever been made, on any basis, total cost and acreage.

Senator HAYDEN. I cannot say that, because I have not checked the figures. You may be right.

Senator DOWNEY. What is the population in the Phoenix area that lies within the central Arizona project? What is the population?

Senator HAYDEN. Close to half a million.

Senator DOWNEY. You realize that that is not much more than 10 percent of the population we now have in the Central Valley area?

Senator HAYDEN. Yes, I realize that.

Senator DOWNEY. We have something over 4,000,000 there.

Senator HAYDEN. Yes.

Senator DOWNEY. I assume you would admit that the amount of income taxes now being paid in that area are approximately 10 times the amount of income taxes being paid in the Phoenix area?

Senator HAYDEN. I would not doubt it.

Senator DOWNEY. Do you not think those two factors certainly should be weighed in considering how much money the Federal Government can afford to invest in the community to support an existing agricultural economy?

Senator HAYDEN. Let me understand you distinctly, then. If you arrive at that conclusion you would say that rather than appropriate money out of the Treasury, rather than authorize this project, let it go back to the desert, let it burn up. Are you willing to say that to this committee, that you are perfectly willing to sit here and see a couple of hundred thousand acres of land go right back to the desert and be perfectly barren, with the people moving out of it and going to some other place?

Senator DOWNEY. Senator Hayden, I would certainly say if it were in the State of California, that any land which cost, say, even twice as much to develop water for and irrigate as it would be worth when irrigated, should not be irrigated by the Federal Government.

Senator HAYDEN. You might say it, but nobody else in California would say it.

Senator DOWNEY. Oh, I beg your pardon, that is not correct.

Senator Hayden, let us review the figures. Let us take the Central Valley project. I assume you well realize that started out as a $170,000,000 project, did it not?

Senator HAYDEN. Yes; that was the original estimate, I believe, made by the California State Board.

Senator DOWNEY. And by the Bureau of Reclamation when it came into it, is that not correct?

Senator HAYDEN. I think you are right.

Senator DOWNEY. The present project is nothing more than what we started out with, except that we have had two minor increases of about 20 percent each, that is correct is it not?

Senator HAYDEN. I think so.

Senator DOWNEY. You now show us figures that that $170,000,000 has swollen to $740,000,000, almost four times the amount the Bureau of Reclamation started out to spend, and what they now expect to spend. That does not include the distributing systems for the irrigation districts that you have in a separate act.

Senator HAYDEN. That is right.

Senator DOWNEY. Don't you think we may well take that as a guidepost, that if the Bureau of Reclamation says, "Here is a project that will cost three-quarters of a billion, and before we get through the Federal Treasury may find itself in debt for this for a billion or a billion and a half or two billion, on the basis of past experience"?

Senator HAYDEN. All I know, of course, is that when we started to develop the Central Valley project we estimated the costs at that time, which were probably a third of what they are now—at least a half. That is one factor that enters into its cost. The other thing is that always when we get into construction we find this has to be done and something else has to be done. They are fully justified in order to make the project a success. We have to do it.

I am glad, so far as I am concerned, that we are going to do all the things necessary to be done in order to make the Central Valley project a complete success. I would not begrudge a dollar of it.

Senator DOWNEY. Do you know the amount of water that is to be developed in the Central Valley project that will actually be applied to the lands?

Senator HAYDEN. I am sorry, I do not have the figures with me.

Senator DOWNEY. You know it is approximately 2,000,000 acre-feet, do you not? It is certainly more than double the amount of water that is to be developed here; is that not correct?

Senator HAYDEN. Yes; that is about right.

Senator DOWNEY. I do not mean the 1,200,000, but the amount you are actually putting on the land.

Senator HAYDEN. There is more land in the California project and it takes more water.

Senator DOWNEY. Consequently, the Central Valley project will irrigate twice as much land at about one-half the cost of the central Arizona project; is that correct?

Senator HAYDEN. That may be.

Senator DOWNEY. That is a differential of 4 to 1 already; is it not?

Senator HAYDEN. Whatever it is, you can figure it arithmetically or geometrically. All I have to say is that there was a civilization endangered in California and the Congress saved it. There is a civilization endangered in Arizona and Congress must save it. When it is done, it is a profitable investment in either case.

Senator DOWNEY. Senator, let me ask you this: You realize that in the Central Valley, in addition to this irrigation water we will release out of Shasta Dam somewhere around 3,000,000 acre-feet of water for salinity control; is that not correct?

Senator HAYDEN. An excellent thing.

Senator DOWNEY. Yes; a very excellent thing. That water for salinity control that we will utilize for very valuable purposes is three times as much water, more than three times as much water as you are going to use to irrigate from the Colorado River; is it not?

Senator HAYDEN. Because the Lord so arranged things that it rains more on the Sacramento watershed than it does in Arizona.

Senator DOWNEY. That 3,000,000 acre-feet of water for salinity control will make possible the irrigation of more than a million acres of land on the lower delta that otherwise would become saline; is that not correct?

Senator HAYDEN. That is right; it makes wonderful rice-growing lands.

Senator DOWNEY. Consequently we have here another large differential, have we not?

Senator HAYDEN. Surely. We in Arizona do not have the water, to start with, and we do not have the delta of the two rivers.

Senator DOWNEY. Senator Hayden, maybe our minds are not meeting at all. Are you indicating by the line of your discussion with me that the per acre cost or the total cost of projects is immaterial?

Senator HAYDEN. I am saying that if you were starting out to irrigate some perfectly raw desert land that had no water at all, never had been irrigated and was not suffering for water because of the fact that the water table had dropped, it presents a very different picture when you go to figure costs. There is no population there to be displaced. You just simply tell folks, "This scheme is not feasible because either there is not enough water or it costs so much to get it."

I caused a survey to be made one time, when I was a member of another committee, of the water resources for the entire West. The fact is that we are now irrigating, using about half the water of the streams of the entire arid region. The other half is now going to

waste in the sea. Almost invariably we have a choice as to where we are going to place the water. There is one place where it costs more and another place where it costs less, to put it on new land. Naturally, if we have a choice between two or more places, we are going to the most economical place to utilize the water.

But that is a very different proposition than saving a civilization such as existed in the Central Valley of California.

Senator DOWNEY. Senator Hayden, may I ask you if you realize that in the Central Valley project the farmers plus the municipal water users will be able to pay off more than half of their investment?

Senator HAYDEN. What do you mean?

Senator DOWNEY. I mean the farmers will pay sufficient money for this water, along with the municipal water users, to more than half pay out the cost of the irrigation and the municipal water capitalization or investments, do you realize that?

Senator HAYDEN. What you have in the Central Valley and what we have in Arizona is that it is impossible for the users of water, either the municipal users or the irrigation users, to pay the entire cost of the project. So we had to subsidize that development in a sense by the development of power. We have to charge to power a part of that cost.

Senator DOWNEY. Senator Hayden, the point I am making is this: In the central Arizona project, the farmers cannot afford to pay 1 cent upon their own irrigation investment.

Senator HAYDEN. They have been doing it.

Senator DOWNEY. Fortunately, from our point of view at least, the central Arizona project is not in as yet. I am talking about the proposed project, your figures indicate that the farmers may be able to pay their operation and maintenance and not 1 cent upon the capital investment for irrigation. Those are the Bureau of Reclamation figures.

Senator HAYDEN. That is your construction of their figures. I did not so understand it.

Senator DOWNEY. That is not denied.

In the central California project, the farmers pay off a very substantial amount of the irrigation investment.

Now, Senator, do you realize that in the Central Valley we can utilize power to what extent we need it to retire the balance of the farm investment and still have a rate below the market for power that will permit us to do that?

Senator HAYDEN. You have very cheap power in California.

Senator DOWNEY. And that is not true in Arizona, is it? In order to work out this plan you will have to compel the power users to pay approximately, according to the Bureau, at least the amount required to produce steam power.

Senator HAYDEN. My understanding is that until the water can be diverted by gravity it would take about a third of the power generated at Bridge Canyon Dam to lift the Colorado River water into central Arizona. All the power would have to be sold, of course. If you include that cost, the rate is bound to be higher than if you did not. There is no doubt about that at all. Still, the power rate would be comparatively cheap.

Senator DOWNEY. You say it would be comparatively cheap. Would it be any cheaper than in Los Angeles or any other place, for instance, where we could produce steam power?

Senator HAYDEN. They have been able to produce steam power in Los Angeles by putting natural gas under the boilers, but the gas supply is running out, and the story I get is that there is a crying need for Colorado River power.

It is not the quantity of water in the Colorado River that makes it possible to generate power; there is not as much water in the entire Colorado River system as the Pend O'Reille River puts into the Columbia River. But there is an enormous drop which we can take advantage of. It is some 2,000 feet in Arizona alone. One plan has been designed and undoubtedly will be undertaken, to go to Marble Canyon and run a tunnel under the Kaibab Plateau and get a 1,200-foot drop in one place. That will have to be done some day, because the need for power is so great.

Senator DOWNEY. Senator Hayden, I will divert from that question of the utilization of the power profits or power revenues and come back to it later by another course.

You have presented to the committee here memoranda which, Mr. Chairman, I think should be included in the record——

Senator HAYDEN. Yes, it would be well to include all of these memoranda.

Senator DOWNEY. Along with all the other memoranda by the Senator.

This is headed "Division of costs" which, of course, is applicable to the central Arizona project. You state the estimated construction costs of the central Arizona project are $738,408,000. You said that later there would be canals constructed under the bill which would take the water from Bridge Canyon down to the Central Arizona project; is that correct?

Senator HAYDEN. There is a proposal at some later time, probably considerably later, I do not know how long, to dig a tunnel that would take the water out of Bridge Canyon by gravity and avoid the pumping.

Senator DOWNEY. Do you understand the cost of that, according to the Bureau of Reclamation estimates, would run about $500,000,000 more?

Senator HAYDEN. Frankly, I do not know about those costs. All I have taken up is what we are proposing to do here. But I do know there have been extensive developments in the reduction of tunnel costs, particularly the tunnels that were built at Boulder Dam which were very much cheaper than originally estimated. The same is true of the big tunnel in Colorado. It did not cost nearly as much as it used to.

Senator DOWNEY. Senator Hayden, is not the only reason for putting that sort of an authorization in the bill, to be exercised 20, 30, 40, or 50 years from now, or probably never, by the Bureau of Reclamation, that it is an attempt to show in some way that Bridge Canyon is an integral part of the central Arizona project?

Senator HAYDEN. It is an integral part, and certainly just as much as the Shasta Dam is an integral part of the central California project.

Senator DOWNEY. Oh, Senator Hayden, I beg your pardon, the irrigation water in the Central Valley project will be stored in Shasta Dam. That is not true in the central Arizona project. You have the water in the river, and that impossible tunnel is included in the bill merely to be able to make a showing that Bridge Canyon Dam is a part of the central Arizona project. It is not in any way a part of the

central Arizona project, because it does not store any water. You will get your water out of Lake Mead.

Senator HAYDEN. How will we get the water out of the Colorado River unless we have the power from Bridge Canyon Dam?

Senator DOWNEY. You have enough power in Hoover Dam to do it.

Senator HAYDEN. Oh, no.

Senator DOWNEY. You have power in Davis. You could build steam plants.

Senator HAYDEN. Every kilowatt of the power at Hoover Dam and every kilowatt of the power at Davis Dam is allocated and gone now. There is a crying demand for this additional power from Bridge Canyon.

Senator DOWNEY. Senator Hayden, perhaps I misunderstood your statement. If what you are saying is that you would have to have sent over to Arizona all the profits and all of the value in the Bridge Canyon Dam in order to work out the central Arizona project, I will agree with you, but you do not need it for any purpose except for that—you need the financing.

Senator HAYDEN. If it were not from the power revenues derived from Shasta Dam which help to pay the cost of the Central Valley project that project would not be feasible. If it were not for the power revenues that would come from the Bridge Canyon Dam, the central Arizona project would not be feasible, so it is 50–50 as far as I see it.

Senator DOWNEY. Senator Hayden, I do not think there is any similarity between the two projects. The primary purpose of Shasta Dam is to store water to irrigate our lands. That is where we are going to get our water to irrigate our lands and for our salinity control.

Senator HAYDEN. It is true that it does not cost as much; they do not propose to charge farmers in the Central Valley as much for irrigating water, because a large part of the cost of that project is to be paid from power revenues.

Senator DOWNEY. That is certainly true. That is the very reason, the very necessary reason, from your viewpoint, that you bring Bridge Canyon into this project, because otherwise it would be totally infeasible and impossible, from even the most improvident and fantastic viewpoint.

Senator HAYDEN. Just as it would have been improvident and fantastic and infeasible to think about the central California project without the power revenues from Shasta Dam.

Senator DOWNEY. All right, Senator, if the chairman will bear with me, let me reiterate my position.

Bridge Canyon is not an integral part of the central Arizona project at all. Your water is in Lake Mead and there is plenty of other available power. You probably have an abundance of it in the 18 percent of the cheaper power that you have in Hoover Dam, which would just about take care of the pumping lift for central Arizona.

Senator HAYDEN. I am sure you are wrong about that.

Senator DOWNEY. Well, amplified by steam plants it would.

Now, it is true that you have to take the total value of Bridge Canyon power away from all the other States in the basin to work this project out.

Now, I want to proceed to the next question. You make a division of costs here under which you itemize certain of the irrigation facil-

ities with their prospective costs and reach a sum of $267,000,000 for the irrigation facilities and $471,000,000 plus for the dam features. Would you have the committee understand from that that the only benefit the central Arizona project gets is from this first proposed expenditure of $267,000,000?

Senator HAYDEN. No; the project is integrated as a whole. I made these figures primarily for the purpose of showing that if California could prove in any court that Arizona did not have the water in the Colorado River, then Congress could cut the amount of this project by $267,000,000, and still have an entirely feasible project that ought to go on and be authorized.

Senator DOWNEY. But Senator Hayden, is it not true from the standpoint of the other lower basin States and the people of the Nation generally, that this total investment is being made for the benefit of the central Arizona project, the whole $800,000,000?

Senator HAYDEN. I cannot concede that. If two-thirds of the power that would be generated there is immediately made available for use in Arizona, Nevada, California, and southern Utah, when that power comes on to the market it will create new wealth, new taxable wealth. It will add to the prosperity of the whole region. That is a highly desirable thing to do.

Senator DOWNEY. In the first place, Senator Hayden, you immediately set over to the Arizona farmers, without any cost to them, one-third of the total amount of power generated which is to be used to pump this million acre-feet of water up 987 feet. You immediately set over a third of the power to them, do you not, without any cost to them?

Senator HAYDEN. What would you have us do with it?

The CHAIRMAN. Pardon me, I will interrupt the matter at this point to consult the convenience of the committee.

This is off the record.

(Discussion off the record.)

Senator DOWNEY. Mr. Chairman, I will discontinue my cross-examination. I will make a 3- or 4-minute statement as to the facts I would have endeavored to elicit by my questions.

The CHAIRMAN. Do you care to make that statement now?

Senator DOWNEY. No; I will wait.

Senator KERR. Off the record.

(Discussion off the record.)

The CHAIRMAN. The committee will stand in recess until 2:30.

(Whereupon, at 12:10 p. m., a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION (2:30 P. M.)

The CHAIRMAN. The committee will come to order.

Senator DOWNEY. Will Mr. Larson take the stand?

EXAMINATION OF V. E. LARSON

Senator DOWNEY. Mr. Larson, without any reflection on you——

The CHAIRMAN. Pardon me. First, this is Mr. Larson, of the Bureau of Reclamation, who previously testified?

Mr. LARSON. Yes, sir.

Senator DOWNEY. I find myself somewhat uncertain about some of the data contained in the reports of the Bureau and in your statement. If you will help me to a clearer understanding of just what certain statements and figures mean, I will appreciate it.

Turning first to the statement that you made before this committee, and to page 24.

On page 24, Mr. Larson, you show there the amount of water that will be available under the central Arizona project under the heading of "New surface water at district headgate—1,082,000 acre-feet"; that is correct, is it not?

Mr. LARSON. That is right.

Senator DOWNEY. That was principally made up by 950,000 acre-feet from the Colorado River?

Mr. LARSON. That is correct.

Senator DOWNEY. On page 15 you have given the Colorado River at 1,200,000 and then had deducted 250,000 acre-feet because of aqueduct losses. To the 950,000 you then added the 64,000 from Buttes Dam, the 19,000 developed in the upper Gila, and the 7,000 developed in the Charleston Dam, making 1,082,000; that is correct, is it not?

Mr. LARSON. That is correct.

Senator DOWNEY. Now, in this computation on page 24, the last statement you made there is, "Water available for lands formerly irrigated but now idle for lack of water," 418,000 acre-feet?

Mr. LARSON. That is right.

Senator DOWNEY. How much is the area of land that you there refer to?

Mr. LARSON. I did not quite catch that question.

Senator DOWNEY. How much is that area of land that you refer to there as requiring 418,000 acre-feet? Is it 76,000 acres?

Mr. LARSON. It is about 73,000, as I recall.

Senator DOWNEY. Your first statement reads as follows under this same table:

Supplemental water needed for lands now irrigated and to replace the necessary reduction in pumping and provide release for salt balance, 652,000 acre-feet.

What I want to ask is this: Where you compute the 418,000 acre-feet as water remaining available for lands formerly irrigated, is there some deduction out of that for salt balance?

Mr. LARSON. Is there some deduction out of 418,000 for supplemental water?

Senator DOWNEY. No, for salt balance.

Mr. LARSON. No. The salt balance is included in the first item, the 652,000.

Senator DOWNEY. That is all of the water required for salt balance for the 1,082,000 acre-feet is included in the 652,000 acre-feet?

Mr. LARSON. That is correct.

Senator DOWNEY. And how much is there included? How much is included for salt balance in the 652,000 acre-feet?

Mr. LARSON. Roughly, 220,000.

Senator DOWNEY. Let me be sure that I understand you. The water required for the salt balance for the 418,000 acre-feet, as set forth in the table, is included in the 220,000 acre-feet that you have just given me?

Mr. LARSON. That is correct.

Senator DOWNEY. It is a fair conclusion, just speaking in general figures, that about one-half of the water from the Central Arizona project, excluding that required for the Tucson area, which is only 12,000 acre-feet, would be required for 73,000 acres?

Mr. LARSON. I do not see how you could get that out of it.

Senator DOWNEY. I deducted the salt balance so it is not in either of the net figures, and, then, on your first item you have 432,000 acre-feet available for net consumptive use, and your second item would be 418,000 acre-feet without any regard for salt balance. There is a differential between 418,000 and 432,000.

Mr. LARSON. On the basis of the figures as you set them up, that is correct.

Senator DOWNEY. I have not set them up. They are your own figures, are they not?

Mr. LARSON. But in order to make the 418,000 available for irrigation, the salt balance would have to be taken into consideration.

Senator DOWNEY. But you say that salt balance for that item is included in the 220,000 acre-feet?

Mr. LARSON. That is right.

Senator DOWNEY. Then of the 1,082,000 acre-feet available under the total Central Valley project, disregarding the Tucson water supply, almost one-half—let us put it that way—will be required to irrigate 73,000 acres of land that is not now presently irrigated.

Mr. LARSON. It is land that has been irrigated, but is now lying idle because of lack of water.

Senator DOWNEY. Let us not emphasize that. I will emphasize that in my next question, Mr. Larson. But that is correct, almost one-half of this water supply that is going to cost in the neighborhood of three-quarters of a billion dollars, is going for land not now presently irrigated, but formerly irrigated within the project, amounting to 73,000 acres?

Mr. LARSON. That is right.

Senator DOWNEY. Where do you get that figure of 73,000 acres, Mr. Larson?

Mr. LARSON. You mean what areas?

Senator DOWNEY. No; what is your authority? Did you make any personal surveys?

Mr. LARSON. We have the areas of the various irrigation districts during a period of years and the acreage that was under cultivation.

Senator DOWNEY. Mr. Larson, we would get along faster if you would let me ask the questions and if you could answer them.

Did you yourself take part in this survey or supervise it, that shows this 73,000 acres of land?

Mr. LARSON. By that, Senator, do you mean did we go out into the field and determine the exact acreage in each district? Is that your question?

Senator DOWNEY. I am asking if you, Mr. Larson, the man who is testifying, had anything to do with the survey out there by which you determined the 73,000 acres.

Mr. LARSON. We obtained the records from the irrigation districts, from the Department of Agriculture surveys, and from the surveys made by the University of Arizona.

Senator DOWNEY. When you say "we," do you mean "I"?

Mr. LARSON. The office, our Phoenix office.

Senator DOWNEY. Did you have anything to do with it? Did you compile the data or get the data?

Mr. LARSON. Yes; we assembled the data there from the various departments.

The CHAIRMAN. He is making this a personal question.

Senator DOWNEY. Mr. Larson, we seriously challenge that figure. We don't believe that 73,000 acres exist, and we want to find out who is going to be here to verify it.

Now, what did you have to do with it?

Mr. LARSON. Me, personally?

Senator DOWNEY. Yes.

Mr. LARSON. No.

Senator DOWNEY. Who in the Bureau is responsible for that figure?

Mr. LARSON. Our Phoenix office.

Senator DOWNEY. And who in the Phoenix office?

Mr. LARSON. By name?

Senator DOWNEY. Yes.

Mr. LARSON. Russell Hurd.

Senator DOWNEY. Is he the chief man, the man that would be responsible out there for this?

Mr. LARSON. He was at that time; that is right.

Senator DOWNEY. How do you spell his name?

Mr. LARSON. H-u-r-d.

Senator DOWNEY. Where can he be located?

Mr. LARSON. He is located in region 7, Bureau of Reclamation, Denver.

Senator DOWNEY. When did he compile these data?

Mr. LARSON. During the period 1945 to about '47, the early part of '47.

Senator DOWNEY. This is offered, then, as land that was idle during what years, Mr. Larson?

Mr. LARSON. During the period 1940–44.

Senator DOWNEY. Do you mean continuously idle over that period of time?

Mr. LARSON. That was the average area idle during the period 1940–44.

Senator DOWNEY. Then we are not talking about any one particular lot of acreage making up the 73,000, we are talking about the average that was taken over those number of years?

Mr. LARSON. That is right. In other words, acreage has varied within the project areas depending on water supplied. For example, in this particular year, the users of water in the Salt River project have been notified that they could expect to receive a certain amount of water. On the basis of that information they in turn cut back their acreage so that they can spread their water on the land in sufficient requirements.

In other words, that is one of the major reasons for the cut-back in their acreage, the water supply.

Senator DOWNEY. Mr. Larson, you are stating that as your opinion. You know nothing about it, do you?

Mr. LARSON. Well, I think the water-supply records available to these projects will bear that out.

Senator DOWNEY. All right. What we would like would be to have you take these years which your survey covered, or I would prefer the present. I think it would be more helpful to the committee. Then give us a list of the owners and locations of those acres, showing the 73,000 acres.

So that you may understand me: We think there is approximately that amount of acreage idle out there not because of lack of water but because of death or foreclosure or sales, or people rotating their crops such as you normally have. I may be wrong. That is my information. I am giving you my idea so that you may better help me get the data.

We want to know the owners of those 73,000 acres, the amount of acreage and where they can be located, so we can investigate and determine.

Mr. LARSON. Senator, to determine exactly the acreage that would lie idle or the acreage that would require water is very difficult to do. For example, during the period 1940–44 they were pumping about double the recharge. At the present time they are pumping about three times the recharge.

When we cut back to the safe yield of the ground water basin what acreage lies idle? What acreage goes out? That is something I do not see how anyone could determine exactly until we determine if there is water available for the project and exactly how the exchanges would be made, how the water would be used within the area.

Senator DOWNEY. Mr. Larson, the chairman may understand me, I do not want to seem captious, but this little item of 73,000 acress is going to cost the Federal taxpayers three or four hundred million dollars, so it becomes a matter of at least some minor importance.

The CHAIRMAN. May I then, Senator Downey, ask Mr. Larson this question for the purpose of trying to clear it up:

What do you desire to say to the committee as your opinion as to how much acreage in this project that was formerly cultivated now lies idle because of a lack of water and for no other reason?

Mr. LARSON. In my opinion, the 73,000 acres we have shown now.

The CHAIRMAN. On what do you base that opinion?

Mr. LARSON. For example, in the Salt River project area, they have on an average of about 5 percent lying idle. They have experienced water shortages. We considered this project on the basis of 672,000 acres. There is adequate water supply to furnish water to 640,000 acres, which is just about the 5 percent that would lie idle.

Now, as far as land is concerned that will go out of production we could have included a larger area. In other words, we could have extended the boundary on to have included more land that is now in production and land that will undoubtedly go out of cultivation. So that the project boundaries could be expanded to include a larger acreage than 672,000 acres.

Senator DOWNEY. Mr. Larson, I have no doubt that will be done before this hearing is over, but I am not talking about that now. As you well know in the average irrigation project in the West of such a magnitude as central Arizona there is customarily 10, 11, 12, or 13 percent of the land that lies idle from year to year, and it varies from year to year. It may lie idle 1, 2, or 3 years; it may be fallow, or the man may have lost money on a crop, or there may have been a death.

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We believe that that is the kind of thing represented by your 73,000 acres.

Now, we have no doubt of your ability to bring in new figures that would be different, but I am not asking about those. If you want to bring them in later, that is all right.

What I would like to have you do is, for the years you made the survey, bring before this committee a list of those lands with their owners so we can check and identify and find out whether it was due to a foreclosure, a death in the family, or the land lying idle from the caprice of the owner, or something of that sort.

Mr. LARSON. Could that not be done, Senator, with the irrigated area within districts?

Senator DOWNEY. I suppose you would have to do it by districts. But we want the names of the people. Let me ask you this:

Have you any description here in Washington of that 73,000 acres?

Mr. LARSON. By districts; yes.

Senator DOWNEY. I mean by owners.

Mr. LARSON. No, we have not.

The CHAIRMAN. May I interrupt. The Senator's questions are apparently directed to show that this 73,000 acres is not an identifiable tract or tracts, that it varies from year to year. He is endeavoring to find out whether in the Bureau of Reclamaion you have any records which would indicate precisely what tracts are idle for lack of water and for no other reason.

Senator MCFARLAND. Mr. Chairman, may I say this, that if the Reclamation Service spent money for that purpose they ought to be kicked out of existence. Now, if you make a survey of that kind to go out and determine the owners of the land when the evidence is here and the evidence is indisputable, that is not necessary. They have the records of the districts themselves.

The CHAIRMAN. Senator, I was trying to develop the basic facts upon which the opinion is formed, and I think he can do it if he will just see what the picture is here.

The Bureau has reached a definite conclusion which it has submitted to this committee in your testimony, that so much land lies idle. I am asking you to say, if you can, on what facts you base that conclusion, and whether or not this is land that is idle only for lack of water.

Mr. LARSON. I base my conclusion on this, Mr. Chairman: The Salt River project has the best water right of any of the irrigation districts in the area, although in years the Salt River project has experienced water shortages. Now, on the basis of the records of their crop areas, there has been approximately 5 percent of their irrigated area lying idle.

With a full water supply each and every year, in my opinion, the percentage would be smaller, possibly 4 percent, I do not know exactly, but we do know that it has only been 5 percent with water shortages in certain years.

Now, applying that to the same area we were considering, it seems to me it is a reasonable assumption to assume that with an available water supply probably about 5 percent is all that would lie idle.

The CHAIRMAN. Do I understand you draw this conclusion in this manner: First, you determine definitely and accurately what the supply of water is?

Mr. LARSON. That is right.

The CHAIRMAN. Secondly, you determine the amount of water that is needed for every acre of land, that is under the water, and capable of receiving the water?

Mr. LARSON. That is right.

The CHAIRMAN. And then by the process of computing the number of acres under the ditches which would have to use the water available you compute the number of acres which must, as a result of that shortage, lie idle, is that right?

Mr. LARSON. That is correct.

The CHAIRMAN. And it is that sort of a process that has brought you to this conclusion?

Mr. LARSON. And that is more or less the limit in determining the area that could be covered. For example, if it was 6 percent—for example, in the Pinal area there are lands in that area that have been cultivated for several years. The project boundary could be expanded to include some of those older lands.

The CHAIRMAN. That, of course, is another issue. Do you have any reports by districts, irrigation districts, of the area within those districts that lies idle because of lack of water or has lain idle?

Mr. LARSON. I base it on that assumption which I gave you just a few minutes ago, basing it upon the conditions that have existed in the Salt River project. I believe the same would apply to the entire area, assuming they had a full water supply, because the land in the other areas is equally as good as that in the Salt River project.

The CHAIRMAN. Thank you, sir.

Senator DOWNEY. Mr. Larson, do you know how much of the land we are now talking about was idle in 1941?

Mr. LARSON. I think I can give you that. In 1941, for the area that we considered, it would be 545,252 acres.

Senator DOWNEY. How much do you find lying idle in that year?

Mr. LARSON. The difference between that and the 672,000 within the project area we are considering.

Senator DOWNEY. Then you think it was lying idle in 1941 because of lack of water?

Mr. LARSON. Possibly not that particular year.

Senator DOWNEY. You even have a bigger amount idle in that year when the project area had so much water it was waterlogged, did you not?

Mr. LARSON. But there again they had no idea in 1940 that they would have that kind of a run-off. That is one of the reasons that their cropping in other areas has fluctuated much greater than it has in the Salt River project.

For example, in 1940——

Senator DOWNEY. Mr. Larson, you are of course giving explanations and I do not see how you can know that that is true.

Mr. LARSON. If you would let me finish possibly I could show you.

You will recall that 1940 was one of the driest years on record and many of the crops within that area burned up. For example, alfalfa in some areas dried out.

Senator DOWNEY. All right, give us 1942, then.

Mr. LARSON. In 1942 it was 586,866.

Senator DOWNEY. How many acres were idle that year, according to those same figures?

Mr. LARSON. 86,000.

Senator DOWNEY. You are presenting this project to the Congress of the United States in 1949. Do you think this 73,000 acres is still idle?

Mr. LARSON. I think a lot of it is idle.

Senator DOWNEY. And the same land has been constantly idle because of lack of water since that survey was made?

Mr. LARSON. Not necessarily the same land because in many cases the farmers have had, for example, 100 acres. If his water supply is half of what would be required for the 100 acres he may apply the water on 50 acres and then fallow the balance.

Senator DOWNEY. Mr. Larson, this figure of 73,000 acres is about 15 percent or about 12 or 13 percent of the total acreage we are talking about?

Mr. LARSON. For what years?

Senator DOWNEY. Whatever years you were figuring on. This acreage you are computing as lying idle constitutes somewhere around 12 or 13 percent of the total acres in the project, does it not? This acreage you are computing as lying idle.

Mr. LARSON. That is right.

Senator DOWNEY. Why would those people owning that percent of the land be unable to get water satisfactorily when 87 percent of the people did?

Mr. LARSON. I do not follow your question, Senator.

Senator DOWNEY. According to you, 88 percent of the people farmed their crops and irrigated in that year. We will just take 88 percent as the figure.

The CHAIRMAN. Do you mean 88 percent of the people, or 88 percent of the land?

Senator DOWNEY. Eighty-eight percent of the farms. Why were these 12 percent in any different position than the other 88 percent?

Mr. LARSON. In my opinion, it was the lack of water.

Senator DOWNEY. You mean some peculiar condition on their places which they did not have while their neighbors had it?

Mr. LARSON. For example, take the Salt River project and the San Carlos project. In the San Carlos project they operated under a very indefinite water supply. For that reason they have not been able to crop the same as they do in the Salt River project. In my opinion the reason is because of an indefinite water supply.

Senator DOWNEY. What is the acreage in the San Carlos project?

Mr. LARSON. 85,000. It is about 100,000 acres and they have irrigated 85,000.

Senator DOWNEY. In order to pin this down let us stick to the Maricopa. How much of the 73,000 acres is in the Maricopa unit and how much in the Pinal?

Mr. LARSON. In the Maricopa unit the maximum irrigated was 462,000. With the project they could irrigate 441,000; the 21,000 is in Maricopa.

Senator DOWNEY. Now we are talking about the 73,000 acres that you denominated as being within the irrigated area but lacking water. Can you tell me how much of that 73,000 is in the Maricopa unit and in the Pinal unit?

Mr. LARSON. 46,000 would be in the Maricopa unit; 26,000 in the Pinal unit. There are two other units.

Senator DOWNEY. But how much is that total you have there now?

Mr. LARSON. 46,000 in Maricopa——

Senator DOWNEY. How much do the two total, Mr. Larson?

Mr. LARSON. About 72,000.

Senator DOWNEY. Well, then you have your acreage in those two areas, do you not, practically?

Mr. LARSON. In those two areas it makes up almost all of the 73,000.

Senator DOWNEY. Let us take the Salt River area. Isn't each water user entitled to 2 acre-feet of water on an equitable distribution?

Mr. LARSON. Within the Salt River project.

Senator DOWNEY. Yes.

Mr. LARSON. The Salt River project, of course, is only a part of the acreage in the Maricopa unit.

Senator DOWNEY. I understand that.

Mr. LARSON. In the Salt River project itself you have first the (*a*) rights which are entitled to perennial flow, and then there are the (*b*) rights and (*c*) rights, so all land does not have equal water rights.

Senator DOWNEY. Are not all of them entitled equally to 2 acre-feet?

Mr. LARSON. It depends on the amount of water available.

Senator DOWNEY. At least on an equitable distribution, if the water is there isn't each one of them entitled to 2 acre-feet?

Mr. LARSON. Part of the land would be. However, your (*a*) rights have first priority on water. Then there are some that have additional storage rights and some have pump rights.

Senator DOWNEY. Mr. Larson, what data on this problem have you here in Washington?

Mr. LARSON. In what connection? That is, in connection with the acreages?

Senator DOWNEY. In connection with what we are talking about, this 73,000 acres that is going to take practically one-half of the water from this total project and that you in your report repeatedly describe as now lying idle.

Mr. LARSON. I think I could assemble the acreages for the various districts, for the area that we considered.

Senator DOWNEY. Will you do that at your earliest convenience and file it with the committee?

Mr. LARSON. Yes; I would be glad to.

Senator DOWNEY. Mr. Chairman, to me this is a most imperative point from the viewpoint of the taxpayers:

I think we definitely ought to get lay information on this thing from the field. I think we ought to stop until we know what we are doing. It looks like $5,000 an acre, or something, is going out for this 73,000 acres of land, or something like that.

The CHAIRMAN. That would be a matter, Senator, to raise before the full committee. It could not be determined here.

Senator DOWNEY. Well, Mr. Chairman, you are the chairman of the committee and we are in session here. I want to say we challenge this, we challenge this. We say this area is nonexistent, it does not exist, and we would like to see some proof of it. Mr. Chairman, we are dealing here with a mere item of 300 or 400 hundred million dollars and 73,000 acres. Here is practically one-half of the full benefit of all this great works to go to these 73,000 acres. We cer-

tainly think the Bureau ought to be in here with some description of this land so that it could be checked. We would like to know what it is.

The CHAIRMAN. I will say that you have requested the witness to produce such information as he has. I am sure he will do that. For the purposes of this afternoon's session, I hope we may proceed with such other examination as may be desired.

Senator DOWNEY. Certainly, Mr. Chairman, but at the risk of being burdensome to you——

The CHAIRMAN. Senator, you could never be burdensome to me.

Senator DOWNEY. I want to persist in this.

The CHAIRMAN. The Chair will not undertake to make a decision upon it this afternoon.

Senator DOWNEY. I understand that, but that so nobody may accuse me of delaying the committee, I am very much of the opinion that we ought to have a better and higher degree of testimony than anything which has been suggested here. It could probably be obtained within 2 weeks, I suppose, by a survey out there to find it.

If I might explain to Senator Malone what this is:

The Bureau shows in its reports that almost one-half of the total amount of water that would be available from the central Arizona project will go to the irrigation of 73,000 acres of land which is alleged to be land formerly irrigated within the project, but presently lacking a water supply. It is our contention and belief that that land has not been irrigated for one reason, and that is because ordinarily you will expect 10 or 12 percent of your land to lie idle from year to year for one cause or another. I might add, Mr. Chairman, if you provide water for 90 percent of the land in an irrigation project, generally you are prety safe, because generally 10 percent lies idle. We found that true in California, at least, and did in Wyoming when I was up there.

The CHAIRMAN. Irrigation has improved since you left Wyoming, Senator.

Senator DOWNEY. The climate hasn't, though.

Mr. Larson, diverting to another point. I understand your reports show that you expect to irrigate a total of 639,680 acres by this project.

Mr. LARSON. That is right.

Senator DOWNEY. Is that correct?

Mr. LARSON. In other words, water could be furnished to approximately 640,000 acres of the 672,000, within the area that we have considered.

Senator DOWNEY. We will hereafter refer to that as 640,000 acres in round figures. Within those figures is included the 73,000 acres of land that you described in your report as being idle totally because of lack of water?

Mr. LARSON. That is right.

Senator DOWNEY. As we have already seen, approximately one-half of this water supply is to go to that 73,000 acres and the other one-half to the balance of land, is that correct?

Mr. LARSON. That is right.

Senator DOWNEY. Will you tell me what is the consumptive use per acre? I do not mean the gross application, I mean the consumptive irrigation use after you deduct your rainfall, on the lands in the Maricopa, Pinal, Upper Gila, and San Pedro. I have taken them

from your report, Mr. Larson; Maricopa, 441,000 acres; Pinal, 150,000; Upper Gila, 146,000; San Pedro, 1,880, making a total of 639,680 acres. We do not want the gross application figure at this time, Mr. Larson. All we want is the consumptive irrigation use.

Mr. LARSON. The consumptive use——

Senator DOWNEY. The irrigation use after the deduction of your rainfall.

Mr. LARSON. The irrigation use for only the lands in cultivation?

Senator DOWNEY. I do not know how you will deal with the 73,000 acres there, Mr. Larson, because we cannot identify it, but you deal with that any way you want. I have itemized before me the 639,680 acres itemized in these four areas—Maricopa, Pinal, Upper Gila, and San Pedro. I want to know what is the consumptive irrigation use for each of those areas. Let's start with Maricopa first, if you will, Mr. Larson.

Mr. LARSON. The consumptive use, as we have it shown in our report for the irrigated land in Maricopa would be 3.2 acre-feet per acre.

Senator DOWNEY. That is after you deduct your rainfall?

Mr. LARSON. That is right.

Senator DOWNEY. So if we multiply 441,000 by 3.2 we will get the amount of consumptive irrigation use for that district, is that right?

Mr. LARSON. That is right.

Senator DOWNEY. Do you have that multiplied out there?

Mr. LARSON. No; I do not have it.

Senator DOWNEY. All right, then give me the per acre consumptive use for Pinal.

Mr. LARSON. The same.

Senator DOWNEY. And how much is it in the Upper Gila?

Mr. LARSON. 2.74.

Senator DOWNEY. Do you round that off in any way, or would you make it 2.74?

Mr. LARSON. 2.7 would be close.

Senator DOWNEY. And the San Pedro?

Mr. LARSON. It would be the same for the San Pedro.

Senator DOWNEY. Do you know what that comes to, the total?

Mr. LARSON. About 1,411,000.

Senator DOWNEY. Oh, no.

Mr. LARSON. That was for the 441,000. Did you want the total?

Senator DOWNEY. If you are working it out there I would like to have it. How much was it for Maricopa?

Mr. LARSON. 1,411,000.

Senator DOWNEY. And Pinal?

Mr. LARSON. 480,000.

Senator DOWNEY. And the Upper Gila?

Mr. LARSON. 128,000.

Senator DOWNEY. And the San Pedro, please.

Mr. LARSON. About 5,000, approximately.

Senator DOWNEY. Have you totaled them?

Mr. LARSON. About 2,024,000.

Senator DOWNEY. Mr. Larson, does that figure of 2,024,000 showing the consumptive irrigation use for this area of land appear any place in your report?

Mr. LARSON. On the basis of 3.2?

Senator DOWNEY. I am asking you if at any place in your report appears a statement of the amount of consumptive irrigation use for this project. I do not mean in these figures but stated in any figures?

Mr. LARSON. I do not know that it is set out in that way anywhere in the report.

Senator DOWNEY. I was not able to find it. I just wondered if it was in there some place. How much does the Bureau of Reclamation consider should be set aside for salt balance?

Mr. LARSON. About 376,000 acre-feet.

Senator DOWNEY. May I check that other figure again, about 2,024,000?

Mr. LARSON. About 2,024,000.

Senator DOWNEY. So with your salt balance the consumptive use would come to 2,400,000 acre-feet?

Mr. LARSON. On that basis.

Senator DOWNEY. Well, that is your basis, is it not?

Mr. LARSON. No, it is not. I would not stop there. In other words, you cannot irrigate land in that way.

Senator DOWNEY. I am not talking about that, I am just talking about these figures as far as we have gone, Mr. Larson. I mean these figures showing the salt balance plus the consumptive irrigation use are your figures that you have just given.

Mr. LARSON. Yes.

Senator DOWNEY. Would you turn to table B–5 in the Bureau of Reclamation report?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Under column 2, under the general heading of Present Annual Water Supply, Acre-feet, there is a column, Surface Supply, 1,676,000 Acre-feet. That is correct, is it not?

Mr. LARSON. That is right.

Senator DOWNEY. Is all of that represented by surface diversion?

Mr. LARSON. That is the surface diversion. Some of that is rediversion, a small amount of it.

Senator DOWNEY. But it is all made by surface diversion?

Mr. LARSON. In other words, it is the waste water or return flow to the river that is rediverted at some other point downstream.

Senator DOWNEY. But is that all diverted by surface diversion?

Mr. LARSON. That is the surface diversion.

Senator DOWNEY. That is, you first divert that amount of water and then some of it finds its way back into the river?

Mr. LARSON. That is right.

Senator DOWNEY. And then is again diverted on the surface?

Mr. LARSON. That is right.

Senator DOWNEY. But this item does not include at all any underground waters?

Mr. LARSON. No.

Senator DOWNEY. The next item we have is Safe Ground Water Yield, 694,600 Acre-feet. That is the amount that you believe can be safely pumped from the underground supply over a period of years without any additional project?

Mr. LARSON. Under their present cropping and operation, yes.

Senator DOWNEY. Are you suggesting they might change their crops in the future so that they would take more water or take less water?

Mr. LARSON. That would be possible.

Senator DOWNEY. But under your present cropping conditions the 694,600 is a safe withdrawal from the underground supply, is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Do you have those two figures added together there?

Mr. LARSON. No, I have not.

Senator DOWNEY. It comes to 2,371,000?

Mr. LARSON. Right.

Senator DOWNEY. Your reports here indicate that there is a consumptive use of that amount from those two sources of water, is that correct?

Mr. LARSON. On the irrigated land.

Senator DOWNEY. Well, what do you mean by that?

Mr. LARSON. The consumptive use as we have it shown by 3.2 is only that on irrigated land.

Senator DOWNEY. I assume I understand you but I am not entirely clear. Is it the meaning of your report that from these two sources of water supply there is available for consumptive irrigation use 2,371,000 acre-feet?

Mr. LARSON. No, I do not mean that.

Senator DOWNEY. What is your qualification there?

Mr. LARSON. If, for example, you take the 1,676,000 and you use it consumptively you do not have a safe yield from the ground-water basin of 695,600. In addition to that——

Senator DOWNEY. Now, wait a minute, Mr. Larson, let us just take up one point. You have told us that all of the 1,676,000 is consumed by surface diversion?

Mr. LARSON. That is surface diversion.

Senator DOWNEY. How could that replenish your under ground?

Mr. LARSON. A large part—I would not say a large part but probably close to one-third of the 1,676,000 is responsible for the recharge that makes it possible to pump 695,000. In other words, if you irrigated your land you could not get a consumptive use of 3.2 unless you applied some additional water. If you only applied that water to the surface which was required by the plants all of the salt would be concentrated in that upper layer and you would soon have alkali land. Additional water must be applied to carry through these excess salts.

Senator DOWNEY. You will remember that on the other side of our equation we allowed about 150,000 acre-feet or 376,000 acre-feet for salt balance. I will come to that salt balance later, Mr. Larson. I understand from your report, from what you have said here and what you have said to me prior to this, that practically all of that 1,676,000, by diversion and rediversion and perhaps rediversion the third time, is consumed?

Mr. LARSON. No. A part of that goes to the ground water basin which makes it possible to pump 695,000 acre-feet of water.

Senator DOWNEY. How much?

Mr. LARSON. Roughly, in my opinion, about a third.

Senator DOWNEY. That is, after your ultimate pumping out you still have a third of that that goes to your under ground? That would be about 525,000 acre-feet, is that right? Is that what you are saying to the committee?

Mr. LARSON. In my opinion close to a third would probably reach the ground water basin.

Senator DOWNEY. Well, that would be over 525,000, about 550,000 acre-feet, I think.

Mr. LARSON. The recharge——

Senator DOWNEY. Then that is the only way you get your safe withdrawal, practically, of the 694,000 acre-feet?

Mr. LARSON. What I mean, Senator, is that the seepage from the canals, the seepage to the ground-water basin from irrigating this land is partly responsible for the recharge to the ground-water basin which makes it possible to pump the 695,000 acre-feet of water.

Senator DOWNEY. Mr. Larson, what is your natural replenishment of underground water there? What is considered your safe withdrawal of underground water?

Mr. LARSON. 695,000 acre-feet on the basis of the present practice of irrigation.

Senator DOWNEY. Then according to your statement practically all of this underground water comes from this surface diversion that you are speaking of?

Mr. LARSON. I do not know exactly. It may be less than a third. In other words, the ground water division of the Geological Survey has made studies of this particular area. In their best judgment the safe pumping from that area would be about 695,000 acre-feet, providing, of course, that the condition remained the same. In other words, that the pumped water in turn was used on the land. All the irrigation, all the seepage from the canals is partially responsible for or contributes to the recharge of the ground-water basin.

Senator DOWNEY. All, right. Give me again your best estimate of the amount of surface diversion of the 1,676,000 that goes into the underground?

Mr. LARSON. Roughly, Senator, I would estimate it somewhere between a quarter and a third.

Senator DOWNEY. Thirty percent?

Mr. LARSON. Between 25 and 30 percent.

Senator DOWNEY. Well, you said between a quarter and a third.

Mr. LARSON. Possibly 25 percent would be a reasonable figure.

Senator DOWNEY. Would you say 500,000 acre-feet?

Mr. LARSON. It probably would not be any greater than that.

Senator DOWNEY. Would it be less, Mr. Larson? All I want is to get your opinion. I have no intention to assert any of my own ideas here.

Mr. LARSON. It would be a very rough estimate, possibly 450,000.

Senator DOWNEY. That is your best judgment.

Now, in column 4 we have "Distribution of ground water released for salt balance, 154,000 acre-feet." Do you think that is the proper amount for salt balance under present conditions?

Mr. LARSON. Under present conditions that would be my opinion.

Senator DOWNEY. But you would step up to 376,000 under the completed project?

Mr. LARSON. That is correct.

Senator DOWNEY. And that would leave you 540,000 that you say you pump for irrigation?

Mr. LARSON. That is correct.

Senator DOWNEY. Where in this table, then, does it show the total amount of water you would have available for consumptive use?

Mr. LARSON. It is based on a surface diversion demand of 5.7 for diverted water, that is, diverted surface water, and 4.7 acre-feet per acre for water that is pumped. That allows a 30 percent loss in surface diversion and 15 percent loss in pumped water.

Senator DOWNEY. Mr. Larson, that was not my question. What I was asking was this: Does table B–5 at any place show, as a result of figures you have here, the amount of water presently available for consumptive use?

Mr. LARSON. No, it does not.

Senator DOWNEY. Is that shown on any of these tables any place?

Mr. LARSON. As I see it, Senator, we have in our reports these tables showing the amount of surface water available, the amount of pumped water available and the amount that would be available at the farmer's headgate, based upon the assumption that the average requirement at the farmer's headgate would be 4 acre-feet per acre.

Senator DOWNEY. You will recall that the consumptive use in the four projects we discussed came to 2,024,000 acre-feet, to which we added 376,000 for salt balance of the completed project, making a total of 2,400,000 acre-feet.

Mr. LARSON. Of course from there you have to go into this——

Senator DOWNEY. What other items would you have to have? That is what I would like to get now, Mr. Larson.

Mr. LARSON. The other items consist of what we call noncultivated land, which would include rights-of-way along canals, rights-of-way along highways. The same is true with farm land. Some of the land is not in cultivation and water goes onto that area. There is water used industrially within the cities in the area, and so forth.

Senator DOWNEY. Mr. Larson, I do not quite understand you. You speak of water going on the rights-of-way; what do you mean by that?

Mr. LARSON. Not exactly surface water. For example, with a canal adjacent to a fence line, an unlined canal, water will seep into the ground from that canal. It will furnish a water supply to grasses, weeds, and such as that along the highway rights-of-way. The same thing is true along canals.

Senator DOWNEY. That is, a certain portion of it goes into vegetation?

Mr. LARSON. Vegetation.

Senator DOWNEY. Can that largely be eliminated, Mr. Larson, by proper methods?

Mr. LARSON. Possibly some could but it would be very expensive to keep that out.

Senator DOWNEY. How large an item do you think that to be?

Mr. LARSON. I haven't any idea, Senator.

Senator DOWNEY. That opinion is not of very much value then, Mr. Larson, if you have no idea of what it would be.

Mr. LARSON. To eliminate all vegetation?

Senator DOWNEY. No. I mean, how much water goes into that vegetation, in your opinion?

Mr. LARSON. There would be a rather large sum throughout the area.

Senator DOWNEY. What do you think it would be?

Mr. LARSON. It would probably be equal to about 10 percent of the irrigated acreage. In other words, noncultivated land—let me put it this way: The use of water on noncultivated land within the project

area would probably equal 10 percent of the requirement for irrigated acreage.

Senator DOWNEY. Under the completed project would that be approximately 100,000 acre-feet, or thereabouts?

Mr. LARSON. I do not know; I would want to do a little figuring before I quoted a figure on that, Senator.

Senator DOWNEY. But, Mr. Larson, has not the Bureau of Reclamation already made these computations? How have they reached the results they have if they have not put specific figures on this? I do not mean inflexible figures.

Mr. LARSON. We have specific figures, Senator. We have many figures indicating what the average losses are in these canals and we have figures showing the demand for water at the farmer's head gate. Our figures are based upon that data.

Senator DOWNEY. Anyway, it is your best opinion that there would be a loss of about 10 percent of the total water in vegetation growth along the rights-of-way, canals, and farmers' ditches—do you include that there?

Mr. LARSON. In my opinion the uses on what we call noncultivated acreage would equal about 10 percent of the water required for the irrigated acreage.

Senator DOWNEY. Then to interpret your own figures, would that mean approximately 100,000 acre-feet for the central Arizona project? We are dealing with about 1,000,000 acre-feet of water there, are we not?

Mr. LARSON. I would say roughly around 200,000 acre-feet.

Senator DOWNEY. 200,000?

Mr. LARSON. Yes.

Senator DOWNEY. That would be 20 percent.

Mr. LARSON. No; 10 percent of the cultivated acreage.

Senator DOWNEY. Two hundred thousand acre-feet. Let us be clear now where you think that 200,000 acre-feet will be lost. We are now talking about loss to vegetation growth?

Mr. LARSON. That is losses on noncultivated acreage.

Senator DOWNEY. In vegetation growth. I am not talking about what seeps into the ground and gets into the underground or what seeps out of the canals. We are talking about the loss to vegetation. Whatever goes down into the ground must appear in the underground and ultimately move out of the project, unless it is absorbed in vegetation; is that right?

Mr. LARSON. A large part of that, Senator, of course is lost in evaporation and transpiration. A large part is evaporation. You could kill off all of the weeds and you would still have evaporation from that area.

Senator DOWNEY. Mr. Larson, let us just stick to this now. Is this your estimate that 200,000 acre-feet——

Mr. LARSON. That is my approximate estimate.

Senator DOWNEY. Just a minute—will be absorbed in vegetation growth along the canals and rights-of-way?

Mr. LARSON. Not absorbed in growth of vegetation. It will be lost in the area due to transpiration and evaporation.

Senator DOWNEY. By transpiration you mean a loss which goes into vegetation growth?

Mr. LARSON. That is right, and evaporation.

Senator DOWNEY. You mean in the canals?

Mr. LARSON. No; evaporation from the soil.

Senator DOWNEY. We are talking about the loss now not on the farmer's property; we are talking about the loss along the canals in vegetation growth. I am sorry to pursue it this way but I think it is vital that we have a clear understanding of what you mean to say.

The CHAIRMAN. May I interrupt, Senator. This will be off the record.

(Discussion off the record.)

The CHAIRMAN. Before we go, Senator Malone left a note for me and asked me to propound this inquiry to the witness, which I do on behalf of Senator Malone. "What is your definition of consumptive use of water?"

Mr. LARSON. The definition we have based our consumptive use estimate on is the quantity of water in acre-feet per cropped acre per year absorbed by the crop and transpired or used directly in the building of plant tissue, together with that evaporated from the crop-producing land. The committee's definition of valley consumptive use includes also the consumptive use on the uncropped area and non-recoverable deep-soil percolation. Valley consumptive use is represented by the difference between the annual flow into the valley, consisting of surface and subsurface movement of water into the valley, and all precipitation and the total out-flow therefrom in the same period, consisting of surface and subsurface movement of water out of the valley, with the appropriate correction for changes in surface and subsurface storage.

For the purpose of this paper the committee's definition of valley consumptive use has been modified by the omission of the term "non-recoverable depercolation loss" and the substitution of the term "equivalent valley area for cropped or irrigated area." Nonrecoverable depercolation loss is a form of out-flow dependent on the factors influencing transpiration and evaporation and the forms of use primarily considered therein.

An effort has been made to limit consideration to valleys where depercolation losses are believed to be negligible. The equivalent valley area in each case comprises the entire area or valley, except for areas consuming no stream flow reduced to an area consuming water at a rate equivalent to that by the cropped area.

Every area considered contains open water or water-logged areas from which the loss of water is materially higher than on cropped lands and the abnormal use on such areas counterbalances the incomplete supply on cropped areas. There are often also extensive areas with partial supplies feeding on groundwaters or surface wastes from the irrigated areas.

Senator DOWNEY. Mr. Larson, may I ask what that definition is from?

Mr. LARSON. From a paper on Consumptive Use of Water for Agriculture, by Robert L. Lowry, Jr., and Arthur J. Johnson, which appeared in volume 107 (1942) of the American Society of Civil Engineers Transactions.

Senator DOWNEY. Thank you very much.

The CHAIRMAN. Thank you very much, Mr. Larson.

The committee will now stand in recess until 10 o'clock on Saturday morning.

(Whereupon, at 3:50 p. m., the hearing was adjourned to Saturday, April 30, 1949, at 10 a. m.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

SATURDAY, APRIL 30, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 10:20 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Kerr, and Miller.

The CHAIRMAN. The committee will come to order.

Mr. Larson, will you come forward, please?

EXAMINATION OF V. E. LARSON—Resumed

Senator DOWNEY. Mr. Chairman, when Mr. Larson was last before the committee, I procured from him a statement as to the consumptive use of irrigation water and the necessary salt-water balance requirements of the central Arizona project, and I have placed his conclusions here in a table as I understood them.

I must admit I apparently made some mistakes when I presented the table to Mr. Larson, and he has corrected it.

I also added my computation as to how much the consumptive use requirements and the salt balance water would be reduced if we eliminated from our consideration the 73,600 acres of land which the Bureau describes as now idle and requiring a full water supply.

I think we can save the time of the committee by not recapitulating these figures.

The CHAIRMAN. That is a pleasant prospect.

Senator DOWNEY. I will merely state that that calculation, as verified by Mr. Larson, indicates that the total requirements for consumptive use of irrigation water in the central Arizona project, as it is contemplated by the Bureau presently, is 2,024,000 acre-feet, the estimated salt balance water required to drain the salt out, 376,000, making a necessity for 2,400,000 acre-feet of water just for those two purposes.

Of course, I understand from Mr. Larson that necessarily other water will be required. This is just these two factors. If we exclude the 73,600 acres of land which the Bureau describes now as totally idle and requiring an entire water supply, we have a total requirement for consumptive use and salt balance of 2,117,000 acre-feet of water for those purposes.

I now ask permission to place this table in the record.

Senator MCFARLAND. It is agreeable to place it in the record as Senator Downey's statement, but not as Mr. Larson's statement.

The CHAIRMAN. It should be submitted to Mr. Larson for his comment.

Senator DOWNEY. It has been, and he has corrected it.

Senator MCFARLAND. It is all right to have it incorporated into the record as Mr. Downey's figures, but not as Mr. Larson's.

The CHAIRMAN. If Mr. Larson will be good enough to examine the figures, he may express his opinion. I would like to know what your view is of this computation. Does it represent your conclusion?

Mr. LARSON. Under the Senator's assumptions the figures are correct as they appear in this table.

Senator MCFARLAND. What are the Senator's assumptions?

Mr. LARSON. That the need for water is based entirely upon the beneficial consumptive use of 3.2. There is no consideration given to the additional water needed in order to get that beneficial consumptive use.

In order to realize a beneficial consumptive use of 3.2, it is necessary to have a full water supply. Under the assumptions as far as the Senator has gone, for example, if this is to represent the demand for irrigation water, the only conceivable way of getting a consumptive use of 3.2 would be to deliver water in a conduit without any losses between the diversion point and each farm. Then on the land the water would have to be diverted through a pipe system and sprinkler system where you could apply all of the water to the cropped land, not permitting any of it to go beyond the root zone, which means there would be no return to the ground-water basin from this irrigation, there would be no losses in the distribution system, and it is entirely theoretical because if such an irrigation system were set up, all of the salt brought into the area would be left in the upper reach of the soil because there would be no seepage water through the soil.

Senator DOWNEY. If I may interrupt, I am trying to expedite these hearings. I have taken the very figures Mr. Larson gave, showing the consumptive use of irrigation water and salt balance water requirements, and that is all this chart stands for.

The CHAIRMAN. He is entitled to present his interpretation.

Senator DOWNEY. I am making no contention that additional water wouldn't be required. I am trying to bring out two factors in the problem, and the table is limited to that, and it so stipulates, and they are the very figures Mr. Larson gives in his report and gives to me.

Mr. Larson and the committee need not worry. I will give Mr. Larson every opportunity to explain fully the additional water he thinks is required.

The CHAIRMAN. May I say, Senator, that for the benefit of a person like myself who doesn't understand as much about water systems as you do, it is desirable to have an explanation.

Senator MCFARLAND. I have no objection to these figures being submitted as Senator Downey's figures, but not as Mr. Larson's figures.

Senator DOWNEY. Very well, Mr. Chairman.

Now, Mr. Larson, how many acres of land are there requiring irrigation in the Maricopa unit?

Mr. LARSON. Four hundred and forty-one thousand.

Senator DOWNEY. You count that the consumptive use need for that in irrigation water, excluding the rainfall, is 3.2 acre-feet per acre, don't you?

Mr. LARSON. That is correct.

Senator DOWNEY. And that makes a need there for consumptive use irrigation water, excluding rainfall, of 1,400,000 acre-feet?

Mr. LARSON. That is correct.

Senator DOWNEY. Now, in the Pinal unit the amount of land is 150,000 acres?

Mr. LARSON. That is correct.

Senator DOWNEY. And the duty there for consumptive use irrigation water, excluding rainfall, is 3.2 acre-feet per acre; is that right?

Mr. LARSON. That is correct.

Senator DOWNEY. That makes a total of 480,000 acre-feet?

Mr. LARSON. That is correct.

Senator DOWNEY. In the upper Gila you have 46,800 acres; is that correct?

Mr. LARSON. That is correct.

Senator DOWNEY. And you calculate a per-acre duty there under the same conditions I mentioned of 2.74?

Mr. LARSON. Not a duty, a consumptive use.

Senator DOWNEY. A consumptive use, excluding your rainfall of 2.74?

Mr. LARSON. That is correct.

Senator DOWNEY. And that makes 128,000 acre-feet?

Mr. LARSON. Yes, sir.

Senator DOWNEY. And in the San Pedro there is 1,880 acres and the necessity for a consumptive use of irrigation water at 2.74.

Mr. LARSON. That is correct.

Senator DOWNEY. That makes a total of 5,000 acre-feet.

Mr. LARSON. Yes, sir.

Senator DOWNEY. And that makes a total of 639,680 acres we have accounted for with a necessity of 2,024,000 acre-feet for consumptive use irrigation water; is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. And you calculate that the salt balance water requirements for that amount of land would be another 376,000 acre-feet; is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. And adding those two sums together, we come to the sum of 2,400,000 acre-feet; is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Now, Mr. Larson, let us exclude from our calculation the 73,600 acres of land which you described in the report and in your testimony as being presently and for an indefinite period totally idle for lack of water and that lies practically wholly in the Maricopa and Pinal units.

Mr. LARSON. Yes, sir.

Senator DOWNEY. And your consumptive use requirement there is 3.2.

Mr. LARSON. That is correct.

Senator DOWNEY. Now, Mr. Larson, let us exclude from our calculation the consumptive use irrigation water required there, we would have to deduct 236,000 acre-feet; is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. That leaves, then, a requirement for 2,164,000 acre-feet, after excluding that area of 73,000 acres of land; is that correct?

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Mr. LARSON. Yes, sir.

Senator DOWNEY. And because we are reducing our water, we likewise should logically reduce our salt balance water; isn't that correct?

Mr. LARSON. That is correct.

Senator DOWNEY. That would be by approximately 20 percent?

Mr. LARSON. Approximately.

Senator DOWNEY. And reduction in salt balance that would amount to another 47,000 acre-feet?

Mr. LARSON. That is correct.

Senator DOWNEY. So, therefore, Mr. Larson, excluding now from our consideration the 73,600 acres of land that you describe as having been totally idle for lack of irrigation water, we have a total consumptive use of irrigation water and salt water balance requirements for the central Arizona project of 2,117,000 acre-feet; is that correct?

Mr. LARSON. That is correct.

Senator DOWNEY. Now, Mr. Chairman, I thought it would be to the convenience of everybody to put in the record this table, which Mr. Larson has gone over and corrected.

Senator MCFARLAND. I have no objection to its being put in as a table compiled by Senator Downey.

Senator DOWNEY. I will withdraw the request.

Mr. Larson, will you please prepare a table along the lines of the one that I have there and have it ready for insertion Monday?

Senator MCFARLAND. Mr. Chairman, my objection is this: Mr. Larson doesn't agree with these figures. He doesn't agree with the conclusions reached here, and it is an attempt to put words in Mr. Larson's mouth to which he has not testified.

The CHAIRMAN. I think, Senator McFarland, that in view of the statement, the explanatory statement, that Mr. Larson was permitted to make by the Chair, the figures are presented now in exactly the way that you understand them to be, and I am sure the committee does. They represent the computations based upon assumptions made by Senator Downey. That is all.

Senator MCFARLAND. I just wanted the record to show that I object to this compilation on the ground that it wasn't compiled by Mr. Larson and he does not reach the same conclusions as the paper would indicate.

Now, if it is desired that it go into the record, it is all right; but I want the record to show my statement in that regard.

The CHAIRMAN. The figures are stripped of any conclusions now.

Senator DOWNEY. Yes.

Senator MCFARLAND. I haven't seen the paper, I don't know what it shows on the top, or what other matter may be endorsed on it. So that is all that I care to mention. If the chairman wants to admit it, that is his right.

The CHAIRMAN. I don't want to admit anything to the record over objection, but I feel that the presentation has now been cleared up so that no conclusions are put into the mouth of the witness with respect to this, and every member of the committee is at perfect liberty to draw his own conclusions. That is the understanding, is it not, Senator Downey?

Senator DOWNEY. Yes, certainly, and if I may add this, I know it will be Mr. Larson's statement to which in greater or lesser degree I will coincide, that additional water will be needed to carry out actual

irrigation, I understand that, and we will later explore with Mr. Larson the additional amount of water that will be required.

Senator McFARLAND. I have made my record. My further objection is that I don't want Senator Downey to be enabled to take the floor of the Senate and say these are Larson's figures. I have made my record, and I will stand on it.

The CHAIRMAN. Is there anything further on that?

Senator McFARLAND. Mr. Chairman, I have now seen the paper. I object to this because the heading of the statement reads "Consumptive use irrigation water and salt water balance requirements, central Arizona project." That is not Mr. Larson's testimony. I have no objection to it being put in as Mr. Downey's statement.

The CHAIRMAN. I think, Senator McFarland, that the record clearly shows now that this is a table, one which Senator Downey cross-examined Mr. Larson on, the position of both the Senator from California and the witness is clear from the questions and answers, and I think in those circumstances the table may very well be admitted into the record, and I hope the Senator will withdraw his objection.

Senator McFARLAND. I cannot withdraw my objection as long as that heading remains on the paper, because it was submitted for the purpose of trying to get Mr. Larson to admit——

The CHAIRMAN. Let's strike out the heading and admit the table.

Senator McFARLAND. And also the words at the bottom. Mr. Larson doesn't concede that the "Total consumptive use irrigation water and salt water balance requirements, central Arizona project, excluding 73,700 acres"—he doesn't admit that, even under Senator Downey's interpretation; so if we may exclude the heading and the words at the foot, I have no objection.

The CHAIRMAN. What is the position of the Senator from California?

Senator DOWNEY. I am beyond speech. I think Mr. Larson and I understand each other, and I think it is perfectly clear.

Senator McFARLAND. Very well, I have no objection that the paper go in, with those exclusions and under the testimony and remarks stated in connection therewith.

(The table referred to is as follows:)

	Acres	Per acre	Acre-feet
Maricopa	441,000	3.2	1,411,000
Pinal	150,000	3.2	480,000
Upper Gila	46,800	2.74	128,000
San Pedro	1,880	2.74	5,000
Total	639,680		2,024,000
Plus estimated salt water balance			376,000
Total			2,400,000

Excluding 73,600 acres:	
As above	2,400,000
73,600 x 3.2	236,000
Total	2,164,000
Reduce salt balance by 20 percent of 236,000	47,000
Total consumptive use irrigation water and salt water balance excluding 73,600 acres	2,117,000

. Senator DOWNEY. Mr. Larson, I next wish to ask your help in developing before the committee the total amount of water that is available in the project at the present time.

I preliminarily want to say that, to me at least, the way the tables are presented by the Bureau, they are somewhat confusing, and I will endeavor to elicit what I desire by questioning.

You first show, Mr. Larson, an item of 1,676,000 acre-feet of water as being available for surface diversion; is that right?

Mr. LARSON. That includes some rediverted water.

Senator DOWNEY. You mean you have that total amount of water available for surface diversion, don't you?

Mr. LARSON. Senator, it depends entirely on how you would like to use the figure. For example, if you are basing it on the amount of water that will be diverted under actual irrigation practices, that is true. That is the amount available for diversion. But to figure the available water supply on the basis of strictly consumptive use, then you must deduct your rediverted water.

Senator DOWNEY. I understand that, Mr. Larson, but all I am trying to develop is that at the beginning there actually is calculated to be available there in an average year or in some average period that we will later develop 1,676,000 acre-feet of water.

Mr. LARSON. That is correct.

Senator DOWNEY. And that 1,676,000 acre-feet of water is diverted out over the land; is that correct?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Some of that flows down back into the streams, doesn't it?

Mr. LARSON. Yes, sir.

Senator DOWNEY. About how much?

Mr. LARSON. The best estimate we have been able to make, and it is an estimate, is probably 100,000 of that is rediverted.

Senator DOWNEY. In surface streams?

Mr. LARSON. That is correct.

Senator DOWNEY. Now, beyond that, a certain amount of this 1,676,000, that is available for surface distribution percolates into your underground supply?

Mr. LARSON. That is correct.

Senator DOWNEY. How much of this surface diversion do you calculate is going into the underground waters and is there available for pumping out of the underground?

Mr. LARSON. We haven't figured it exactly that way, Senator. On the basis of present irrigation practices, the Geological Survey has estimated that 695,000 acre-feet could be pumped, provided that pumped water was used on irrigated land within that area.

Senator DOWNEY. All right. Let me ask you this question: How much of that 694,000 acre-feet do you calculate comes from this surface diversion and how much comes from naturally percolating sources?

Mr. LARSON. It would be only a rough estimate. As I say, we haven't figured it that way. Possibly 450,000.

Senator DOWNEY. 450,000 comes from your surface diversions?

Mr. LARSON. That is correct.

Senator DOWNEY. That would leave, then, about 250,000 that you think is available in the underground waters from naturally percolating sources?

Mr. LARSON. Roughly, yes.

Senator DOWNEY. Well, then; I will see if you agree with me on this, Mr. Larson, that we do have physically available there for use in the central Arizona project the 1,676,000 acre-feet of water that is diverted by surface diversion, plus 250,000 acre-feet of water additional which constitutes the underground water from naturally percolating sources.

Mr. LARSON. That is correct.

Senator DOWNEY. So that we would have what, for a total, Mr. Larson.

Mr. LARSON. About 1,900,000.

Senator DOWNEY. I make it to be exactly 1,926,000; is that right?

Mr. LARSON. It was 695,000 less 450,000, 245, 1,676,000.

Senator DOWNEY. 1,676,000. What is the total that you get?

Mr. LARSON. 1,676,000.

Senator DOWNEY. I added 250,000 to that, making 1,926,000.

What is your calculation?

Mr. LARSON. I have 695,000 less 450,000, that is 245,000, and that added to 1,676,000, I get 1,921,000.

Senator DOWNEY. 1,921,000. Thank you.

Now, Mr. Larson, in addition to that, I understand that it is the belief of the Bureau that something approaching 150,000 acre-feet of water additional may be developed by putting in new local conservation works.

Mr. LARSON. We have about 100,000 included in this project. Beyond that it is questionable.

Senator DOWNEY. I thought your figures showed 136,000.

Mr. LARSON. In the reservoir—you are speaking of this area now, the Pinal and Maricopa, it is 42,000 Horseshoe and 64,000 at Butte.

Senator DOWNEY. I am speaking of the whole Arizona project, Mr. Larson. I thought I took it from your figures. Your table indicates that 42,000 acre-feet of additional water can be developed at Horseshoe Dam?

Mr. LARSON. That is right.

Senator DOWNEY. And 64,000 at Butte Dam?

Mr. LARSON. That is right.

Senator DOWNEY. And 7,000 at Charleston Dam; is that right?

Mr. LARSON. That 7,000 is salvage loss in the river.

Senator DOWNEY. Well, you expect to be able to salvage that which is now lost?

Mr. LARSON. By construction at Charleston.

Senator DOWNEY. And water conserved by the Safford Valley improvement and Hooker Dam, 19,000?

Mr. LARSON. That is correct.

Senator DOWNEY. And what do those four items total?

Mr. LARSON. 132,000.

Senator DOWNEY. 132,000?

Mr. LARSON. Yes.

Senator DOWNEY. And that is the amount of new water that you believe can and should be developed by the local projects in central Arizona?

Mr. LARSON. That is correct.

Senator DOWNEY. And if that were done, we would then have that amount of water additional to the other amounts that you gave me heretofore this morning?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Is that right?

Mr. LARSON. Yes, sir.

Senator DOWNEY. That would be accomplished without any recourse to Colorado River water; is that right?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Now, Mr. Larson, I want to divert from this line of questioning for a few minutes and later come back to it.

You stated that of the total amount of water to be developed by the central Arizona project, including these local improvements and the water coming in from the Colorado River, almost one-half would be utilized on the 73,600 acres of land now totally idle.

Mr. LARSON. Yes, sir.

Senator DOWNEY. The total amount of the obligation to be incurred by this project allocated to irrigation benefits is almost exactly $400,000,000, isn't it?

Mr. LARSON. It is very close.

Senator DOWNEY. 398-plus?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Can we fairly use the rounded figure of $400,000,000?

Mr. LARSON. Yes, sir.

Senator DOWNEY. So, consequently, the capital charge to be allocated against the irrigation of this 73,600 acres of land that has been totally idle for several years would be about $200,000,000; is that right?

Mr. LARSON. No, I do not follow you, Senator.

Senator DOWNEY. You say do not follow me. Let me make myself plain.

We have an allocation here to irrigation of approximately $400,000,000; is that right?

Mr. LARSON. That is correct.

Senator DOWNEY. Approximately one-half of the water that is going to be developed by the project will be used for this 73,600 acres?

Mr. LARSON. Yes.

Senator DOWNEY. Then, isn't it correct to say that that 73,600 acres has a capitalization cost for the irrigation benefits alone, not counting power, of approximately $200,000,000?

Mr. LARSON. No, I do not follow it that way, Senator.

Senator DOWNEY. Will you explain how you differ from my conclusions?

Mr. LARSON. Yes. This project is set up to serve supplemental water, and in my opinion there is no way that you can withdraw any portion of the 640,000 acres and say there is a water supply for the balance.

In other words, there are fixed costs, taxes, and so forth, on this land that is lying idle. The project is set up to serve supplemental water to all of the land under the project area.

To take a hypothetical case and say that half of the water would be used on half of the land, I do not think that is true unless you make the assumption that the water at the present time is spread out, or, that you are definitely confining a new supply to the balance of the acreage, which isn't true. They are spreading their water thinner

and covering a greater acreage, or rotating the water on portions of the land so that this water as set up in the report is supplemental water for the entire 640,000 acres.

Senator DOWNEY. I want to read to you from the report of the Bureau of Reclamation, December 1947, which was prepared under your supervision.

Mr. LARSON. That is right.

Senator MCFARLAND. What page?

Senator DOWNEY. Page 4, paragraph 18, referring to the new water that is to be brought into the project from the Colorado River and local improvements, and I now quote from paragraph 18:

> The studies indicate that this new water made available for diversion at the headgates of the irrigation district each year would be sufficient to (1) replace the overdraft on the underground basin, (2) permit the drainage of excess salt out of the area and maintain a salt balance, (3) provide a supplemental supply to land now in production but not adequately irrigated, (4) increase the water supply for the city of Tucson.

Incidentally, I here interpolate that that is an item of 12,000 acre-feet.

Mr. LARSON. That is correct.

Senator DOWNEY. To continue:

> (5) Maintain irrigation of 73,600 acres of land formerly irrigated but now idle for lack of water and would not be sufficient water to continue irrigation of new land. There would, however, be sufficient water to permit stabilization and some improvement of the existing agricultural economy of the area.

Now, Mr. Larson, to explain the matter to some of the committeemen who were not here during your previous cross-examination, it is our contention that that 73,000 acres of land, more or less, is nothing more than the usual percentage of land that lies idle in such a project, in projects such as this, from year to year, due to people allowing their crops to lie fallow; because of foreclosures; due to the fact that people do not want to put all of their land in, and other causes.

You differ with California's contention on that, and you say, "No, this is not that character of land. This is land that has been totally idle for many years because of lack of water."

And while we cannot agree with that statement, we are accepting it in toto, that here is 73,000 acres of land that has been idle for a long time because of lack of water and that you want to provide a full water supply for it.

Now, again I ask you in view of my statement and the statement you have made, if that 73,000 acres of land, since it is consuming approximately one-half of all the water to be developed, is not going to cost under this proposed project a capital amount in the neighborhood of $4,000 an acre—I want to correct that—approximately $3,000 an acre; 73,000 acres against $200,000,000.

Mr. LARSON. Senator, possibly one reason why we seem to differ to some extent on this percentage of land lying idle, is because of the figures we are using in this report. The figures we have shown in our report are net irrigated acres, not acreage that is assessed by the irrigation district.

For example, the Salt River project is usually referred to as 242,000 acres. Yet, we show a maximum irrigated acreage in the Salt River project of 229,000.

Now, during the period from 1940 to 1944, the percentages of irrigated land in the Salt River project have run in this order:

In 1940, it was 94 percent of the maximum; 1941, it was 96; in 1942, it was 95; it was 94 in 1943; in 1944, 95; or during that period it averaged 95 percent.

The same thing is true in the Imperial irrigation district. According to the testimony, as I recall, Mr. Dowd testified that the Imperial irrigation district has 450,000 acres. Yet, if we think of it on an acreage basis, in 1941, 1942, 1943, 1944, 1945, and 1946, during that period the maximum irrigated acreage was 405,000 acres. During that period, the average, based upon the maximum, is 96 percent of the maximum irrigated acreage. In other words, 4 percent remained idle. Percentages would run in this order: 1941, 98.9 percent; 1942, 94; 1943, 94; 1944, 95; 1945, 97; or an average of 96 percent.

Senator DOWNEY. To shorten this, let me say I am taking your assumption on this, that this 73,000 is not in whole or in part the usual amount of land that lies idle. I am taking your assumption. I am assuming that this is 73,000 acres of land totally idle for many years because of lack of water. That is your statement; you have made it repeatedly in the record.

Mr. LARSON. Not lying idle continually. That is the land, I say, that lies idle—a man may have a hundred acres. He applies his water to half of it. Say this half [indicating] 1 year. He may apply his water to the other half the next year. Then, half of that land is lying idle. I am not implying that this half remains idle all the time.

The CHAIRMAN. You mean that the 73,000 acres with respect to which you have testified is not a particular tract or tracts?

Mr. LARSON. That is right.

The CHAIRMAN. But a variable area of land?

Mr. LARSON. That is right.

The CHAIRMAN. Which may be in one part of the project at one time and in another part of the project at another time?

Mr. LARSON. Yes, sir.

The CHAIRMAN. You are, as I understand you, telling us that the water supply for this project has been so low that the irrigators on that project from time to time have had to allow 73,000 acres to go without water.

Mr. LARSON. That is correct.

The CHAIRMAN. In order to distribute the supply to the acres, whatever they have been?

Mr. LARSON. Yes, sir.

The CHAIRMAN. That is the way I understood you.

Senator DOWNEY. And each year it has been 73,500 acres?

Mr. LARSON. That is the average, Senator.

Senator DOWNEY. The average. Let me read again what you say:

> And to maintain the irrigation of 73,500 acres of land formerly irrigated but now idle for lack of water.

Mr. LARSON. That is right, but that does not say it is the same area each year that was idle.

Senator DOWNEY. Mr. Larson, isn't your whole report built up on the assumption that you are going to give a partial supply to about 441,000 acres, whatever it is, or 500,000, plus a complete supply for 73,000 acres of land now totally idle?

Mr. LARSON. No. The report is set up on the basis of serving a supplemental supply of water to 640,000 acres of land.

Senator DOWNEY. Mr. Larson, let me read you again your language.

The CHAIRMAN. May I suggest to Senator Downey that these are extremely argumentative questions.

Senator DOWNEY. I am not asking a question, I am going to read his report.

The CHAIRMAN. I understand, but that is the purpose of arguing with him and making him give the committee a different conclusion from the one he has given.

Senator DOWNEY. No.

The CHAIRMAN. I am not going to interrupt you, but I am going to say the position of both the interrogator and the witness is perfectly clear to me, and I am sure it is also perfectly clear to every other member of the committee.

Senator DOWNEY. Mr. Chairman, I desire to show repeated statements of the witness contrary to what the witness has said in his report.

Let me ask you this: Does not your report declare that it is to provide a supplemental supply to land now in production but not adequately irrigated, a supplemental supply, and to maintain irrigation of 73,500 acres of land formerly irrigated but now idle for lack of water?

Mr. LARSON. That is correct.

Senator DOWNEY. That is correct?

Mr. LARSON. But I don't see anywhere in that statement that says it is the same 73,000 acres that has been lying idle. It is land scattered over the project, and it may not be the same area each year. In fact, the 73,000 is the average and not any specified amount each year.

Senator DOWNEY. Mr. Chairman, in order to save the time of the committee, I would like to insert at this point the very excerpts from the report of the Bureau of Reclamation, statements of their representatives on this particular 73,500 acres of land.

The CHAIRMAN. Yes.

(The material referred to above is as follows:)

EXCERPTS FROM REPORT OF BUREAU OF RECLAMATION ON CENTRAL ARIZONA PROJECT SHOWING THAT 73,000 ACRES OF LAND FORMERLY IRRIGATED BUT NOW IDLE IS TO RECEIVE A FULL, NOT A SUPPLEMENTAL WATER SUPPLY

Page 4:

"18. Studies indicate that this new water made available for diversion at the headgates of the irrigation districts each year would be sufficient to: (1) replace the overdraft on the groundwater basins; (2) permit the drainage of excess salts out of the area and maintain a salt balance; (3) provide a supplemental supply to lands now in production, but not adequately irrigated; (4) increase the water supply for the city of Tucson; and (5) maintain irrigation of 73,500 acres of land formerly irrigated but now idle for lack of water. There would not be sufficient water to permit irrigation of new land. There would, however, be sufficient water to permit stabilization and some improvement of the existing agricultural economy of the area."

Page R-28:

"b. *Need for new water.*—The need for water for lands under the central Arizona project is fivefold. Additional water is needed to: (1) permit reduction of pumping and thus limit withdrawals from the groundwater basin to its safe annual yield; (2) permit delivery of a supplemental supply to lands now inadequately irrigated; (3) permit delivery of an adequate supply to developed lands

now idle for lack of water; (4) permit delivery of an adequate municipal supply to the city of Tucson; and (5) permit carrying of excess salts out of the basin."

Page R–29:

"(3) *New supply.*—The maximum acreage ever irrigated in the central Arizona project area amounts to about 671,960 acres. However, water shortages are ever recurrent in the area, and each year it is necessary to allow arable land to remain idle in order that there may be a more adequate supply for the remainder. During the period 1940–44, inclusive, an average of about 566,170 acres was actually irrigated. Part of the remaining 105,790 acres lay fallow for lack of water. The central Arizona project would permit utilization of an estimated 73,510 acres of this developed acreage. These 73,510 additional acres would utilize approximately 418,000 acre-feet of water annually."

Appendices to report—Pages B–85, B–86:

"g. *Irrigation of lands now idle.*—The maximum acreage ever irrigated in the project area totals about 671,960 acres. (See table B–1.) However, water shortages are ever recurrent in the area, and each year it is necessary to allow arable land to remain idle to provide sufficient water for the remainder. During the period 1940–44, inclusive, an average of about 566,170 acres was actually irrigated. Part of the remaining 105,790 acres lay fallow for lack of water. The quantity of water available for these developed lands now idle for lack of water would be the remainder of the 1,082,000 acre-feet of new water developed under the central Arizona project, after the requirements for reduction in pumping, supplemental water needed for lands now irrigated, and municipal water supply have been deducted. These requirements have been estimated in the foregoing paragraphs and the following information has been prepared to summarize these requirements and compute the quantity of water available for lands now idle because of lack of water.

	Acre feet a year	
New surface water available at district head gates		1,082,000
Surface diversions required to replace the necessary reduction in pumping	539,000	
Supplemental water needed for lands now irrigated	113,000	
Required for municipal water supply	12,000	
Subtotal		664,000
Water available for lands formerly irrigated but now idle for lack of water		418,000

This 418,000 acre-feet of water would be utilized by lands in the various units of the project. The total assignments of new water to the several units were established by integration among the various units so as to meet their respective irrigation requirements in the most practicable and equitable manner. The results of these computations are listed in table B–23 which summarizes the stabilized irrigated acreages of the various units after completion of the central Arizona project. The acreage formerly irrigated but now idle for lack of water which could be returned to production under the central Arizona project is summarized in table B–24. The table also lists the quantity of new water which would be required to maintain irrigation of this acreage.

TABLE B–24.—*Water requirements—Formerly irrigated land, central Arizona project*

	Land irrigated			Diversion demand	New water required
	Ultimate development	Average 1940–44	Returned to production		
	Acres	*Acres*	*Acres*	*Acre-feet an acre*	*Acre-feet*
Maricopa unit	441,000	394,970	46,030	5.7	262,400
Pinal unit	150,000	123,730	26,270	5.7	149,700
Upper Gila unit	46,800	45,640	1,160	5.2	6,000
San Pedro unit	1,880	1,830	50	4.9	250
Total	639,680	566,170	73,510		418,350

Senator DOWNEY. Mr. Larson, I think that you were reading figures there indicating the amount of land that is customarily idle in certain districts, even where they have a full water supply, weren't you?

Mr. LARSON. No. I was reading from the Salt River project and the Salt River project has not had a full water supply, but their average irrigated acreage for the period 1940 to 1944 was 95 percent of the maximum irrigated in the project.

The figures I read from the Imperial irrigation district were approximately the same.

Senator DOWNEY. Mr. Larson, is it not true that in our western irrigation projects that even where there is a full supply of water, it is customary to have about 10 percent of the land idle from year to year because the farmer wants to let it lie fallow or because he doesn't believe he can make any money out of the crop or because there is a foreclosure or because of a death or because of lack of capital or whatever other reason there may be; is that not true?

Mr. LARSON. I would qualify that to this extent, Senator: It would probably be 10 percent of the maximum assessed acreage, but I disagree when confining it to the percentage of the maximum irrigated acreage.

Senator DOWNEY. Now, Mr. Larson, let's clarify our minds on that. Do not your own figures deduct 10 percent from the gross area because of highways and rights-of-way and building and that sort of thing? That is one thing, isn't it?

Mr. LARSON. Not the figure we have used here. We have used the irrigated acreage, and that does not include highways and such as that.

Senator DOWNEY. That is right. You have used the net figure. In other words, the figures that you have were arrived at by taking the total amount of acreage in the district and then deducting the 10 percent because of highways and buildings and other rights-of-way; is that not correct?

Mr. LARSON. No. We have taken the reports on the actual irrigated acreage, as near as we could determine them.

Senator DOWNEY. All right. The gross figures with which you start, then, are the actual irrigated lands and excluded out of those already are rights-of-way and highways and buildings.

Mr. LARSON. That is correct.

Senator DOWNEY. All right. Now, again I ask you if it is not usual in western irrigation projects for there to be a certain amount of land lying idle, not because of lack of water, but because of some other reason that the farmer does not desire to irrigate.

Mr. LARSON. That is correct, and in my opinion, Senator, that percentage will be approximately 5 percent.

Senator DOWNEY. Is that 5 percent apart from this 73,000 acres?

Mr. LARSON. No; it is not.

Senator DOWNEY. Then, according to you, there were 73,000 acres of land totally idle, plus another 5 percent.

Mr. LARSON. Yes. In other words, Senator, there are 672,000 acres, as we have included it in the project, 640,000 acres that could be served water each year on the basis of 4 acre-feet per acre at the farmer's head gate, which means, then, that 32,000 acres would be out of production, which is representative of that 5 percent.

Senator DOWNEY. Mr. Larson, I asked you for whatever data you had in your possession showing how you reach this figure of 73,600. Is that data available?

Mr. LARSON. Yes. I think it is in this appendix, Senator.

Senator DOWNEY. I won't attempt to go into it now. I want to examine it over the week end.

What I desire to have is all the data that is available to the Bureau of Reclamation from which it drew its conclusion about the 73,600 acres.

Mr. LARSON. That is shown on page C–19 of the appendix.

Senator DOWNEY. In that volume that you have there?

Mr. LARSON. Yes.

Senator DOWNEY. And that is all the data that you have?

Mr. LARSON. Here at the present time; yes, sir. That shows the irrigated——

Senator DOWNEY. Does your field office have other data?

Mr. LARSON. We have records from which these data were compiled.

Senator DOWNEY. Well, in order to irrigate this land it is going to cost a capital charge of $3,000 per acre to the Government. We are challenging the statement that there is such land, and I am challenging you to produce the data from which you worked out this figure of 73,600.

Mr. LARSON. It is in this report.

Senator DOWNEY. Does that show the sources of that data?

Mr. LARSON. Yes, sir.

Senator DOWNEY. And are some of the basic data back in your office in Arizona?

Mr. LARSON. Why, surely, the same as the field office.

Senator DOWNEY. Can you have that air mailed to us?

The CHAIRMAN. The Chair wants to suggest that the Senator is asking impossible questions. Now the members of this committee are not altogether blind to facts. The questions which are being now asked have been asked and answered all yesterday afternoon. If this were a trial court, the questions would be excluded.

I ask the Senator to help expedite the hearing. I really feel that the Senator is not doing his case a bit of good by the prolongation of questions of this character.

Senator DOWNEY. Mr. Chairman, I am very much in opposition to the viewpoint expressed by the chairman. Here is an item of 73,600 acres of land for which it is asked to have a total irrigation—it is asking $200,000,000, or $3,000 an acre.

The CHAIRMAN. The Chair is perfectly well aware of that, as is every other member of the committee. I submit what the Senator is saying is purely argumentative; it is just wasting the time of the committee and of all of the witnesses here, including the witnesses from California.

Senator DOWNEY. Does the chairman rule that we are not entitled to ask for the basic data from the Bureau of Reclamation?

The CHAIRMAN. Not at all, but it is perfectly obvious the witness has answered your question at least a half-dozen times.

Senator DOWNEY. Mr. Chairman, at the risk of displeasing the chairman, again I desire to ask Mr. Larson: Can you secure from your Reclamation office in Arizona the basic data upon which these figures are based?

The CHAIRMAN. I suppose it could be supplied if you had a freight car to bring out the records of that office.

Mr. LARSON. That is what I was going to bring out.

Senator DOWNEY. Mr. Chairman, that may be an amusing remark to you. I have compiled many of these kinds of records, and I suppose probably 50 or 60 pages would show the basic data from which this was taken, if there is any basic data. If it was a survey taken in the year, it would be property owners' descriptions of the property. Maybe somebody is guessing. Nobody could know what it was, Mr. Chairman, unless they had made a survey.

I rather resent the attitude of the chairman on this. I think I am well within my rights in asking for the basic data for this item of 73,000 acres. I am sorry to displease the chairman.

Talking about a freight car of records, it wouldn't take 50 pages of basic data to show the survey by which they segregated this 73,000 acres.

Could you provide that basic data?

Mr. LARSON. It would take some time because the data is taken from several sources. It comes from records of irrigation districts, it comes from records of the Department of Agriculture, it comes from records made by the University of Arizona, and in some cases we have had to rely entirely on the records of some of these small irrigation districts, but all of the large amounts, wherever there was any question, we tried to get at least two sources of the information.

Senator DOWNEY. Mr. Larson, haven't you most of that data here right now?

Mr. LARSON. No, I do not have it here, Senator, and, in addition to that, let me say this:

Throughout the preparation of this report and other reports previous to this one, we have encouraged your representatives as well as other representatives to call at our office at any time and go over anything in regard to the studies we have made and which were questioned. Your representatives have been over there several times. They have volumes of photostated copies of our supporting data.

It seems to me that if you seriously question the 73,000 acres or any portion thereof, they have certainly had an opportunity to come in and check prior to now. To bring all of that data back is suggesting a big job.

Senator DOWNEY. Very well, Mr. Larson. I will not proceed further on this.

Now, referring to your statement made to this committee, and on page 24 at the top of the page you have the item showing the distribution of this water, water available for lands formerly irrigated but now idle for lack of water, 418,000 acre-feet, which you agreed was practically one-half of the net water that would be produced, and you have agreed that one-half of the irrigation cost would be about $200,000,000.

Now, I ask you this: Is it not true that the capital charge for that 418,000 acre-feet of water remaining available for lands formerly irrigated but now idle for lack of water would be about $200,000,000?

Mr. LARSON. I can't agree that that is a true representation, Senator. It is supplemental water throughout.

Senator DOWNEY. Well, I am just reading from your own report, Mr. Larson. It says:

Water remaining available for lands formerly irrigated but now idle for lack of water—418,000 acre-feet.

You yourself have agreed that this is approximately one-half of the amount of water that would be available in the total project. Well, at least, Mr. Larson, let me ask you this: The total irrigation cost is $400,000,000; is that right?

Mr. LARSON. That is the portion allocated to irrigation.

Senator DOWNEY. And one-half of that would be $200,000,000; is that right?

Mr. LARSON. That is right.

Senator DOWNEY. And you yourself have allocated approximately one-half of the water to be developed of 418,000 acre-feet to 73,600 acres of land, described as formerly idle and requiring total water supply; is that correct? Just answer that "Yes" or "No."

Mr. LARSON. Under your assumption, yes.

Senator DOWNEY. All right. Now, Mr. Larson, let me ask you this: How many kilowatt-hours of power would be required to pump the total amount of water up out of the Colorado River 987 feet?

Mr. LARSON. During the 70-year period the average would be about 1,500,000,000 kilowatt-hours.

Senator DOWNEY. And is it fair to say that we can expect that that would have a commercial sale value of approximately 5 mills per kilowatt-hour?

Mr. LARSON. Senator, that approach is entirely different than we ever use in setting up these irrigation projects. On the multiple-purpose projects, which include power, the portion of power used for pumping on the project is considered part of the irrigation cost.

Senator DOWNEY. Mr. Larson, if you would answer my questions, I think we would make haste here. Is it not true that the commercial value of that power would be about 5 mills?

Mr. LARSON. Approximately so.

Senator DOWNEY. So the total value from a commercial viewpoint of pumping that 1,200,000 acre-feet of water up 987 feet would be about $7,500,000, wouldn't it? That would be 5 mills multiplied by a billion and a half kilowatt hours.

Mr. LARSON. That is correct.

Senator DOWNEY. And one-half of that would amount to approximately $3,750,000; is that correct?

Mr. LARSON. That is correct.

Senator DOWNEY. Now, if you allocate that pumping charge against 73,000 acres of land, you get something in excess of $50 an acre per year, don't you?

Mr. LARSON. That is correct.

Senator DOWNEY. In other words, Mr. Larson, the commercial value of the power to pump the necessary water to irrigate this 73,000 acres for the electrical charge alone would be about $50 an acre each year?

Mr. LARSON. That is correct.

Senator DOWNEY. How much additional would be the operation and maintenance charges of that pumping? I am just referring to the pumping, I don't want to go into anything else at this time.

Mr. LARSON. I don't have that figure immediately available. I would be glad to furnish it for the record.

Senator DOWNEY. Might it add $5 or $10 an acre?
Mr. LARSON. I haven't any idea.
Senator DOWNEY. Would you furnish it for the record?
Mr. LARSON. Yes, sir.
(The material referred to above is as follows:)

Central Arizona project—Cost of pumping water into Granite Reef aqueduct—May 3, 1949

Item	Feature	Costs allocated to irrigation		
		Construction costs	Operation and maintenance	Replacement requirements
1	Bluff Dam	$6,954,000	$5,000	$1,600
2	Coconino	977,000	2,100	300
3	Bridge Canyon Dam	50,189,000	6,300	20,100
4	Bridge Canyon power plant	18,762,000	295,200	229,500
5	Havasu pumping plants	25,973,000	318,600	214,500
6	Power transmission system	21,408,000	347,700	217,600
	Total	124,263,000	974,900	683,600

1. Average annual costs for a 70-year period:
   (*a*) $124,263,000/70 years $1,775,200
   (*b*) Operation and maintenance 974,900
   (*c*) Replacement requirements 683,600
   Total 3,433,700
2. Average annual water pumped for a 70-year period: (*a*) 1,075,000 acre-feet.
3. Average annual cost per acre-foot: (*a*) $3,433,700/1,075,000=$3.19.

Senator DOWNEY. Are there any other pumping charges required to bring this water into the project area?
Mr. LARSON. Just that one lift.
Senator DOWNEY. I ask you this, Mr. Larson: Do you think that any Reclamation Bureau project is justified that involves using electricity, electrical power, that would have a commercial value of $50 an acre per year in perpetuity?
Mr. LARSON. Senator, the report shows the way we have computed the feasibility. First, will the returns equal the cost? And they will. They will do that and sell power at a very attractive rate.
Secondly, the benefits exceed the cost on the basis that we have shown in the project.
Therefore, in answer to your question I would say yes, that it is justified.
Senator DOWNEY. That is, the Congress of the United States would be justified in setting up a project where the value of the electrical energy for pumping the water alone would exceed $50 an acre a year? Is that what you are telling this committee?
Mr. LARSON. Exactly, Senator. For example, you set up a value of 5 mills for power. You say that is what it is worth to the Nation. If you dispose of it or use it in any other way, they are accepting a loss. We might look at the probable power value. In other words, what is the competitive rate for that power? We could apply the same theory.
For example, on the basis of the cost of producing power in the Los Angeles area, assuming oil at $2.25 per barrel, if you pay 5 percent on your bonds, your power will cost about 8.75 mills. If you pay 4

percent, it will cost 8.50 mills; if you pay 3 percent on your bonds, it will be 8.25 mills; if you pay 2 percent on your bonds, it will be 8.1 mills.

Senator DOWNEY. I am accepting your statements.

Mr. LARSON. Let me finish. With oil at $1.75 a barrel—and your witness testified that the cost of oil at the present time is $1.74, so that the $1.75 figure is very close, so on 5 percent investment or 5 percent interest on your investment, it is 7.75 mills; if it is 4 percent, it is 7.50 mills; if it is 3 percent, it is 7.3 mills; and at 2 percent it is 7.1 mills.

Now, then, we might apply the same assumption and say that, for example, the difference between 5 mills and the lowest rate shown here, which is 7 mills, the United States would be losing 2 mills on every kilowatt sold.

Senator DOWNEY. Mr. Larson, I don't follow that. I have no doubt everything you have said is true. I am taking your own assumptions and those of the Bureau that the commercial value of this power, really a cheap commercial value, would be 5 mills, and that would mean that the value of the power for pumping alone without any other of these rather fantastic costs would be $50 an acre.

Now, how much profit does your calculation show the farmer might make out of an acre of land after using all his materials and putting in his labor and that of his family?

Mr. LARSON. We have figured a gross crop income of $100.

Senator DOWNEY. Won't you please try to answer my question? What profit do you anticipate the farmer would make per acre?

Mr. LARSON. I don't know exactly what that would be.

Senator DOWNEY. Is $50 an acre a fair assumption?

Mr. LARSON. Probably.

Senator DOWNEY. And, consequently, you think that a project is justified in which the value of the electric energy alone, without any other cost or expense, is equal to the profits the farmer may hope to make out of it?

Mr. LARSON. Senator, when you consider the benefits, the profits made by the farmer only represent a small portion of the benefits to the Nation.

Senator DOWNEY. What are those benefits that you speak about?

Mr. LARSON. When a farmer grows lettuce, for example, in order to plow and prepare his ground for the seed, it means that he must have farm machinery. Therefore, there is some benefit all along the line on the basis of manufacturing that machinery, mining the iron ore, transporting the machinery to his land.

As he is growing that lettuce, he is supplying employment to many people within the area. As he harvests the lettuce, the same thing is true. In harvesting, packing, all along the line. On the basis of all these benefits, it is our belief that those benefits will more than exceed the gross crop income.

Senator DOWNEY. Now, Mr. Larson, let us test that a little. Your argument, then, is that the Government, along with other very large costs, is entitled to set aside power worth $50 an acre a year for the farmer to use because he in his operations develops other employment in the purchase of materials. That is correct, isn't it?

Mr. LARSON. Because indirectly I think the Nation will benefit to that extent.

Senator DOWNEY. And you are looking at it from the national viewpoint. That is, the question of the generation of income taxes and materials and general prosperity of the country.

Mr. LARSON. That is right.

Senator DOWNEY. How do you think the employment and the wealth that would be produced by the allocation of this power to pumping this water in perpetuity 987 feet would compare with the use of that power in manufacturing?

Mr. LARSON. I think it would be worth considerably more in farming than in manufacturing.

Senator DOWNEY. You do?

Mr. LARSON. That is my opinion, yes; because many of these raw materials must come from the farms.

Senator DOWNEY. But it is a question of how much farm produce you would grow from 73,000 acres, isn't it? What is the total amount of electrical power now used in all of Arizona, not only for illumination in the homes, but likewise for manufacturing and everything?

Mr. LARSON. As I recall, it is something close to about 1,500,000,000 kilowatt-hours annually.

Senator DOWNEY. In other words, you think we would be justified in setting aside for the pumping of this water approximately the same amount of electric energy as is now consumed by all the people in the State of Arizona, not only for their homes but for manufacturing and everything else?

Mr. LARSON. Yes; I do.

Senator DOWNEY. And you think that more would be gained by binding that tremendous power supply of 1,500,000,000 kilowatt-hours down in perpetuity to the pumping of this water almost a thousand feet than in allowing it to be used by the community generally?

Mr. LARSON. I believe that would be true, Senator.

Senator DOWNEY. Have you any idea of the amount of employment that would be generated in manufacturing if this power were used in manufacturing?

Mr. LARSON. No, sir.

Senator DOWNEY. Let me see if your opinion might be affected by a statement that I believe is correct. I would like to have you check it, but it comes from the Bureau of the Census.

The latest Bureau of the Census data on manufacturing covers the year 1939. Those figures indicate that, using the average manufacturing industry, approximately 125,000 factory workers would be given employment in plants using 1,500,000,000 kilowatt-hours a year of purchased electrical energy.

Now, let me interpret that statement as I understand it, very clearly. If this 1,500,000,000 kilowatt-hours could be used in manufacturing in Arizona, California, any place in the Southwest, you would expect an employment of 125,000 factory workers. If that is true, would you still think that you would gain more by binding that titanic power down as much as all of Arizona is now using for every use to the pumping of this water?

Mr. LARSON. My opinion is this: Assuming there is a water right for the project, yes; I think it is feasible.

Senator MCFARLAND. Senator Downey, may I interrupt for a moment?

Senator DOWNEY. Yes.

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Senator McFARLAND. Mr. Chairman, I only want to interrupt Senator Downey for this reason: that he may want to cross-examine as to the matter I am about to mention, and it would save him from calling Mr. Larson back. I would like to have appear in the record, at the end of this cross-examination, a copy of an application of the Arizona Power Authority for all of the power developed at Bridge Canyon. I hope the application will be received in evidence and made a part of the record. I only do this at this time because Senator Downey might want to interrogate as to this matter.

Senator DOWNEY. I will interrogate Mr. Larson but not adversely as to this, Senator McFarland. It is very apparent that in the Southwest we are going to have a tremendous lack of hydroelectric power, which will be a very great handicap to potential manufacturing industries.

I should think Arizona would want it, California wants it, and all would want it.

The CHAIRMAN. Are you referring to the letter of the Arizona Power Authority under date of April 26, addressed to Secretary Krug?

Senator McFARLAND. That is correct.

The CHAIRMAN. You desire this to appear in the record at the conclusion of the cross-examination?

Senator McFARLAND. That is right.

The CHAIRMAN. Without objection, it is so ordered.

ARIZONA POWER AUTHORITY,
Heard Building, Phoenix, Ariz., April 26, 1949.

Hon. JULIUS A. KRUG,
Secretary of the Interior, Interior Building, Washington, D. C.

DEAR SIR: Application is hereby made for all electric energy which may be generated and developed at that certain proposed Public Works project known as Bridge Canyon Project on the Colorado River or so much thereof as may, by law, rules and regulations, be made available for use within the State of Arizona.

Throughout its history, Arizona has been short of electric power resulting repeatedly in great damage and frequent interruptions to the entire economy of the State in the industrial, agricultural and social fields.

A recent survey of the power field for our State indicates that after using the entire output of Parker, Davis and Boulder Dams made available to the State of Arizona, plus the entire generation output of generating capacity within the State, Arizona will still suffer from power shortage and that such a shortage will continue until power becomes available from the proposed Bridge Canyon project.

Arizona possesses vast quantities of raw products which have remained unused and undeveloped through the history of the State because of power shortage.

Our engineers have exhaustively studied the possibility of substituting power generation within the State using our cheapest priced fuel, natural gas, but further advise us that power can be sold at Bridge Canyon much cheaper than we can supply it from any other source.

We not only have great need for additional power in order to make proper use of these natural resources, but we must have increasing quantities of power to even maintain our present economy. For a number of years past there has been a slow-down in our mineral, agricultural, woodworking, metal activities, transportation and other industrial and commercial lines because of increasing demands for additional motive power. For the reasons stated, we trust that due consideration will be given to our application and if additional information or data may be required we stand ready to supply the same and to meet for such conferences regarding our application as you may deem advisable.

Respectfully yours,

ARIZONA POWER AUTHORITY,
M. J. DOUGHERTY, *Chairman.*

Senator McFARLAND. I beg your pardon for interrupting.

Senator DOWNEY. I am glad you did interrupt. We have made no contention that there is not a very great need for this power, and the question is whether California should be compelled to help finance this, but California would happily take all of this power and two or three times over if we could.

Senator McFARLAND. Sale of the power in Arizona would eliminate the necessity of California paying anything on our irrigation project, and make it purely an Arizona project built on ground entirely within our own State and the power would be used entirely within our own State.

Senator DOWNEY. Let me read again to you from the statement I have in my hand, which now comes from the Federal Power Commission:

Data at the Federal Power Commission shows that in 1948 the total consumption of electric energy by all manufacturing and extractive industries, mining, forestry, et cetera, in Arizona was about 940,000,000 kilowatt-hours. A very large part of this was produced by the industries for their own use.

And then this is my addition:

The 1,500,000,000 kilowatt-hours annually of electric energy is, therefore, more than half greater than the total consumption by Arizona's manufacturing and extractive industries in 1948.

As you yourself have stated, Mr. Larson, this 1,500,000,000 kilowatt-hours it is proposed to tie into the pumping of this water in perpetuity is about the amount of electric energy now used for all purposes in Arizona. That is correct, isn't it?

Mr. LARSON. That is true.

Senator DOWNEY. Now, Mr. Larson, I want to discuss with you a table that appears on page 399 of the hearings before a subcommittee of the Committee on Public Lands, United States Senate, Eighteth Congress, first session, on S. 1175, hearings having taken place in 1947.

Mr. Chairman, I would like to have this table, from which I am about to read, placed in the record at this point.

The CHAIRMAN. What is the table?

Senator DOWNEY. It is a table showing electrical requirements.

The CHAIRMAN. You have identified it?

Senator DOWNEY. Yes.

The CHAIRMAN. Without objection, it may be inserted.

(The table referred to is as follows:)

[In thousands]

	1945	1950	1960	1970
Southern California:				
Kilowatt-hours	10,031,000	13,192,000	21,358,000	30,547,000
Kilowatts	1,757	2,496	4,152	6,052
Southern Nevada:				
Kilowatt-hours	233,476	506,313	880,741	179,180
Kilowatts	65	116	201	269
Southern Utah:				
Kilowatt-hours	7,125	14,480	31,835	51,660
Kilowatts	1.8	4.1	8.5	12.9
Arizona:				
Kilowatt-hours	1,752,000	2,516,000	3,678,000	4,544,000
Kilowatts	343	481	713	886

Senator DOWNEY. I believe, subject to being corrected, that this was placed in the record by the Bureau of Reclamation. It shows that in southern California in 1945 the amount of kilowatt-hours used was 10,000,000,000-plus.

I have to apologize to you. I am informed that you yourself submitted this very valuable data in answer to my interrogatory. This is on page 399, Mr. Larson.

The figures here given show that southern California in 1945 required 10,000,000,000 kilowatt-hours; in 1950 would require 13,000,000,000; in 1960, 21,000,000,000; and in 1970, 30,000,000,000.

For Arizona it was shown that in 1945 you were using 1,752,000,000; it was anticipated in 1950, 2,516,000,000; in 1960, 3,678,000,000; and by 1970, 4,544,000,000.

I understand, Mr. Larson, that we have only three important power sites left on the Colorado River in the southwest area, and those are at Bridge Canyon, which we are talking about, and Glen Canyon, and Kanab Creek.

Mr. LARSON. At that distance, but at a greater distance there are other sites.

Senator DOWNEY. In the upper basin?

Mr. LARSON. That is correct.

Senator DOWNEY. That would involve heavy expenses to bring it down and possibly arguments as to the use of the power.

Now, we expect to get about 4,500,000,000 kilowatt-hours out of Glen Canyon; is that right?

Mr. LARSON. That is about right.

Senator DOWNEY. About the same amount out of Bridge Canyon?

Mr. LARSON. About 4½.

Senator DOWNEY. But that power will be much less firm and more intermittent?

Mr. LARSON. By coordinated operation it will be firm energy.

Senator DOWNEY. It can be firmed up?

Mr. LARSON. That is correct.

Senator DOWNEY. And then Kanab Creek, how much do they anticipate that might develop?

Mr. LARSON. As I recall, I think it is something like about 7,000,000,000 kilowatt-hours.

Senator DOWNEY. Seven billion, is it that much?

Mr. LARSON. Yes, sir.

Senator DOWNEY. I would like to have that checked. What does the Kanab Creek project comprise?

Mr. LARSON. It will consist of a dam at Marble Canyon and a tunnel approximately 45 miles in length where water could be dropped back into the Colorado River at the mouth of Kanab Creek. That drop would be something like 1,200 feet.

Senator DOWNEY. Would that be an efficient and economical power project, or would it be rather expensive?

Mr. LARSON. Well, it is rather difficult to say at this time. We now contemplate starting on the investigation of that potentiality.

Senator DOWNEY. Have you checked the production there?

Mr. LARSON. As listed here in our Colorado River Basin report, it would be 6,570,000,000.

Senator DOWNEY. Mr. Larson, in any event, these potential power sites in the Southwest will fall far short of developing the amount of electrical energy that we should have in the next 20 to 30 years; is that right?

Mr. LARSON. I think it would.

Senator DOWNEY. So there is going to be a great dearth of hydroelectric power and a great demand for it, isn't there?

Mr. LARSON. That is right.

Senator DOWNEY. As you have very eloquently pointed out yourself, Mr. Larson, when one of these projects is installed, it does not thereafter burn up the natural resources, natural gas or fuel oil, but operates, we might extravagantly say, through eternity; is that right?

Mr. LARSON. That is right.

Senator DOWNEY. Unless the dams silt up or something of that kind. Of course, hydroelectric power, when it is once installed, is an asset of almost incalculable value to the Nation, isn't it?

Mr. LARSON. That is correct.

Senator DOWNEY. We can't hope to get these power installations in before 10, 20, 30, or 40 years from now?

Mr. LARSON. Possibly.

Senator DOWNEY. During that period of time the Nation is apprehensive, at least, that we may be in rather straightened circumstances for fuel oil and natural gas?

Mr. LARSON. That is correct.

Senator KERR. May I interrupt to say that one member of the committee makes vigorous protest to that conclusion.

Senator DOWNEY. Senator, I am happy to hear you say that because I know you are an expert in that subject, and I hope you will testify for us in the tidelands bill when it comes up before this committee.

Senator KERR. I might even be persuaded to do that.

Senator DOWNEY. But it is true that in the vicinity of these dams we don't have any known petroleum deposits, do we, or natural gas?

Mr. LARSON. The nearest large deposits of any source of fuel, in my opinion, would be the coal deposits in Utah.

Senator DOWNEY. Wyoming has valuable coal deposits, too; is that right?

Mr. LARSON. I said "nearest." The Utah deposits are nearer.

The CHAIRMAN. You meant nearest but not most valuable.

Senator DOWNEY. I was trying to ingratiate myself with the chairman by referring to his great State.

In any event, Mr. Larson, I take it all of us would be agreed that this electrical energy that is going to be produced at great cost to the taxpayers of the Nation is an asset that we should providently and economically guard and use, shouldn't we?

Mr. LARSON. That is correct, and I think this bill points that out, Senator, because you will note in the bill as well as in our report we show that at the present time, and assuming the value of this energy at something like four or four and a half mills, that the pumping route is the most feasible. However, at some later date if the value of the power is greater, possibly a gravity route would be more feasible. Thereby you would save the energy that would be used in pumping.

Senator DOWNEY. At a slight investment of about a half billion dollars.

Mr. LARSON. There, again, it is economics. I said based upon an increased value of power, assuming that it becomes economical sometime in the future.

Senator DOWNEY. In other words, you are expressing the opinion that this power that you are suggesting should be tied up for this acreage in Arizona will possibly become so valuable that the Nation will feel obligated economically to expend another huge sum to release that power?

Mr. LARSON. There is that possibility if the power was of the necessary value.

Senator DOWNEY. Let me ask you this: If these figures that I have read to you are correct, that in the Southwest where we are very certain we are going to develop manufacturing industries in the next generation out of our own minerals and other resources, this amount of electrical energy that is being set aside for this pumping to this rather meager acreage would result in the employment of 125,000 people; wouldn't you say that in the immediate future, with a great lack of electrical energy right now, it is rather improvident to suggest tying it up the way you say?

Mr. LARSON. I don't think so, Senator. There are these other possibilities on the river, and if that energy is needed immediately, those developments could be placed under construction. I don't think the upper basin would object to getting Glen Canyon under way immediately.

Senator DOWNEY. But, Mr. Larson, your figures would indicate here that by 1970 we are going to require close to 40,000,000,000 kilowatt-hours, while in 1950 we are only using about a third of that amount. I am just taking your own figures.

Mr. LARSON. That may be true, but your witness showed that you can purchase oil now for $1.74 a barrel in that area, and at the present time I do not believe that is an unreasonable cost.

Senator DOWNEY. Mr. Larson, I thought we had all agreed that to the fullest extent that we could use hydroelectric energy it was preferable to do that. Mr. Strauss, Mr. Krug, and Mr. Warne have made many what I consider somewhat extreme statements on that subject, but it is very poor strategy to be burning up fuel oil or gas when there is hydroelectric energy available.

Mr. LARSON. I don't think they testified to the extent of excluding irrigation.

Senator DOWNEY. Let me ask you the question this way, Mr. Larson. Looking at it from a national viewpoint, and you are, after all, representing a national bureau, if it can be demonstrated that the use of this 1,500,000,000 kilowatt-hours of electric energy used in manufacturing would produce far more employment and wealth than tying it up for the purpose of pumping water, would you still feel it ought to be tied up for this purpose?

Mr. LARSON. I think if that could be proven, that would be another matter.

Senator DOWNEY. Just answer it, on my assumption; and then we will go ahead.

Do I understand your answer is in the negative, that you do not believe we should tie it up for this purpose if it does have a far greater potential use for manufacturing in the way of producing employment and wealth?

Mr. LARSON. If all elements were considered under present as well as future conditions, possibly so, but the reclamation law is founded on irrigation of these lands; the use of water for irrigation has prior use.

Any of the reservoirs on the river must be operated for the benefit of irrigation. For example, you could apply that same theory or principle to Lake Mead and say that if the benefit to the power user was greater than to the farmer, then the reservoir should be operated strictly for the benefit of power. Yet, in accordance with the law of the river, irrigation has prior use.

Senator DOWNEY. But, Mr. Larson, let me point out to you an inconsistency in your position. Before Hoover Dam was built, water rights on the Colorado River were totally appropriated up to the minimum flow in the summer. Even if you would assume that there was some loss of electrical energy, still those water rights were in existence and were entitled to be protected, and their water is now being stored in Lake Mead in lieu of the rights they had before Hoover Dam was built.

But let me ask you this: There is a certain amount of pumping for the Metropolitan Water District?

Mr. LARSON. That is correct.

Senator DOWNEY. But that is pumping for municipal purposes, isn't it?

Mr. LARSON. That is right.

Senator DOWNEY. And municipal water has a greater value than farm water, doesn't it?

Mr. LARSON. Yes.

Senator DOWNEY. Several times?

Mr. LARSON. Yes.

Senator DOWNEY. In other words, the very existence of a great population in southern California is dependent upon getting municipal and industrial water there?

Mr. LARSON. That is correct.

Senator DOWNEY. I would like, while we are discussing this, to ask what is the total pumping lift——

The CHAIRMAN. Before you raise that question, Senator, I just wanted to make this comment for the record at this point. We are discussing, as I see it, the plan for the development and utilization of the water resources of the Colorado River, set forth in the Boulder Canyon Project Act. The question, then is: To what extent may these water resources be equitably used for the development of the resources of all of the States in the basin?

I think that is the fundamental issue here. What a witness' opinion may be with respect to how much money may or should be expended is at best only advisory. That determination will have to be made by the Congress in the last analysis. In the upper basin, it is already apparent from the investigations which have taken place that many of the projects which have been contemplated will cost a large sum

of money to construct and to make available. So a decision will ultimately have to be made whether or not the expenditure of the sums necessary to utilize those resources, not only in Arizona and in Nevada but in all of the upper basin States, all of the States of this basin. That seems to me to be clear.

Senator DOWNEY. Mr. Chairman, I certainly have no discordant note with what you have said.

The CHAIRMAN. My point, then, is that it may be doubted whether or not the purpose of the Colorado River Project Act should be hampered and delayed by consideration of the over-all problem, the weighing of power and oil and all of those other things. We have got to determine eventually to what extent we can use these waters beneficially in all of the States.

Senator DOWNEY. I must admit, for once, that I do not follow what I consider to be the usually very clear reasoning and statesmanlike viewpoint of the Senator from Wyoming. He nearly always carries me away by his logic.

Perhaps I misunderstand it, but it would seem to me certainly a fair and imperative consideration for this committee to determine whether this 1,500,000,000 kilowatt-hours would be worth two or three or five times as much, say, in the State of Arizona alone, if used for industrial and manufacturing purposes, than if used to provide a comparatively small amount of water for an area in Arizona that certainly does need attention.

May I ask the chairman, since he has commented to me: In regard to this electric power, assume that we should reach the conclusion that it might be worth two or three or five times as much in the development of employment and wealth in the State of Arizona itself than by tying it up in this fashion. Would the Senator think that is not a consideration we should consider?

The CHAIRMAN. I shall not give an answer upon the basis of any assumptions that may be made now.

Senator DOWNEY. Mr. Larson, let me ask you this question: There are other places in Arizona in which this water can be used; aren't there?

Mr. LARSON. Possibly, but on the basis of the benefits that would be derived from the water, it appears that the greater benefits would be in the area that is now under consideration.

Senator DOWNEY. But at far greater cost?

Mr. LARSON. But I believe the benefits would outweigh the costs. There, again, Senator, we must recognize that we in the Bureau can only investigate these potentialities. It is the State's right to determine where they want to use their water.

Senator DOWNEY. To get back to another point that you had spoken of, you expressed the opinion that you recognized the possibility that power might become so valuable in the Southwest that it would be expedient for the Federal Government to construct this big tunnel that I believe your Bureau said would cost about $500,000,000 and thereby relieve the necessity of pumping up that thousand feet; is that correct?

Mr. LARSON. There is that possibility if the value of the power would justify it from an economic standpoint.

Senator DOWNEY. If you divert that 1,200,000 acre-feet of water at Bridge Canyon, will you not reduce your power output on the Colorado River more than 1,500,000,000 kilowatt-hours?

Mr. LARSON. No; I do not believe so. Possibly it would be something less, but there again—and this is, of course, assuming the water is available to the State—the State has the privilege of diverting the water at any point on the river.

That same theory is true in the upper basin. Any time an upper basin project goes in, the flow of the river decreases and there in turn the potential power output at these dams decreases.

Senator DOWNEY. If the diversion of this 1,280,000 feet of water at Bridge would reduce the power production on the Colorado River as much as 1,500,000,000 kilowatt-hours, you certainly wouldn't deem it advisable to construct this tunnel in order to release that 1,500,000,000; would you, assuming that?

Mr. LARSON. It would only be done on the basis that the value of that power would justify the expenditure.

Senator DOWNEY. Yes; but I am asking you if the reduction in the power output at Davis and Bridge and Hoover Dam would be reduced more than 1,500,000,000 kilowatt-hours, would you still think there was any sense in that?

Mr. LARSON. Possibly not, and then it wouldn't be economically justifiable, would it, Senator, because that would certainly be taken into consideration and it was taken into consideration at the time these potential routes were considered.

In other words, if we diverted the water at Bridge Canyon, the loss of power at Bridge Canyon, at Hoover, and Davis was certainly considered against the amount of power that would be required in pumping the water.

Senator DOWNEY. Will you please produce and place in the record at this point a statement of how much power production on the Colorado River would be reduced if we were to divert the 1,200,000 acre-feet of water at Bridge Canyon rather than at Parker?

Mr. LARSON. As I recall, Senator, that information is already in the record in the previous reports that have been submitted.

Senator DOWNEY. Will you please place it in the record at this point, so that people who read it will know what conclusions to draw from the statement you have made and the implications?

(The material referred to above is as follows:)

The net estimated reduction of system firm energy at Bridge Canyon, Hoover, and Davis power plants, offset in some degree by energy production at the Aqueduct power plant, would average 1,156,000,000 kilowatt-hours annually during the first 50-year period of operation. If water is pumped at Lake Havasu the potential power output would be increased at the Bridge Canyon, Hoover, and Davis plants, but during the first 50-year period of operation an average of 1,393,000,000 kilowatt-hours annually would be required by the Havasu and McDowell pumping plants. The details under the two alternatives are outlined in the following table:

Central Arizona project—Comparison of net energy production under alternatives of diverting water at Bridge Canyon Reservoir or pumping from Lake Havasu, May 2, 1949

Power plants	Annual firm energy in million kilowatt-hours					
	Diversion at Bridge Canyon Dam			Pumping from Havasu Lake		
	Condition (A)	Condition (B)	Condition (C)	Condition (A)	Condition (B)	Condition (C)
Bridge Canyon	4,000	3,734	3,468	4,675	4,395	4,114
Aqueduct	52	64	76			
McDowell	23	21	19	23	21	19
Horseshoe	40	40	40	40	40	40
Buttes	35	35	35	35	35	35
Subtotal	4,150	3,894	3,638	4,773	4,491	4,208
Stewart Mountain replacement	25	28	32	25	28	32
Subtotals	4,125	3,866	3,606	4,748	4,463	4,176
Reduction in output at:						
Hoover	374	451	528			
Davis	89	108	126			
Subtotal	463	559	654			
Pumping requirements, Havasu and McDowell				1,154	1,393	1,633
Net energy production	3,662	3,307	2,952	3,594	3,070	2,543

Condition (A)—Assumes upper basin depletion of 2,952,000 acre-feet per annum and diversions to Central Arizona project of 850,000 acre-feet per annum.
Condition (B)—Upper basin depletions are assumed to be the mean between conditions (A) and (C), with diversions to the project of 1,025,000 acre-feet.
Condition (C)—Fifty years after condition (A) assuming 75,000,000 acre-feet at Lee Ferry during 10-year low run-off period; 1,200,000 acre feet annual diversion to central Arizona, and no coordination needed because of fully regulated condition of stream flow in low run-off period.

Senator DOWNEY. Now, Mr. Larson, let me ask you this: Would you justify the use of other great amounts of electric power that may be developed in pumping water up, thousands of acre-feet, elsewhere in the Southwest? How far would we go with what I would term this rather improvident use of a very valuable asset? Would we be willing to expend another 1,500,000 kilowatt-hours in Nevada?

Mr. LARSON. Senator, in Nevada we have potential projects that include a maximum pumping lift of 1,100 feet.

Senator DOWNEY. And how much water would be involved in that?

Mr. LARSON. There would be less water, but there is a maximum pumping lift. The cost per acre would exceed the cost of this project because the water demand would be substantially the same.

Senator DOWNEY. You are now contemplating another project in Nevada that would be as expensive as this per acre?

Mr. LARSON. One of the potential projects in Nevada would have a maximum pumping lift of a little over 1,100 feet.

Senator DOWNEY. That is not quite the answer to the question. One of the things that makes this pumping very expensive is that half of the water you take out of the Colorado River doesn't ever get beneficially applied. You don't have a consumptive use of one-half of the water that you get out.

Mr. LARSON. Yes; I think you do, Senator.

Senator DOWNEY. I don't think you do, Mr. Larson. I mean beneficial consumptive use because of your salt balance and your leakage

from your canals and your desert vegetation and your 250,000 acre-feet loss along the canal, you don't beneficially consume one-half of the water you take out of the Colorado River. That is one of the things that makes this a very expensive pumping lift. You admit there would be a canal loss of 250,000 acre-feet.

Mr. LARSON. Not entirely.

Senator DOWNEY. Almost?

Mr. LARSON. Yes. You will note that part of the water lost is recovered and used by pumping. It increases the recharge and, therefore, is used and it is beneficial to the area.

Senator DOWNEY. Now, Mr. Larson, again referring to half of the capital cost, which in my assumption I allocate against this 73,000 acres, I refer now to the sum of $200,000,000, one-half the cost allocated against irrigation. If you would assume the principal was never repaid but at 2½ percent it was a charge on that $200,000,000, that is $5,000,000 a year; isn't it?

Mr. LARSON. Yes, sir.

Senator DOWNEY. That, allocated against 70,000 acres, is about $70 per acre; isn't it?

Mr. LARSON. Approximately.

Senator DOWNEY. So, consequently, even if we assumed none of the principal was ever repaid and if we disregard all operation and maintenance and replacement, the interest charge alone would amount to the equivalent of about $70 an acre for this 70,000 acres?

Mr. LARSON. Approximately.

Senator DOWNEY. And you feel that is justified, as the representative of the Bureau of Reclamation—that sort of project?

Mr. LARSON. As we have set up this project, I have answered your question several times. I do think it is justified on the basis of the analysis, and the analysis of this project is exactly the same as that of any project. We use the same method on your projects in California.

Senator DOWNEY. I hope not with any such result. Let me continue.

Suppose you have an exceedingly economic and valuable power project in connection with an irrigation project, but not as here, because the water is not stored here for central Arizona at Bridge Canyon, but assume it is an integral part of the project and you can work it out for a small body of land by utilizing this very cheap power to irrigate the land at a cost of $10,000 an acre. Under your theory that would be justified?

Mr. LARSON. Under the cost of this particular project, in my opinion it is justified. Now, under some hypothetical case that you may set up, I couldn't say "Yes" or "No" because I don't know without going into what the benefits would be.

Senator DOWNEY. I am assuming that the same principles prevail in the hypothetical case, and that is that the project would pay out because of the large power possibilities, however expensive the acreage you mgiht have for irrigation may become. I say how high in your judgment should you go? Suppose it is $10,000 an acre. Do you think it should be done?

Mr. LARSON. In my opinion, it is economically feasible as long as the benefits exceed the cost.

Senator DOWNEY. All right.

Mr. LARSON. And as long as the returns from the project, the overall project, will return the total cost, in my opinion the project is feasible.

Senator DOWNEY. Mr. Larson, what you are stating to this committee and to the Congress of the United States is that where you have a combined hydroelectric-irrigation proposition, that regardless of the cost of irrigation, so long as the power revenues and the power that is generated will work it out, it becomes immaterial as to the cost per acre of the irrigation.

Mr. LARSON. No, I am not, Senator. I added to that that the benefits would have to exceed the cost.

Senator KERR. I wonder if I might ask if the chairman has an idea of when we would be permitted to consider the legislation before us on the basis of its merits and not on the basis of hypothetical or imaginative situations over which we have no control and which are not before us.

The CHAIRMAN. That is a question which will almost answer itself, I will say to the Senator. I had been hoping that by allowing the most extreme latitude in the examination of witnesses we might bring these hearings to a termination. I think they are almost ended.

Senator KERR. If they are almost to a conclusion, I will withdraw the question.

The CHAIRMAN. I think they are, but I have an idea that when the committee meets on Monday, the question will be raised by the Senator from California, who has already indicated to the chair that he will want to discuss the desirability from his point of view of securing additional information in the field, and I assume, therefore, that the committee will on Monday have before it the problem of deciding how much more time it is going to give to this question to the exclusion of many other most important problems before it.

Senator MCFARLAND. Mr. Chairman, may I ask a question? Is this going to be before we go ahead with these hearings? I understand Senator Downey only has two or three more witnesses, and I was in hopes we could get this evidence in before entering into any prolonged discussion which should occur in executive session.

The CHAIRMAN. The Senator misunderstands me. I am saying that I think the committee on Monday will have to decide how much more time it will give to this hearing. The committee is perfectly within its jurisdiction in strictly limiting the time.

Senator MCFARLAND. I am agreeable to that and have been all the time.

The CHAIRMAN. I say, as chairman of the committee, I am rapidly coming to the conclusion that we are giving too much time to unnecessary discussion of the issues here.

Senator MCFARLAND. As far as we are concerned, we will certainly try to conform to the decision of the committee and the desires of the chairman. We are willing to submit——

The CHAIRMAN. The committee will have to decide that.

Senator KERR. I am willing for the subject to be exhausted unless in the meantime I, as a member of the committee, have become exhausted.

Senator DOWNEY. Let me say this: I am glad to laugh at the clever repartee of the Senator. Possibly he is not interested in the facts.

Senator KERR. I am greatly interested, and my presence at the hearings is evidence of it, but you have asked this witness one question 20 times to my knowledge this morning.

Senator DOWNEY. What is the question?

Senator KERR. About speculative values and hypothetical cases which would be the case if certain hypothetical conditions existed, which question is not before the committee, and I don't think it needs to be answered more than 15 times that the project is feasible and if the matter is going to continue to be heard on that basis, I want the chairman to excuse me and I will keep in touch with the committee and come back when some other matter of information is before it.

Senator DOWNEY. It may be that Senator Kerr and other members of the committee are totally disinterested in the matter.

The CHAIRMAN. The prolongation of these hearings by interminable questions has already driven from the hearing room all but two Senators except the Senator from California and the Senator from Arizona. Now, I submit no profit can be gained by anybody from that sort of situation, and the case is rapidly taking on the aspect of a purely dilatory proceeding. I know that is not the purpose of the Senator, but I must impress him with the thought that it is crowding the patience of all the members of this Senate to have the matter prolonged in what seems to be an unnecessary way.

Senator DOWNEY. Let me say to the chairman his remarks about long questioning certainly do not apply to me. They may apply to other Senators here. This is the first witness whom I have cross-examined at any length. Now, since the chairman and the Senator from Oklahoma——

The CHAIRMAN. I submit the facts. Who is listening to you?

Senator DOWNEY. I want to get these facts out. Maybe nobody is interested in what the cost of this is. Maybe nobody in interested in the value of electricity.

The CHAIRMAN. I think that is fully known by the members of the committee. Look at this hearing last year. This matter has been threshed over so many times that it is now only cold straw.

Senator DOWNEY. Mr. Chairman, I very much disagree with that, but the chairman is entitled to say what he wants. Again I reiterate that, certainly, I have not consumed time in questioning witnesses. This is the first witness that I have cross-examined hardly at all.

Now, here is the representative of the Bureau, who prepared the reports, who is speaking for the Bureau—and I think he should have been presented first—who comes at the tail end of Arizona's case. I certainly am going to insist, as far as I can, that I be allowed to continue the line of questioning on other activities. I think the reports are filled with many mistakes, I think there are gross exaggerations in there. As far as this particular item is concerned, 73,600 acres, and tying up of that electrical energy, I am through except for one or two more questions I would like to ask. I then intend to proceed to other questions. Of course, if the chairman says that I am not to have that privilege——

The CHAIRMAN. The chairman does not deny the Senator any privilege. He merely points out to the Senator from California that the Senator from California certainly must well know the tremendous burden that is being carried by all of the Members of the Senate.

There is more work to be done in Washington today than at any time in my experience, and when the Senator demands that the members of this committee, to the exclusion of tremendous important public questions, both international and national, shall give their time and attention to this matter on which there are already published extensive hearings, giving practically all of the facts which can possibly be developed, it seems to me that the Senator out of consideration for his colleagues would push this examination a little more rapidly than he does and without indulging in argumentation with the witness.

Senator DOWNEY. Now, Mr. Larson, if you do not have this information available, I would appreciate your getting it for me. Do you know in what Bureau of Reclamation project there is the highest cost for pumping water? I am referring now to irrigation water and not municipal water. What is the highest that you know of in the Bureau of Reclamation projects?

Mr. LARSON. Offhand, I couldn't give you that, Senator.

Senator DOWNEY. Do you know any that is as much as $10 per acre?

Mr. LARSON. I do not know. I will furnish that in accordance with your question.

Senator DOWNEY. You will procure that?

Mr. LARSON. That is correct.

(The data referred to above are as follows:)

Cost of pumping water for irrigation on existing or potential Bureau of Reclamation projects

Project units	Central Arizona project	The Dalles project	Columbia Basin main unit	Columbia Basin Pasco unit
1. Estimated construction cost of pumping plant	$25,973,000	$475,000	$42,360,000	$790,000
2. Annual power cost	$2,529,500	$33,234	$684,000	$2,950
3. Annual provision for replacement	$214,500	$4,500	$387,000	$3,200
4. Annual operation and maintenance	$318,060	$11,088	$500,000	$4,000
5. Average head (feet)	985	948	310	176
6. Acre-feet pumped	1,075,000	11,200	3,730,000	22,500
7. Cost per acre-foot	$3.19	$5.41	$0.42	$0.45

Senator DOWNEY. Now, Mr. Larson, I want to ask you this question: You emphasize in your report that this project is justified in its high expense because it is a so-called rescue project and that unless the project is carried there will be a serious disruption of the economy and economic life of central Arizona.

Mr. LARSON. That is true.

Senator DOWNEY. These are just preliminary questions.

Now, Mr. Larson, you can't apply that to this 73,000 acres of land that has been totally idle and requires a new water supply, can you?

Mr. LARSON. Yes; you can, to some extent, Senator, because the cost in these districts is placed upon that entire area. In other words, there is a fixed cost on that land.

Even though the land isn't in production, the fixed costs remain. Also the taxes in the area are based upon that entire acreage, not the portion that is under crop production.

Senator DOWNEY. Let me say this: Apparently, from your report, this 73,000 acres has not been in cultivation for a long period of time

or an equal amount. Hasn't the economy of Phoenix adjusted itself to that fact?

Mr. LARSON. I haven't said it hasn't been in for a long time. The land is out intermittently. I say the fixed costs of the project are based on the entire acreage and not on the cultivated acreage.

Senator DOWNEY. Haven't you told us that on an average there have been at least 73,000 acres lying idle?

Mr. LARSON. On the average.

Senator DOWNEY. That hasn't been producing crops?

Mr. LARSON. No.

Senator DOWNEY. It hasn't been giving employment?

Mr. LARSON. No.

Senator DOWNEY. Then, Phoenix certainly has adjusted itself to that 73,000 acres, whatever it is or its nature, of not being in production.

Mr. LARSON. Not entirely.

Senator DOWNEY. No further questions.

Now, I have additional questions of Mr. Larson on another subject. I assume the chairman is going to recess.

The CHAIRMAN. We are still in the mood of getting this over if we can. I will be very glad to go on until 1 o'clock.

Senator DOWNEY. Very well.

Senator KERR. I regret that I am going to be compelled to deny myself the pleasure of staying. I understood we had set a precedent of staying until 12 only on Saturday.

The CHAIRMAN. Off the record.

(Discussion outside the record.)

(The letter from Arizona Power Authority to Hon. Julius A. Krug, Secretary of the Interior, dated April 26, 1949, reads as follows:)

ARIZONA POWER AUTHORITY,
HEARD BUILDING,
Phoenix, Ariz., April 26, 1949.

Hon. JULIUS A. KRUG,
Secretary of the Interior,
Interior Building, Washington, D. C.

DEAR SIR: Application is hereby made for all electric energy which may be generated and developed at that certain proposed public works project known as Bridge Canyon project on the Colorado River or so much thereof as may be, by law, rules, and regulations, be made available for use within the State of Arizona.

Throughout the history, Arizona has been short of electric power, resulting repeatedly in great damage and frequent interruptions to the entire economy of the State in the industrial, agricultural, and social fields.

A recent survey of the power field for our State indicates that after using the entire output of Parker, Davis, and Boulder Dams made available to the State of Arizona, plus the entire generation output of generating capacity within the State, Arizona will still suffer from power shortages and that such a shortage will continue until power becomes available from the proposed Bridge Canyon project.

Arizona possesses vast quantities of raw products which have remained unused and undeveloped through the history of the State because of power shortage.

Our engineers have exhaustively studied the possibility of substituting power generation within the State, using our cheapest-priced fuel—natural gas—but further advise us that power can be sold at Bridge Canyon much cheaper than we can supply it from any other source.

We not only have great need for additional power in order to make proper use of these natural resources, but we must have increasing quantities of power

to even maintain our present economy. For a number of years past there has been a slow-down in our mineral, agricultural, woodworking, metal activities, transportation, and other industrial and commercial lines because of increasing demands for additional motive power. For the reasons stated, we trust that due consideration will be given to our application, and if additional information or data may be required we stand ready to supply the same and to meet for such conferences regarding our application as you may deem advisable.

Respectfully yours,

ARIZONA POWER AUTHORITY,
M. J. DOUGHERTY, *Chairman.*

The CHAIRMAN. We will recess until Monday morning at 10 o'clock, and at that time we will start with an executive session.

(Whereupon, at 12:10 p. m., a recess was taken until 10 a. m. Monday May 2, 1949.)

CENTRAL ARIZONA PROJECT AND COLORADO RIVER WATER RIGHTS

MONDAY, MAY 2, 1949

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 11 a. m., in room 224, Senate Office Building, Senator Joseph C. O'Mahoney (chairman) presiding.

Present: Senators O'Mahoney (chairman), Downey, McFarland, Ecton.

The CHAIRMAN. The Chair will open the session this morning with the statement that the committee in executive session this morning, discussing the future conduct of these hearings, has come to the understanding that there will be obtained for the record a report of the United States Geological Survey with respect to certain water conditions as found by that Government Bureau in Arizona; that Senator Downey will confer with the Reclamation officials for the purpose of eliciting a statement of facts from the Bureau so that it will be unnecessary for the committee to hold public hearings by which this information would be secured through question and answers for inclusion in the record. (This material appears at p. 918 of the hearings.)

Senator MCFARLAND. To be done more by way of interrogatories.

The CHAIRMAN. By interrogatories, exactly.

Senator DOWNEY. With preliminary discussion.

The CHAIRMAN. Certainly, with preliminary discussion with the Reclamation Service.

The thought is that the conclusion can be expedited in this manner.

Then the Senator from California will present three additional witnesses whose direct statements will not exceed 3 hours in total. It is the hope of the Senator from California that perhaps their direct testimony may be presented in less time than that.

Senator DOWNEY. Did you say the Senator from California, or the chairman, which? [Laughter.]

The CHAIRMAN. This time does not, of course, include the time that may be taken by members of the committee in questioning witnesses.

With that understanding we now enter the last lap of this marathon, and the Senator from California will call his first witness.

Senator DOWNEY. Mr. Ely, if you will come forward, please.

STATEMENT OF NORTHCUTT ELY, SPECIAL COUNSEL, COLORADO RIVER BOARD OF CALIFORNIA

Senator DOWNEY. Mr. Ely, will you identify yourself for the purpose of the record, please, and then proceed to make your statement

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in whatever form you desire, it having been agreed that your statement in chief will be limited to 1 hour's time.

Mr. ELY. Mr. Chairman, my name is Northcutt Ely. I am a member of the bar of California and the District of Columbia, with offices in the Tower Building, Washington, D. C. I am special counsel for the Colorado River Board of California, and appear here as one of the attorneys for the State of California.

This statement is directed to the question of the legal availability of water for the central Arizona project, and more particularly to Arizona's position that this question has been predetermined in her favor by the Colorado River compact, the Boulder Canyon Project Act, and related documents.

This claim that all issues have long since been decided in Arizona's favor appears to be completely refuted by the reports of Government departments, including such expressions as "four major problems would appear to be in dispute between California and Arizona" (report of Secretary of the Interior on S. J. Res. 145, 80th Cong.); "there is not available for use in the other State sufficient water for all the projects, Federal and local, which are already in existence or authorized"; "these unresolved questions"; "further development of the water resources of the Colorado River Basin, particularly large-scale development, is seriously handicapped, if not barred, by lack of a determination of the rights of the individual States" (H. Doc. 419, 80th Cong., p. 5); "There is agreement among all agencies concerned as to the urgent need for resolution of the water-rights issues involved" (Report of the Director of the Bureau of the Budget, May 17, 1948; Hearings, H. J. Res. 225, 80th Cong., House Judiciary Committee, p. 28); "authorization of any of the projects inventoried in the report should not be considered to be in accord with the program of the President until a determination is made of the rights of the individual States to utilize the waters of the Colorado River system" (H. Doc. 419, 80th Cong., p. 1); and, of course, the letter of the Secretary of the Interior transmitting the central Arizona project report to the Senate, September 16, 1948, "Assurance of a water supply is an important element of the plan yet to be resolved. * * * If the contentions of the State of Arizona are correct, there is an ample water supply for this project. If the contentions of California are correct, there will be no dependable water supply available from the Colorado River for this diversion."

This Federal caveat of "unresolved questions" is paralleled by a statute of the State of Arizona (act of February 24, 1944, Laws 1944, pp. 419–427: The Hoover Dam Documents, H. Doc. 717, 80th Cong., 2d sess., p. A–563, containing the full text of a water contract with the Secretary of the Interior, which controls all deliveries from Hoover Dam storage to Arizona projects. The contract—and hence the Arizona statute—says:

Reservations:

10. Neither article 7 nor any other provision of this contract shall impair the right of Arizona and other States and the users of water therein to maintain, prosecute, or defend any action respecting, and is without prejudice to, any of the respective contentions of said States and water users as to (1) the intent, effect, meaning, and interpretation of said compact and said act; (2) what part, if any, of the water used or contracted for by any of them falls within article III (a) of the Colorado River compact; (3) what part, if any, is within article III (b) thereof; (4) what part, if any, is excess or surplus waters unapportioned

by said compact; and (5) what limitations on use, right of use, and relative priorities exist as to the waters of the Colorado River system: *Provided however*, That by these reservations there is no intent to disturb the apportionment made by article III (a) of the Colorado River compact between the upper basin and the lower basin."

This Arizona statute was enacted subsequently to all of the transactions which she now says predetermined the issues that her statute recites.

The Secretary of the Interior, in a decision accompanying his execution of that contract (The Hoover Dam Documents, p. A568), said:

* * * Article 10 was purposely designed to prevent Arizona, or any other State, from contending that the proposed contract, or any provision of the proposed contract, resolves any issue on the amounts of waters which are apportioned or unapportioned by the compact and the amounts of apportioned or unapportioned water available to the respective States under the compact and the act. *It expressly reserves for future judicial determination any issue involving the intent, effect, meaning and interpretation of the compact and act. The language of article 10 is plain and unequivocal and adequately reserves all questions of interpretation of the compact and the act.* [Emphasis is supplied here and throughout, unless otherwise indicated.]

If Congress were now asked to authorize expenditure of a large sum to build a structure on land whose title was stated to be in dispute in the very documents on which the claim of title is based, it would demand a court action to clear the title before risking the money.

Nevertheless, Arizona asks the Congress to agree with her that she has a firm water right for this project. To reach that end, she claims, first, that although all other States must charge their uses which were in existence at the effective date of the Colorado River compact against the apportionment made by article III (a) of the Colorado River compact, Arizona is not so chargeable with the uses on the Gila River, which are the oldest uses she has. She believes that she alone, among the five States represented in the lower basin, is the beneficiary of article III (b), which authorizes the lower basin to increase its uses by 1,000,000 acre-feet, and she proposes to charge her uses on the Gila to that category. She believes that one system of measuring uses, "diversions less returns to the river," applies to California, as indeed it does, because Congress required California to agree to it, but that a different and much more favorable standard applies to her uses on the Gila. And for that matter, to Arizona's uses on the main stream, I might add.

She says all these favorable results were guaranteed her by the Colorado River compact in 1922 or confirmed by the Boulder Canyon Project Act in 1928. If so, the question arises why Arizona did not ratify the compact in 1923 or at the latest 1929, and why, to the contrary, she found it necessary for her Senators to filibuster the Boulder Canyon Project Act and to vote against it; why she sued three times in the Supreme Court, first, to declare the act and compact unconstitutional, next to perpetuate the testimony of the negotiators, and, finally, to ask the Court to ignore the compact and act and make an equitable apportionment for her. The answer, of course, lies in the fact that the contemporary (and correct) construction of the compact and the act by her negotiators, her distinguished Supreme Court counsel, Mr. Dean Acheson (now Secretary of State) and the whole history of the documents she now relies upon were all diametrically

opposed to the interpretations she now asserts, and on which she asks the United States to gamble a billion dollars.

I. THE ISSUES

What are these issues that have prevented an agreement between Arizona and California for a quarter century, which provoked three Supreme Court suits by Arizona (all dismissed by the Court), issues which Arizona now says have all been decided in her favor? Arizona's argument seems to concede that there are, or at least were, three of them, which the attorneys general of Nevada and California have defined as follows (Hearings, S. J. Res. 145, 80th Cong., p. 60):

1. Whether by the terms of the California Limitation Act, California is entitled to participate in the 1,000,000 acre-feet of water referred to in article III (b) of the Colorado River compact. This issue is one of interpretation of the California Limitation Act and the corresponding language in section 4 (a) of the Boulder Canyon Project Act.
2. Whether the measure of "beneficial consumptive use" of waters of the Gila River in Arizona is the actual beneficial consumptive use of such waters made in Arizona, or is the amount of the depletion by Arizona of the virgin flow of the Colorado River at its confluence with the Gila. This is a question of interpretation of article III of the Colorado River compact.
3. Whether the 4,400,000 acre-feet of the water apportioned by article III (a) of the Colorado River compact to which California is limited by the Project Act and Limitation Act is a net quantity, or is subject to reduction by reason of evaporation and other reservoir losses, particularly at Lake Mead. This is, again, a question of interpretation of the California Limitation Act and section 4 (a) of the Project Act.

The Secretary of the Interior, in his report on House Joint Resolution 225, Eightieth Congress, translated these issues (and a fourth, relating to the Mexican Water Treaty, which we have not considered) into terms of acre-feet, as follows:

I have not attempted to examine the merits of the contentions made by the spokesmen for Arizona and California on these questions. Assuming, however, that there is some merit to both sides on all four of the major questions, it is obvious that there are many answers, in terms of the number of acre-feet of water which California may use under section 4 (a) of the Boulder Canyon Project Act that might conceivably be given. Using the long-run average flows shown in this Department's report on the Colorado River Basin as a basis for computations, the answers might range from as much as 6,250,000 acre-feet per year to approximately 4,000,000 acre-feet. Likewise, there is a great range in the amount of water from the Colorado River system which might be found available for use in Arizona. The maximum might be somewhat over 3,500,000 acre-feet, the minimum nearly as little as 2,250,000 acre-feet.

If Arizona is wrong on any one of these issues, there is not an adequate water supply for the central Arizona project.

The documents which present these questions are, in chronological order, the Colorado River compact, the Boulder Canyon Project Act (with the California Limitation Act), the Supreme Court litigation, the California and Arizona water contracts, and the Mexican Water Treaty. These will be identified in the same order below, together with their hearings on the three issues with which we are concerned.

II. THE COLORADO RIVER COMPACT

The Colorado River compact (the Hoover Dam Documents, H. Doc. 717, 80th Cong., p. A–17) is an interstate agreement made for the purpose of apportioning the use of the waters of the Colorado

River system. The "system" by definition (art. II (a)) "means that portion of the Colorado River and its tributaries within the United States of America." The division is not among the several States, but between two grand subbasins, upper and lower (art. III (a) and (b)). These subbasins are the parts of the basin "from which waters naturally drain into" the system above and below Lee Ferry (art. II (f) and (g)). Lee Ferry is a point in the river in northern Arizona, near the Utah line.

The use of only a part of the water supply is divided. Further apportionment of the use of any surplus may be made by a further compact after October 1, 1963, if the States so unanimously agree (art. III (f) and (g)). This provision is permissive, not mandatory.

Article III (a) of the Colorado River compact reads as follows (p. A–19, the Hoover Dam Documents):

> There is hereby apportioned from the Colorado River system in perpetuity to the upper basin and to the lower basin respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

Paragraph (b) provides that—

> In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum.

A. Status of III (b) water under the Colorado River compact

Arizona contends that the negotiators of the compact intended the III (b) water for Arizona, although they did not say so; that this 1,000,000 acre-feet is identical with, and is found flowing in, the Gila River; and that it is "apportioned water." The significance of this last claim becomes apparent when we reach consideration of the Boulder Canyon Project Act.

1. As to whether the framers of the Colorado River compact intended the III (b) water for Arizona's exclusive use:

This is one point, at least, on which the United States Supreme Court has spoken positively against Arizona. In *Arizona* v. *California*, 292 U. S. 341 (1934), Arizona made precisely the claim she makes here as to the intent of the negotiators.

The Court's opinion, in *Arizona* v. *California*, 292 U. S. 341, 348, stated; the Hoover Dam Documents, p. A786):

> The interference apprehended will, it is alleged, arise out of a refusal of the respondents to accept as correct that construction of article III (b) of the compact which Arizona contends is the proper one. It claims that this paragraph, which declares:
>
> "In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum" means "that the waters apportioned by article III (b) of said compact are for the sole and exclusive use and benefit of the State of Arizona."

After quoting Arizona's brief in almost the same words as her argument here, the Court said (p. 358; p. A792, the Hoover Dam Documents):

> * * * Arizona is one of the States of the lower basin and any waters useful to her are by that fact useful to the lower basin. But the fact that they are solely useful to Arizona, or the fact that they have been appropriated by her, does not contradict the intent clearly expressed in paragraph (b) (nor the rational character thereof) to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone. It may be that, in apportioning

among the States the 8,500,000 acre-feet allotted to the lower basin, Arizona's share of waters from the main stream will be affected by the fact that certain of the waters assigned to the lower basin can be used only by her; but that is a matter entirely outside the scope of the compact.

The Court said also:

* * * *There is no allegation that the alleged agreement between the negotiators made in 1922 was called to the attention of Congress in 1928 when enacting the act; nor that it was called to the attention of the legislatures of the several States."*

It is curious why, if this agreement was ever in fact made, Arizona did not take the trouble to tell the other State legislatures or Congress about it; and even more curious is the claim that Congress intended to adopt and enforce an agreement that it never heard of.

Let us see what the negotiators did report as to article III (b):

The California, Wyoming, and Colorado negotiators all reported to their Legislatures that the lower basin was allotted an allowable increase of 1,000,000 acre-feet because of the anticipated rapid development on the lower river to follow the construction of Boulder (now Hoover) Dam, not merely the expected increases of use on the Gila. None reported that the million acre-feet was earmarked for Arizona. They all related it to anticipated increases, not to existing uses. Thus (p. A76 of the Hoover Dam Documents):

California: Extract from the report of W. F. McClure, Commissioner for California, January 8, 1923, to the Governor of California:

In conclusion permit me to add that the terms of the compact do full justice to the States in interest, and the equitable division and apportionment of the use of the waters of the Colorado River system whereby the lower basin is allocated 7,500,000 acre-feet per annum by reason of the probable rapid development upon the lower river, and fully guarantees to California an ample water supply to adequately care for the enormous future growth of the Imperial Valley and adjacent territory. * * *

Colorado: Extract from the report of Delph Carpenter (p. A78, The Hoover Dam Documents), Commissioner for Colorado on the Colorado River Commission, to the Governor of Colorado, December 15, 1922:

By reason of development upon the Gila River and the probable rapid future development incident to the necessary construction of flood works on the lower river, the lower basin is permitted to increase its development to the extent of an additional 1,000,000 acre-feet annual beneficial consumptive use before being authorized to call for a further apportionment of any surplus waters of the river.

Wyoming: Extract from the report of Frank C. Emerson, commissioner of the State of Wyoming (p. A127, The Hoover Dam Documents), to the Governor and the Wyoming Legislature, January 18, 1923 (p. 15):

* * * The lower basin is allowed to increase its use of water 1,000,000 acre-feet per annum in addition to the 7,500,000 acre-feet apportioned for its use by reason of the possible developments upon the Gila River, and the probable rapid development generally upon the lower river. This additional development is at the peril of the lower division as no provision is made for delivery of water at Lee Ferry for this additional amount.

The CHAIRMAN. What is the meaning of that last sentence?

Mr. ELY. I interpret it, Mr. Chairman, to mean that to the extent the lower basin may increase its uses upon the lower river, which means the main stream, beyond the quantity guaranteed by the upper

basin for delivery under article III (d) of the compact, 75,000,000 acre-feet in every 10-year period, it is dependent upon such supplies as may be physically available in the lower basin for that purpose.

The CHAIRMAN. And you agree that the additional development is at the peril of the lower division as stated by Mr. Emerson?

Mr. ELY. In peril in the sense that the upper basin is not guaranteeing the delivery of water at Lee Ferry to accommodate that 1,000,000 acre-feet of additional use.

The CHAIRMAN. So that the inclusion of article III (b) does not, as Mr. Emerson asserted in any way affect the equal division of the waters at Lee Ferry between the upper and the lower basin?

Mr. ELY. I would have to take the time, Mr. Chairman, to state a difference of view as to the words you have used "equal division of water at Lee Ferry." The compact effected a division between the two basins with respect to their uses from all sources, including the tributaries. It did not effect an equal division as to use of waters at Lee Ferry.

The CHAIRMAN. What I am getting at is the concluding phrase of Mr. Emerson's statement, "as no provision is made for delivery of water at Lee Ferry for this additional amount." What is the significance of that?

Mr. ELY. The significance of that, to my mind, Mr. Chairman, is that the lower basin, if it has in fact put to use the 7,500,000 acre-feet apportioned to it by article III (a), incorporating in that use whatever uses it may make from whatever source at any point within the basin, on the tributaries—meaning the Gila specifically—then uses beyond that 7,500,000 acre-feet, wherever those additional uses may occur, are accountable for under article III (b) up to the extent of 1,000,000 acre-feet; and inasmuch as those uses might take place out of waters of the tributaries or out of the main stream from waters physically available there, manifestly the upper basin is not identifying or not underwriting the availability of that 1,000,000 acre-feet of additional use.

The CHAIRMAN. In other words, the upper basin is not being called upon to provide this 1,000,000?

Mr. ELY. That is correct, sir. I might state, Mr. Chairman, to avoid any confusion there, that under our construction the 75,000,000 acre-feet per 10-year period which you guarantee—using "you" in the sense of the upper basin States—is so much wet water. It is not identified with article III (a) water at all. The 75,000,000 acre-feet may very well contain water, the use of which is classified under article III (b) and will contain a certain surplus available for Mexico, as well as for use in the lower basin. There we touch one of the basic disagreements between California and Arizona. Arizona seeks to identify the 75,000,000 acre-feet guaranteed by the upper basin under article III (d) with the 7,500,000 acre-feet apportioned to the lower basin by article III (a). We do not. We say that the 75,000,000 acre-feet does include some III (a) water; it may very well include some III (b) water and it may very well include some surplus.

To continue with my prepared statement:

Herbert Hoover, who had presided over the negotiation of the Colorado River Compact as representative of the United States, replied to a questionnaire by Congressman Carl Hayden, January 27, 1923

(Congressional Record, January 30, 1923, pages 2710–2713; page A34, The Hoover Dam Documents). This included the following:

Question 6. Are the 1,000,000 additional acre-feet of water apportioned to the lower basin in paragraph (b) of article III supposed to be obtained from the Colorado River or solely from the tributaries of that stream within the State of Arizona?

The use of the words "such waters" in this paragraph clearly refers to waters from the Colorado River system, and *the extra 1,000,000 acre-feet provided for can therefore be taken from the main river or from any of its tributaries.*

And from page A41 of "The Hoover Dam Documents:"

Question 22. Does the Colorado River Compact apportion any water to the States of Arizona?

No, nor to any other State individually. The apportionment is to the groups.

No other negotiator is known to have reported to the contrary. Arizona did not publish the reports of her negotiators, if any were made. One of them, Mr. Norviel, who signed the compact, apparently addressed the Arizona Legislature, because one legislator explained her vote against ratification of the Colorado River Compact by the statement that she had been for it until she heard Mr. Norviel explain that the Gila was included. That appears in the House Journal of the Arizona Legislature, 1923, at page 571. If Mr. Norviel reported a trade of the 1,000,000 acre-feet of III (b) water for inclusion of the Gila, he did not convince the legislature.

The Arizona Legislature rejected the Colorado River Compact in 1923. The lower house approved the compact with a reservation "that the Gila River System, including the waters of said Gila River and streams tributary thereto, be not included, considered or involved in any way with the so-called Colorado River Compact" (House Journal, 1923, pages 210–212), but the compact failed of ratification even with that amendment.

In that reservation is expressed the nub of this 25-year controversy: From the beginning, Arizona's great dissatisfaction with the Colorado River Compact was that it charged against the lower basin's rights under article III (a) of the compact, and hence against Arizona, Arizona's uses of water on the Gila River and its tributaries. For 22 years, she fought the compact because it accomplished that result. The interpretation she now offers would have substantially the same effect as the exclusion of the Gila River from any charge under article III (a) of the compact. The question is not, as Arizona witnesses indicate from time to time, whether some other State is to be permitted to come in and take the Gila River waters. It is simply whether Arizona must render an accounting for her own uses of the Gila, which are old perfected rights, in the same manner as all the other States must account for theirs, under article III (a) of the compact. She wants to avoid that accounting, because, to the extent that uses on the Gila (however measured) are chargeable as uses of III (a) waters, the quantity of III (a) water available to Arizona out of the main stream is reduced.

2. As to whether the negotiators of the compact intended to classify the III (b) waters as "apportioned": The importance of this point derives from the fact that 6 years after the signature of the Colorado River compact, Congress, in enacting the Boulder Canyon Project Act, required California to enact a reciprocal statute limiting her uses to "4,400,000 acre-feet of the waters apportioned to the lower

basin States by paragraph (a) or article III of the Colorado River Compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact." Arizona says the III (b) waters were intended by the compact negotiators to be "apportioned," and that Congress and the California Legislature intended to limit California to 4,400,000 acre-feet in all apportioned waters, notwithstanding the fact that the limitation applies on its face only to those apportioned by article III (a).

While, strictly speaking, the question here is what Congress and the California Legislature intended in 1928, not what the negotiators said in 1922, nevertheless it happens that an explicit report on this point by Delph E. Carpenter (pp. 78, 81, The Hoover Dam Documents), Colorado's compact negotiator, was placed before Congress during the debate on the project act.

Mr. Carpenter was commissioner for the State of Colorado on the Colorado River Commission which framed the compact; in fact, he is generally credited with being the father of the idea of a compact among the States of the Colorado River Basin. Immediately after the compact was signed by the States' representatives at Santa Fe, Mr. Carpenter, under date of December 15, 1922—and you will note that is 3 weeks after the compact was signed—reported to the Governor and legislature of the State of Colorado. His report was made a part of the Congressional Record during the debates in the Senate on the Boulder Canyon Project Act (Congressional Record, Senate, 70th Cong., 2d sess., Dec. 14, 1928, vol. 70, pt. 1, pp. 577–579, 584–585; The Hoover Dam Documents, p. 278). In his report (p. 577), Mr. Carpenter says:

Seven million five hundred thousand acre-feet, exclusive annual beneficial consumptive use, is set apart and apportioned in perpetuity to the upper basin and a like amount to the lower basin.

The CHAIRMAN. Can you give the citation to the Hoover Dam Documents?

Mr. ELY. That is at page A78.

Continuing with the quotation:

* * * * * * *

By reason of the development upon the Gila River and the probable rapid future development incident to the necessary construction of flood works on the lower river, the lower basin is permitted to increase its development to the extent of an additional 1,000,000 acre-feet annual beneficial consumptive use before being authorized to call for a further apportionment of any surplus waters of the river.

No further apportionment of surplus waters of the river shall occur within the next 40 years. At any time after 40 years if the development in the upper basin has reached 7,500,000 acre-feet annual beneficial consumptive use or that of the lower basin has reached 8,500,000 acre-feet, any two States may call for a further apportionment of any surplus waters of the river, but such supplemental apportionment shall not affect the perpetual apportionment of 7,500,000 acre-feet made to each basin by this compact.

The CHAIRMAN. Do you assume, therefore, that statement means that such supplemental apportionment may affect the 1,000,000 acre-feet of III (b) water?

Mr. ELY. To the extent that the 1,000,000 acre-feet has not in fact been put to use at the date of the second apportionment, if one is ever made—in my personal opinion the unused portion of the 1,000,000

acre-feet falls into the surplus of which it is a part. The lower basin's right to retain permanently the additional use of 1,000,000 acre-feet, or any portion thereof, is dependent upon use, unlike the right under article III (a) to retain in perpetuity the right to use 7,500,000 acre-feet independent of actual use thereof.

The CHAIRMAN. You just referred to this 1,000,000 acre-feet of III (b) as part of the surplus.

Mr. ELY. We regard it as a part of the surplus or excess waters unapportioned by the compact, the lower basin being given a right to establish a permanent use in such surplus to the extent of 1,000,000 acre-feet, but to acquire that right by use and not by apportionment.

Mr. Carpenter mentions that point in the paragraph that I am about to quote. Mr. Carpenter makes this statement, which appears in the Hoover Dam Documents at page A81:

> The repayment of the cost of the construction of necessary flood-control reservoirs for the protection of the lower river country probably will result in a forced development in the lower basin. *For this reason a permissible additional development in the lower basin to the extent of a beneficial consumptive use of 1,000,000 acre-feet was recognized in order that any further apportionment of surplus waters might be altogether avoided or at least delayed to a very remote period. This right of additional development is not a final apportionment.*

According to Mr. Carpenter's statement, the right to increase the use of waters referred to in III (b) is not an apportionment, but merely a measure of the time when the lower basin may apply for additional apportionment under paragraph (f), article III. This, we take to be the true significance and intent of the compact.

There is nothing in the report of any other negotiator to controvert Mr. Carpenter's explicit statement, which was printed and widely circulated between 1922 and 1928.

Mr. Carpenter's statement, which I have reported, was before Congress during consideration of the Project Act, and was placed in the Congressional Record during the debates in the Senate.

Indeed, in a subsequent Supreme Court case, Dean Acheson, then Arizona's counsel, and now Secretary of State of the United States, spelled out the same result in even more detail. Mr. Acheson's statement will be referred to later, in chronological order.

B. As to the measure of "Beneficial consumptive use" intended by the Colorado River compact

The controversy here, as in other respects, centers over the Gila River. Arizona's end objective now, as in 1922, is to free herself of any accounting under article III (a) of the compact for her uses on the Gila, notwithstanding the fact that article III (a) says, in terms, that the apportionment therein made "shall include all water necessary for the supply of any rights which may now exist," and the Gila rights are the oldest existing rights in Arizona. Arizona's first effort was to construe the compact as excluding the Gila altogether; her second, to identify it with the waters referred to in article III (b) of the Colorado River compact; her third, to find a method of calculating her uses on that stream in such a manner as to minimize them. This last is the "depletion theory," as contrasted with the measurement of consumptive uses as "diversion minus return flow." She would hold California to the latter method, diversions minus return flow, while claiming the benefits of the depletion method

for herself. The importance of these two bases, as to Arizona, is as follows:

The Gila River, in its lower reaches, was, in a state of nature, a wasting stream. In the last 100 miles above the point where it discharges into the Colorado, its bed is wide, sandy, flat, and subject to intense heat. As a result, although an average of about 2,300,000 acre-feet of water per year flows into the Phoenix area in central Arizona from the mountainous watershed of the Gila and its tributaries, it has been estimated by the Bureau of Reclamation that, in a state of nature, before any water was put to use in central Arizona, an average of only approximately 1,300,000 acre-feet per annum flowed from the Gila, at its mouth, into the Colorado. The rest was lost by evaporation, deep seepage, and transpiration.

Arizona argues that it is chargeable, for its use of Gila water, only to the extent that it "depletes" the flow of the main stream of the Colorado below the quantity which would have flowed in it in a state of nature. California contends that that view is a distortion of the measure of charge specified in the compact; namely, "beneficial consumptive use." By construction of an extensive system of impounding reservoirs in the mountains east of Phoenix and batteries of pumps in the lowlands, Arizona projects have accomplished the capture and utilization of substantially all of the 2,300,000 acre-feet. All of that water supply is actually being beneficially and consumptively used in Arizona and produces crops. Similarly, large amounts are salvaged along the main stream by California. One way of expressing the problem is, therefore: "Is a State or project entitled to salvage, by conservation works, water which in a state of nature was wasted, and not be charged under the compact for the water so salvaged?" As a corollary, "Is California to be charged with the use of salvaged water and Arizona not?"

Under many conditions the amount of "depletion" of a stream may approximate the amount of "beneficial consumptive use"; in fact, that may be generally true. In many instances, however, and to an unusual degree in the case of the Gila, and along the lower reaches of the Colorado River system generally, the depletion, measured at some downstream point, is not equivalent to beneficial consumptive use.

The allocation of water under the Colorado River compact was not made in terms of main stream depletion. It was made in terms of utilization of the entire water system, wherever such uses occur, whether on tributaries or on the main stream. Article III (a) of the compact apportions "the exclusive beneficial consumptive use" of waters of the "Colorado River system" (which art. II (a) defines as including both main stream and tributaries). Article III (a) makes no reference to stream depletion nor, in fact, to conditions existing in a state of nature. What is chargeable to each basin, and logically to each State, is whatever water of the system is actually put to beneficial consumptive use.

No definition of the phrase "beneficial consumptive use" is found in the compact, presumably because the term is a common one and well understood in water law as meaning diversions from a river minus return flow to that river.

There is, fortunately, abundant evidence as to what the compact negotiators meant by "beneficial consumptive use." And I might add that this was communicated to the Congress.

Delph E. Carpenter, in a report to the Colorado legislature, rendered December 15, 1922, 3 weeks after he signed the compact (and which was placed in the Congressional Record during debate on the Project Act: Seventieth Congressional Record, 577–586, December 14, 1928) said of the expression "beneficial consumptive use" (p. A–80, the Hoover Dam Documents):

> * * * It means the amount of water consumed and lost to the river during uses of the water diverted. Generally speaking it is the difference between the aggregate diverted and the aggregate return flow. It is the net loss occurring through beneficial uses.

In a supplemental report dated March 20, 1923 (also placed in the Congressional Record during debate on the Project Act, Seventieth Congressional Record, 584–585, December 14, 1928; page A–102, The Hoover Dam Documents), Mr. Carpenter said:

> In my original report (printed in the Colorado Senate Journal of January 5, 1923) I discussed and defined the term "beneficial consumptive use." In addition to the discussion there contained, I might add there is a vast difference between the term "beneficial use" and the term "beneficial consumptive use." A use may be beneficial and at the same time nonconsumptive or the use may be partly or wholly consumptive. A wholly consumptive use is a use which wholly consumes the water. A nonconsumptive use is a use in which no water is consumed (lost to the stream). "Consume" means to exhaust or destroy. The use of water for irrigation is but partially consumptive for the reason that a great part of the water diverted ultimately finds its way back to the stream. All uses which are beneficial are included within the apportionments (that is, domestic, agricultural, power, and so forth). The measure of the apportionment is the amount of water lost to the river. The "beneficial consumptive use" refers to the amount of water exhausted or lost to the stream in the process of making all beneficial uses. As recently defined by Director Davis of the United States Reclamation Service, it is the "diversion minus the return flow." (Congressional Record, January 31, 1923, p. 2815). Water diverted and carried out of the basin of the Colorado River by the Strawberry, Moffat, or other tunnels or by canal into the Imperial Valley is wholly consumed as regards the Colorado River, because no part of it ever returns to that stream system.

The statement by Director Davis, appears, I may add, in the Hoover Dam Documents, at page A–48, and in turn refers back to a table on page A–47.

I trust the committee will note the significance of Mr. Carpenter's utilization of these particular trans-mountain diversions as illustrations of the effect in his mind of the term "beneficial consumptive use"; that the amount diverted and carried out of the basin, whether on the Strawberry or Moffat tunnels, or the Imperial Valley, or he might have added had he foreseen the event, the Metropolitan Aqueduct in California, is consumed in the amount diverted because no part of it returns to the stream.

The CHAIRMAN. That means you agree with his definition of the category into which uses in California that you have just mentioned, fall?

Mr. ELY. Yes. We think Mr. Carpenter, like ourselves, was speaking of actual diversions minus return flow in the definition of "consumptive use."

I may interpose here, that if the contrary conclusion should ever be established, that under the Colorado River compact the phrase "beneficial consumptive use" means depletion, that is, the quantity by which the use at the place of use depletes the flow at some downstream point, then in such event, which we regard as unlikely, that definition would apply obviously to all applications of the Colorado River com-

pact, including its application to California. Inasmuch as the California Limitation Act by its terms is made subject in all respects to the Colorado River compact, then I might say if the depletion theory were ever established, contrary to our expectation, as being the true measure of uses under the Colorado River compact, obviously that same definition applies to California.

Under the depletion theory the very large quantities of water salvaged along the mainstream on the California side or in connection with works in which California has an interest, would be creditable or would be available for credit to California, just as they would in any other State. There cannot be two different rules under the same compact, one applying to California, and the other to Arizona or any other State.

We think diversions minus returns to the river is the compact's universal rule. But if "depletion" is the rule, that is the universal rule, and we are entitled to its benefit. I do not think Arizona has ever stopped to figure out the possible effects upon her of relieving California from the measure of consumptive use which we assume is applicable, namely diversions minus returns to the river, and substituting a measure based upon depletion. In fact, Arizona desires the depletion theory applied with respect to water salvaged in Arizona on the mainstream, as well as the Gila, but denies its benefits to California.

Senator McFARLAND. Mr. Chairman, I cannot let that go unchallenged. I am not going to question the witness, but that is not a true statement.

Mr. ELY. I would be happy to have Arizona's view made clear in that respect.

Senator McFARLAND. We will make it plain. The hearing is now proceeding under an agreement for limitation of time.

Mr. ELY. Mr. Carpenter, testifying before the Senate Committee on Irrigation and Reclamation in 1925 (hearings on S. Res. 320, 68th Cong., 2d sess., pp. 691 et seq.) placed in evidence a tabulation prepared by R. I. Meeker, now a witness for Arizona, in which he showed the Gila system as producing 3,120,000 acre-feet, of which 2,677,000 was produced in Arizona and 443,000 in New Mexico. I should like to offer that table for the record, Mr. Chairman, and to save the committee's time, may I hand that to the reporter?

The CHAIRMAN. Have you seen that, Senator McFarland?

Senator McFARLAND. No; I have not.

Mr. ELY. It is in the hearings on S. Res. 320, at page 691.

Senator McFARLAND. I do not think there is anything new in this compilation that is not in those hearings, so I guess I have seen it all.

(The table is as follows:)

MEEKER TABLES

[Compiled by R. I. Meeker, irrigation engineer, December 2, 1925]

TABLE A.—*Colorado River Basin water supply—Contributions by States*

These figures represent conditions of reconstructed river or river flow unreduced by irrigation uses. Actual river flow is now less due to consumption by irrigation. The Arizona figures include the Gila River, which is a part of the Colorado River system.

[Approximate values only]

State	Acre-feet	Percent of basin supply	State	Acre-feet	Percent of basin supply
Colorado	12,000,000	55	Nevada	75,000	0.03
Arizona	3,850,000	18	California	0	0
Utah	3,100,000	14			
Wyoming	2,200,000	10		21,725,000	100
New Mexico	500,000	2			

Colorado produces 55 percent of the Colorado River water supply.

The upper basin States contribute 79 percent of the basin water supply.

Upper basin allotment under the terms of the compact will be 35 percent of the basin water supply and 44 percent of upper basin production.

COLORADO RIVER BASIN WATER SUPPLY—AVERAGE YEARLY FLOW OF BASIN

Based on long-time mean, covering wet and dry cycles. Recorded flow corrected for depletion by irrigation. These figures represent approximately the total yearly flow of the Colorado River basin unreduced by irrigation consumption; in other words, the run-off of the reconstructed river. Upper and lower basin terms fit definitions of same in Colorado River compact as drafted at Santa Fe, N. Mex., November, 1922.

TABLE 1.—*Total basin water supply—reconstructed river*

	Acre-feet	Percent
Upper Colorado River Basin	17,000,000	79
Lower Colorado River Basin	4,600,000	21
Total basin supply	21,600,000	100

TABLE 2.—*Colorado River compact allocations*

[Compact of November 1922]

	Acre-feet	Percent
Upper Colorado River Basin	7,500,000	35
Lower Colorado River Basin	8,500,000	39
Unallotted surplus	5,600,000	26
Total basin supply	21,600,000	100

TABLE 3.—*Water-supply data*

[Values in acre-feet]

Reconstructed Colorado River at Lees Ferry		17,000,000
Inflow to Colorado River between Lees Ferry and above mouth of Gila River:		
Utah (Pariah, Kanab, and Virgin Rivers)	225,000	
Nevada (Virgin)	75,000	
Arizona (other tributaries)	1,175,000	
		1,475,000
Reconstructed Gila River:		
New Mexico supply	443,000	
Arizona supply	2,677,000	
		3,120,000
Total water resources, Colorado River Basin		21,595,000

TABLE 4.—*Lower Colorado Basin resources*

[Values in acre-feet]

Average yearly water supply	4,600,000
Utah	225,000
Nevada	75,000
New Mexico	443,000
	743,000
Arizona	3,852,000
Total	4,595,000

TABLE 5.—*Arizona water production, Colorado River Basin*

[Average yearly water supply; values in acre-feet]

Gila River system:		
Gila River at Kelvin		787,000
Salt River at McDowell		1,470,000
Verde River at McDowell		609,000
Aqua Fria at Glendale		181,000
Hassayampa		23,000
Consumption above gaging stations		50,000
		3,120,000
New Mexico production:		
Gila at Guthrie, Ariz	244,000	
San Francisco at Clifton	199,000	
Total	443,000	
Gila system production in Arizona		2,677,000

TABLE 6.—*Summary—Arizona water contribution*

[Average yearly values, in acre-feet]

Gila system production		2,677,000
Main Colorado River:		
Little Colorado River	200,000	
Williams River	75,000	
Other tributaries	900,000	
		1,175,000
Total water production, Arizona		3,852,000

Mr. ELY. Mr. Carpenter explained this in the following colloquy (p. 691):

Senator ASHURST. That is, according to Mr. Meeker, the mean flow of the Gila River, which empties into the Colorado a little above Yuma, Ariz., is, so Mr. Meeker says, about 3,120,000 acre-feet, of which Arizona furnishes 2,677,000 acre-feet.

Mr. CARPENTER. Yes, sir; would empty if not used in Arizona * * * That is, that amount of water would go in if it were not retained and used for irrigation. This is what they call the reconstructed total.

Mr. Meeker's tables (pp. 692–693) show "total water resources, Colorado River Basin" as 21,595,000 acre-feet, including 17,000,000 acre-feet as "Reconstructed Colorado River at Lee Ferry," 1,475,000 as "Inflow to Colorado River between Lee's Ferry and above mouth of Gila River," and 3,120,000 acre-feet as "Reconstructed Gila River."

Judge Richard E. Sloan of Arizona, legal adviser to the Arizona commissioner in the negotiation of the Colorado River compact, and a member of the drafting committee which wrote the Colorado River

compact, in a statement released less than 2 months after the compact was signed, said (Arizona Mining Journal, January 15, 1923, the Hoover Dam Documents, supra, p. A63):

> It may be of interest to know why the figures of 7,500,000 acre-feet for the upper basin and 8,500,000 acre-feet for the lower basin were reached. It grew out of the proposition made by the upper basin that there should be a 50-50 division of rights to the use of the water of the river between the upper and lower basin which should include the flow of the Gila, and the insistence of Mr. Norviel, commissioner from Arizona, that no 50-50 basis of division would be equitable unless the measurement should be at Lee's Ferry. As a compromise the known requirements of the two basins were to be taken as the basis of allotment with a definite quantity added as a margin of safety. The known requirements of the upper basin being placed at 6,500,000 acre-feet, a million acre-feet of margin gave the upper basin an allotment of 7,500,000 acre-feet. *The known future requirements of the lower basin from the Colorado River proper were estimated at 5,100,000 acre-feet. To this, when the total possible consumptive use of 2,350,000 acre-feet from the Gila and its tributaries are added, gives a total of 7,450,000 acre-feet. In addition to this, upon the insistence of Mr. Norviel, 1,000,000 acre-feet was added as a margin of safety, bringing the total allotment for the lower basin up to 8,500,000 acre-feet.* This compromise agreement is justified when we consider that the flow of the river will not be affected by any artificial division, but will continue uninterrupted, to be used for any beneficial purpose recognized, including power, as freely as though no such apportionment had been attempted.

Judge Sloan is clear that the consumptive uses in the Gila are 2,350,000 acre-feet; that is how the figure of 7,450,000 acre-feet which he gives (rounded out to 7,500,000 acre-feet in article III (a) of the compact), was arrived it. He does not hint that the Gila uses were written down to a million acre-feet by application of the depletion theory; he states them as what they are, 2,350,000. Nor does he claim that the million acre-feet of III (b) water was intended for Arizona; he calls it "a margin of safety, bringing the total allotment for the lower basin up to 8,500,000 acre-feet."

The next document in the "Law of the River" is the Boulder Canyon Project Act, and its reciprocal legislation, the limitation act of the California Legislature.

The CHAIRMAN. You are there beginning a new division of your statement, Mr. Ely, No. III, the Boulder Canyon Project Act. The quorum call will probably sound in just a few minutes.

If it is agreeable, we will suspend at this time to assemble this afternoon at 2 o'clock in room G–48, the gallery floor.

(Discussion off the record.)

(Whereupon, at 11:50 a. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION (2 P. M.)

The CHAIRMAN. The hearing will be in order.

Senator DOWNEY. Mr. Chairman, may I say that subject to the satisfaction of the chairman and the committee, our other witnesses have decided to yield their time to Mr. Ely, whatever is necessary, for him to complete his statement, if that is satisfactory.

The CHAIRMAN. Very well.

This may be off the record.

(Discussion off the record.)

STATEMENT OF NORTHCUTT ELY—Resumed

Mr. ELY. To resume:

III. THE BOULDER CANYON PROJECT ACT AND THE CALIFORNIA LIMITATION ACT

Arizona claims, in effect, that whether or not the Colorado River compact itself allocated the million acre-feet of III (b) water to Arizona, the Boulder Canyon Project Act did so, and that California assented to it; moreover, that the project act intended that Arizona's uses, at least on the Gila, were to be measured by depletion, not by diversions minus return flow.

The second of these will be disposed of first.

A. As to the measurement of beneficial consumptive use intended by the Boulder Canyon Project Act

During the debate on the Boulder Canyon Project Act, there was no suggestion that "beneficial consumptive use," under the compact, meant "depletion"; there were repeated references, in the debate and in the official documents considered by Congress, to consumptive use in terms of diversion minus return flow; wherever the uses on the Gila were referred to, they were stated to be at least 2,350,000 acre-feet; and finally, in the one instance in which the act defined consumptive use, it defined it specifically as "diversions less returns to the river." Arizona says this definition applies to California, but not to her. Let us examine the record.

1. Documents before the Senate: Attention has already been called to the report of Mr. Carpenter to the Colorado Legislature, which defined and explained consumptive use as "the difference between the aggregate diverted and the aggregate return flow," and as the "diversion minus the return flow." This was placed in the Congressional Record during the debates on the project act (70 Congressional Record, 577, et seq., December 14, 1928). He therein refers to Director Davis' reply to Senator Hayden's questionnaire, in which Director Davis likewise defines consumptive use as "diversion minus return flow."

One of the important documents considered by the Senate during debate on the Boulder Canyon Project Act was Colorado River Development, Senate Document 186 (70th Cong., 2d sess.), by George W. Malone, State engineer of Nevada, now United States Senator from that State. Mr. Malone defined consumptive use as follows (p. 36):

DUTY OF WATER

Gross duty equals total amount diverted from the stream per acre.
Net duty equals total amount delivered to the land per acre.
Consumptive duty equals the amount actually consumed, meaning the difference between the gross amount diverted and the return flow to the stream.

Mr. Malone used exactly the same figure (p. 39) as Mr. Meeker (hearings, S. Res. 320, 68th Cong., 2d sess., p. 693) for the water production of the "Reconstructed Gila River"—3,120,000 acre-feet.

In the hearings on the Swing-Johnson bill (hearings before Senate Committee on Irrigation and Reclamation, 70th Cong., 1st sess., on

S. 728, S. 1274), Mr. Thomas Maddock, a member of the Arizona Colorado River Commission, testified (p. 81):

* * * As a matter of fact, there are over 3,000,000 acre-feet in the complete Gila. Perhaps, eventually, there will be 4,000,000, but we can easily see 3,000,000 acre-feet at the present time. This is appropriated and practically being used right now.

And at page 97, Mr. Maddock said:

* * * there is much of Arizona's water that never reaches the Colorado, yet in the Santa Fe compact the consumption within the basin is considered. It must be considered. We have a river, like the Santa Cruz, that comes down in torrents at times, yet never reaches the Gila or Colorado Rivers on the surface.

This was the type of evidence before the Congress when it passed the Swing-Johnson Act. There is ample evidence on the "diversion minus return flow" basis, and not a word of the depletion theory. Now let us examine the legislative history of the act.

2. Definition of "Beneficial consumptive use" in the Boulder Canyon Project Act: Section 4 (a) of the project act declares that the act shall not take effect, unless and until—

(1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, mentioned in Section 13 hereof, and the President by public proclamation shall have so declared, or (2) if said states fail to ratify the said compact within six months from the date of the passage of this act then, until six of said states, including the state of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven states signatory thereto, and shall have approved said compact without conditions, save that of such six-state approval, and the President by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this act, that the *aggregate annual consumptive use* (*diversions less returns to the river*) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin states by paragraph (a) of Article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

I desire to call attention, in the language of section 4 (a), to the line I have italicized, reading, "aggregate annual consumptive use (diversions less returns to the river)." That definition of consumptive use appears at one place only in the project act, in section 4 (a). Under the normal rules of statutory construction, a phrase once defined in a statute is presumed to retain the same definition throughout unless the legislature indicates to the contrary elsewhere.

Thus Congress hinged its assent to the compact and the plan of development of the lower basin upon (1) seven-State ratification of the compact, or (2) ratification by six States, including California, plus the enactment by California of a prescribed limitation act.

The second paragraph of section 4 (a) outlined a possible subcompact for the lower basin, which Congress would approve. Such compact has never been executed, hence this paragraph is of interest only because it affords some material for interpretation of the limitation act required by the first paragraph of the section.

The second paragraph of section 4 (a) reads:

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet, for exclusive beneficial *consumptive use* in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial *consumptive use* of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

I desire to call the attention of the committee to the words I have underscored twice in this paragraph, the words "consumptive use."

It will thus be noted that the term "consumptive use" appears three times in section 4 (a) of the Boulder Canyon Project Act, once with respect to California, twice with respect to Arizona. As to California, it is defined as "diversions less returns to the river." As to Arizona, it is not defined, but the reference to Arizona appears in the sentence immediately following the sentence containing the definition.

The two sentences are reciprocal, purporting to deal with all the waters available to the lower basin. Arizona says, nevertheless, that the phrase "consumptive use" in her case means "depletion," and hence has a meaning different from, and more favorable than, the meaning of the same phrase used as to California in the same section relating to the same subject matter and specifically defined. This extends far beyond Arizona's plea for a special method of accounting on the Gila. It extends to her uses from the main stream, which, like California's, are serviced by Hoover Dam storage. It means that she wants two methods of measurement applied to water released from the same reservoir and under similar contracts made under the same statute, one method crediting Arizona with all water salvaged on the main stream as well as on the Gila, the other method charging California with her full diversions. This is a rather extraordinary piece of statutory construction. It is no more extraordinary, however, than another claim of Arizona relating ot these same two sentences, to which we now turn.

B. Did Congress intend to exclude California from participation in the III (b) water?

It will be noted that neither the first paragraph of section 4 (a) which deals with water for California via the proposed California Limitation Act, nor the second paragraph, which deals with water

for Arizona via a proposed tri-State compact, makes any mention of the million acre-feet referred to in article III (b).

Arizona argues that silence as to the million acre-feet in the first paragraph is intended to bar California; that silence on the same subject in the second paragraph is intended to have the opposite effect, awarding the million acre-feet to Arizona. The first phase was consummated by action of the State of California in adopting the Limitation Act. The authorization to enter into a three-State compact was never carried out. However, the language used in authorizing the three-State compact is valuable as a guide to the interpretation of the earlier part of the section. It must be presumed that words and phrases were used in the same sense throughout the section. In fact, the two parts must be read together in order to make sense. Unless this is done, the three-State compact would provide no water at all for California.

In section 4 (a), the Congress was unquestionably attempting to provide a means of settling questions relating to the use of all of the waters available to the lower basin under the Colorado River compact. Nothing appears in the act nor in the debate which indicates any intent to leave the question of III (b) water open. California is limited to 4,400,000 acre-feet of water apportioned by article III (a) of the compact, "plus not more than one-half of any excess or surplus water unapportioned by" the Colorado River compact. Arizona, under the three-State compact, would have been allotted 2,800,000 acre-feet of water apportioned by article III (a) plus "one-half of the excess or surplus waters unapportioned by the Colorado River compact." These words are identical with the words used with reference to the California limitation. In neither the limitation on California nor the three-State compact is III (b) water mentioned. Unless we assume that Congress intended to leave the III (b) water out of consideration—that is to say, free of any restriction upon use by California at all—the only possible conclusion is that the word "unapportioned," as used in section 4 (a), includes the water referred to in article III (b) of the Colorado River compact, and that such water is part of the excess or surplus, one-half of which is available to California. By the same token, under the three-State compact, one-half of such water would have been available to Arizona. The two allotments, 4,400,000 acre-feet to California and 2,800,000 acre-feet to Arizona, plus 300,000 acre-feet to Nevada, exhaust the 7,500,000 acre-feet apportioned to the lower basin by article III (a). The two allotments of unapportioned water, one-half each to California and Arizona, exhaust the unapportioned water.

The two paragraphs of section 4 (a) of the Project Act, the first dealing with the California limitation, and the second with the proposed lower basin compact, must be read together as parts of a whole. The proposed lower basin compact, taken literally, and alone, would provide no water at all for California. The California allocation set out in the first paragraph should, by implication, be read into and form a part of the compact described in the second paragraph. Only by that means could the proposed compact be rounded out as a complete scheme for disposition of the lower basin water. It could not be

expected that California would enter into any such compact if it provided California no water. The two paragraphs of section 4 (a) dovetail together in such a way as to demonstrate that they are in pari materia. Identical expressions in the two paragraphs must, therefore, be given identical construction.

The suggested three-State compact (clauses 3 and 4) also contemplated that Arizona should have the exclusive beneficial use of the Gila and that except as to return flow reaching the Colorado River, the Gila should never be subject to diminution by reason of the allowance of water to Mexico under treaty. Arizona argues that this means that under the proposed compact the Gila water was to be in addition to the 2,800,000 acre-feet of III (a) water theretofore mentioned. By compact definition, III (a) water is water of "the Colorado River system," a phrase which includes the Gila. Arizona's argument is, thus, that the 2,800,000 acre-feet proposed for Arizona, although described as III (a) water, that is, system water was intended to be taken from the main stream only and the use of the waters of the Gila would constitute a firm right in addition thereto.

That interpretation presents a mathematical impossibility. That the uses on the Gila must be charged to III (a) water is clear from the language of the compact which says that that apportionment "shall include all water necessary for the supply of any rights which may now exist." At the time the compact was written, the rights on the Gila were well established and "existed." To consider the Gila as an addition to the 2,800,000 acre-feet would carry the proposed apportionment of III (a) water to Arizona, together with those made to the other States, far beyond the figure of 7,500,000.

The language of clauses 3 and 4 of the proposed three-State compact can be reconciled with clauses 1 and 2 of that compact, and with the Colorado River Compact, only by considering the use of the Gila, not as an addition to, but as included within the III (a) water which would have been available to Arizona under the proposal. If the proposed three-State compact had been adopted, the language of clauses 3 and 4 would have had the effect of protecting the Gila from diversion for uses out of the State of Arizona and as limiting the draft to serve the Mexican burden to the water in the main stream.

In the light of Mr. Carpenter's explanation of the compact, the legislative history of the project act and the internal evidence of the text of the Project Act, it is clear that the Congress and California intended that California should participate in III (b) water.

Not only is this the logical meaning of section 4 (a) of the project, but its legislative history supports it.

Section 4 (a) passed through 17 successive stages in the Senate. Not one Senator nor one draft of amendment disclosed any intent to exclude California from participation in the million acre-feet of III (b) water, and every Senator who faced that question expressed the intent that California should participate in that million acre-feet.

The various forms of amendments which were considered, and the explanations given by their authors, make it clear that the question before them was whether California should have 4,600,000 or 4,200,000 acre-feet of the waters apportioned by article III (a) of the compact;

and that they all intended California to have half the remaining waters, whatever those waters comprised.

The essential points of this legislative history are these:

The committee reported out the Swing-Johnson bill in the Seventieth Congress with an amendment (Congressional Record, 70th Cong., 1st sess., p. 5025) which provided that the Government's water contracts should

> not provide for an agreegate annual consumptive use in California of more than 4,600,000 acre-feet of the water allocated to the lower basin by the Colorado River Compact mentioned in section 12 and one-half of the unallocated excess and/or surplus water—

and required California to ratify that limitation.

This was the first session of the Seventieth Congress, the spring before the project Act was taken up and passed.

On May 19, 1928, Chairman Phipps of the committee printed a proposed amendment making the compact inoperative until either seven States ratified it, or, failing that, until six States did so and California enacted a limitation act restricting her uses to 4,600,000 acre-feet of the waters apportioned to the lower basin States by the Colorado River Compact and/or more than one-half of any excess or surplus waters unapportioned by the compact.

We are still dealing with the session preceding the session at which this bill became law. The session in the spring of 1928 ended in an Arizona filibuster, the filibuster to which Senator Hayden referred when he testified the other day.

On May 28, 1928, Senator Pittman, of Nevada, placed in the record (70th Cong., p. 10259) a suggested amendment. It proposed a condition making the project act inoperative until all seven States had ratified the compact and California had enacted an act limiting her uses to 4,200,000 acre-feet of III (a) water, 500,000 acre-feet of III (b) water, and one-half of the excess or surplus. It also authorized an agreement among Arizona, California, and Nevada disposing of the remainder of the water available to the lower basin; thus of the $7,500,000 acre-feet of III (a) water, 300,000 acre-feet to Nevada and 3,000,000 acre-feet to Arizona; of the III (b) water, 500,000 acre-feet to Arizona; and to Arizona one-half of the excess or surplus.

There the matter stood when consideration of the Swing-Johnson bill was halted by an Arizona filibuster at the end of the first session of the Seventieth Congress.

When the second session convened in December 1928 the Swing-Johnson bill was the unfinished business. There was no filibuster in the final session of the Seventieth Congress, which resulted in enactment of the Boulder Canyon Project Act. The filibuster took place the preceding spring.

On December 5, 1928, Senator Hayden printed a proposed amendment which was identical with that previously suggested by Senator Pittman. I have here a photostat of the Hayden amendment as printed December 5, 1928, which I have reproduced in a parallel column with the provision of section 4 (a) of the Boulder Canyon Project Act as passed by the Senate, to indicate the close correspondence between the proposal originally made by Senator Hayden, which in turn was identical with that made by Senator Pittman the previous spring, and the act as finally enacted.

Senator Hayden's draft as printed December 5, 1928

[See Cong. Record, 70th Cong., 2nd Sess., Dec. 6, 1928, p. 162)

70TH CONGRESS
2D SESSION

H. R. 5773

IN THE SENATE OF THE UNITED STATES

DECEMBER 5, 1928

Ordered to lie on the table and to be printed

AMENDMENT

Intended to be proposed by Mr. HAYDEN to the bill (H. R. 5773) to provide for the construction of works for the protection and development of the lower Colorado River Basin, for the approval of the Colorado River compact, and for other purposes, viz: Strike out all of lines 1 to 18, both inclusive, and insert in lieu thereof the following:

"SEC. 4 (a). This Act shall not take effect and no authority shall be exercised hereunder, unless and until the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact mentioned in section 12 hereof, and the President, by public proclamation, shall have so declared: *Provided*, That the ratification act of the State of California

As Passed by the Senate

70TH CONGRESS
2D SESSION

H. R. 5773

IN THE HOUSE OF REPRESENTATIVES

DECEMBER 15, 1928

Ordered to be printed with the amendment of the Senate

AN ACT

To provide for the construction of works for the protection and development of the lower Colorado River Basin, for the approval of the Colorado River compact, and for other purposes.

* * * * * * * * * * * * * * * *

SEC. 4 (*a*). *This Act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this Act, and no water rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claims to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, mentioned in section 12 hereof, and the President by public proclamation shall have so declared, or (2) if said States fail to ratify the said compact within six months from the date of the passage of this Act then, until six of said States, including the State of California, shall ratify said compact and shall consent to waive the provisions of the*

SECTION 4 (a), BOULDER CANYON PROJECT ACT—Continued

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shall contain a provision agreeing that the aggregate annual consumptive use by that State of waters of the Colorado River shall never exceed 4,200,000 acre-feet of the water apportioned to the lower basin by paragraph (a), of Article III of said compact, and that the aggregate beneficial consumptive use by that State of waters of the Colorado River shall never exceed 500,000 acre-feet of the water apportioned by the compact to the lower basin by paragraph (b) of said Article III; and that the use by California of the excess or surplus waters unapportioned by the Colorado River compact shall never exceed anually one-half of such excess or surplus waters; and that the limitations so accepted by California shall be irrevocable and unconditional, unless modified by the agreement described in the following paragraph, nor shall said limitations apply to water diverted by or for the benefit of the Yuma reclamation project for domestic, agricultural, or power purposes except to the portion thereof consumptively used in California for domestic and agricultural purposes.

"The said ratifying act shall further provide that if by tri-State agreement hereafter entered into by the States of California, Nevada, and Arizona the foregoing limitations are accepted and approved as fixing the apportionment of water to California, then California shall and will therein agree (1) that of the 7,500,000 acre-feet annually appor-

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first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and shall have approved said compact without conditions, save that of such six-State approval, and the President by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph a of Article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to

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tioned to the lower basin by paragraph (a) of Article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 3,000,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) of the 1,000,000 acre-feet in addition which the lower basin has the right to use annually by paragraph (b) of said article, there shall be apportioned to the State of Arizona 500,000 acre-feet for beneficial consumptive use, and (3) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (4) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (5) that the waters of the Gila River and its tributaries shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of Article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters apportioned by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply one-half of any deficiency which must be supplied to Mexico by the lower basin, and (6) that the State of California shall and will further mutually agree with the States of

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Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which can not reasonably be applied to domestic and agricultural uses, and (7) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact."

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the lower basin by paragraph (a) of Article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of Article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water

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and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said Tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

I shall point out the differences that developed between the Hayden proposal and the bill as passed, in order to emphasize certain points.

The Hayden amendment specifically divided the million acre-feet between Arizona and California. That appears, Mr. Chairman, in the left-hand column of the photostat I have handed you, page 2, lines 5 to 9 of the Hayden amendment. It reads, as to the million acre-feet, that—

the aggregate beneficial consumptive use by that State—

California—

of waters of the Colorado River shall never exceed 500,000 acre-feet of the water apportioned by the compact to the lower basin by paragraph (b) of said article III.

With respect to Arizona, it provided, at page 3, lines 5 to 9, as follows:

Of the 1,000,000 acre-feet in addition which the lower basin has the right to use annually by paragraph (b) of said article—

that is paragraph (b) of article III—

there shall be apportioned to the State of Arizona 500,000 acre-feet for beneficial consumptive use.

To pause there, I may say that this evidence would appear to dispose of any notion that anyone at the time of consideration of the Boulder Canyon Project Act thought that this million acre-feet was to be found flowing in the Gila. If it was, was it the intention of the sponsor of this amendment to grant one-half of the water flowing in the Gila to California, to come over an take it and export it?

Obviously the amendment was dealing with main-stream water, the only water physically available to California.

The difference between Senators Phipps' and Hayden's proposals, as several Senators pointed out, aside from the issue of six-State versus seven-State ratification, amounted to 400,000 acre-feet of III (a) water. Both thought that they were dividing everything else equally, including the million acre-feet of III (b) water. Senator Hayden's amendment specifically made that division.

I shall come to other features of the Hayden amendment and trace them into the final bill as passed by the Senate, at a later point in this presentation.

For parliamentary reasons, the Phipps amendment became the working document before the Senate. Senator Hayden withdrew his amendment, of which I have handed you a copy, and proceeded thereafter by offering amendments to the Phipps amendment. As it finally emerged, section 4 (a) included the alternative of six-State ratification, adopted a compromise of 4,400,000 acre-feet as between the Phipps proposal of 4,600,000 and Hayden's of 4,200,000 with respect to the limitation on California's use of III (a) water; permitted California to use one-half of the excess or surplus unapportioned by the compact; authorized, but did not require, a lower-basin compact which would apportion, of the III (a) water, 300,000 acre-feet to Nevada and 2,800,000 acre-feet to Arizona; and permitted Arizona, like California, to use one-half of the excess or surplus water unapportioned by the compact. But all reference to the million acre-feet of III (b) water was deleted. What did the Congress intend with respect thereto? To withdraw that million acre-feet from both States? This

seems scarcely logical. To leave it free of any limitation, and permit either State to take it all? That is perhaps arguable. To deny all of it to California and give all of it to Arizona? This requires us to assume, first, the remarkable statutory construction that identical phraseology in the two sentences on the same subject matter in the same section is to have opposite meanings. There is, to the contrary, evidence that the Senate believed the million acre-feet to be a part of the unapportioned excess or surplus, and intended California to have half of that excess or surplus, whatever it might contain.

At this point may I revert again to the photostat I have handed you. I have drawn lines, which I suppose cannot be readily reproduced in the final record, in three colors, to show where in the section as passed by the Senate the deletion occurred corresponding to the reference to the half-million acre-feet for California and for Arizona. You will see that the deletion is clean-cut. The 500,000 acre-feet comes out in its entirety as to both of them.

May I call attention also at this point to another interesting point here. In the Hayden amendment, page 3, line 11, appeared the following among the items which should appear in the lower-basin compact to which Congress was giving its advance approval:

(4) That the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State.

That language survived. It appears in the section as it passed the Senate at page 3, line 7, renumbered to read:

(3) That the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State.

It is argued by Arizona witnesses that this language which I have just read appearing in the project act as finally enacted represents the million acre-feet of III (b) water, and that by that reference Congress intended that Arizona should have it all.

If that were the case, then what was intended in the original Hayden amendment from which this language evolved? It appeared there, too. But there also appeared in the Hayden amendment specific disposition of the million acre-feet, 500,000 to Arizona, 500,000 to California. Was it intended to dispose of a million acre-feet twice? Obviously not. The item which appeared as item (4) in the original Hayden amendment and as item (3) in the bill as passed by the Senate, simply was intended as reassurance that the State of Arizona should continue to have the exclusive beneficial use of the Gila and that the claim theretofore advanced from time to time that the outflow of the Gila River had been in part appropriated by California through diversions for Imperial Valley, should be waived. It had been asserted at various times that the appropriations made for diversion into Imperial Valley, which at that time was below the inflow of the Gila, established a prior appropriation to part of the Gila waters. This language waived that construction, I take it, and had no further intent except to reassure Arizona on that point.

Now, in explaining the original amendment (printed December 5, 1928), Senator Hayden said (Congressional Record, December 6, 1928, p. 165), referring to the photostat which I handed you:

Mr. HAYDEN. The provision in the amendment is that the State of California shall agree not to use more than 4,200,000 acre-feet of the water apportioned in perpetuity to the lower basin, and not more than 500,000 acre-feet of the addi-

tional 1,000,000 acre-feet which the compact authorizes to be appropriated in the lower basin.

That is strictly accurate language in both particulars. He carefully distinguished between the water apportioned, the 7,500,000, and the water which the compact authorized to be appropriated, that is, the additional million. He recognized specifically the intent that California might have the right to appropriate one-half of that million acre-feet.

At a later point, Senator Hayden said (p. 174):

Mr. HAYDEN. The hour is getting late. If I may, I should like to continue the reading of the amendment that I have offered so that I may explain its terms. I have read the proposal now contained in the bill as reported to the Senate and as recommended by the Senate Committee on Irrigation and Reclamation for the purpose of pointing out that the committee placed in the bill the 4,600,000 acre-feet of water, which, as I have said, was the demand made by California; whereas in the amendment that I have offered is 4,200,000 acre-feet of water, which is the quantity recommended for apportionment to California by the governors of the four upper basin States. Thus far the provisions are the same except for the difference of 400,000 acre-feet. To go on with the amendment, which provides further——

and that the aggregate beneficial consumptive use by that State of waters of the Colorado River shall never exceed 500,000 acre-feet of the water apportioned by the compact to the lower basin by paragraph (b) of said article III—

That refers to the extra million acre-feet apportioned to the lower basin by the Colorado River compact. So that, adding together the 4,200,000 acre-feet apportioned by paragraph (a) of article III of the Colorado River compact and the 500,000 acre-feet apportioned to the lower basin by paragraph (b) of the same article of the compact the total quantity of water which we ask the State of California to be limited to is 4,700,000 acre-feet out of the main stream of the Colorado River, which is 100,000 acre-feet more than California demanded at Denver.

At page 174, explaining his proposal for a lower basin compact, Senator Hayden said:

I have read what California is required to do and how that State is limited. Let me now tell the other side of the story, as it appears in the amendment.

Then he reached the provision in his amendment relating to III (b) water for Arizona. This, Mr. Chairman, is the item appearing in the photostat I have handed you, at page 3, line 5, of the Hayden amendment. He said:

* * * of the 1,000,000 acre-feet in addition which the lower basin has the right to use annually by paragraph (b) of said article, there shall be apportioned to the State of Arizona 500,000 acre-feet for beneficial consumptive use—

Again dividing the water equally with California so far as the additional million acre-feet are concerned——

On December 8, 1928, Senator Bratton printed a proposed compromise, which read:

* * * the ratification act of the State of California shall contain a provision agreeing that the aggregate annual consumptive use by that State of waters of the Colorado River shall never exceed 4,400,000 acre-feet of the water apportioned to the lower basin by paragraph (a) of article III of said compact, and that the aggregate beneficial consumptive use by that State of waters of the Colorado River shall never exceed 500,000 acre-feet of the water apportioned by the compact to the lower basin by paragraph (b) of said article III; and that the use by California of the excess or surplus waters unapportioned by the Colorado River compact shall never exceed annually one-half of such excess or surplus waters.

The following colloquy then took place (p. 333):

Mr. KING. I will ask the Senator if it is not a fact that at the time when the governors' conference considered the matter and recommended a settlement upon a basis of 4,200,000 acre-feet to California there had not been fully discussed and fully appreciated the fact that there was probably a million acre-feet subject to capture which, under the compact, was allocated to Arizona and to California, so that if 4,200,000 acre-feet were awarded out of the 7,500,000 there would be an additional 500,000 acre-feet out of this 1,000,000 acre-feet which, under the compact, was to be allocated to the two States, so California in the aggregate would get 4,700,000 acre-feet.

This next is an interesting reply. This is from the Senator whose figure ultimately prevailed in the compromise.

Mr. BRATTON. That is true if the estimated surplus actually exists. At the same time, Arizona would get her 3,000,000 acre-feet agreed to by the governors as her just share of the allocated water, *plus 500,000 acre-feet, being one-half of the unallocated surplus*, so that while California would get 4,700,000 acre-feet Arizona would get 3,500,000 acre-feet. *The surplus to which the Senator from Utah refers would be equally divided between Arizona and California.* Neither State would get an advantage by reason of the division of the surplus. [Emphasis supplied.]

Senator Bratton, whose compromise figure of 4,400,000 acre-feet as to the III (a) uses was ultimately accepted, was thus clear that the million acre-feet of III (b) uses was part of the "unallocated surplus."

On December 10, 1928, Chairman Phipps printed an amendment, reading, on this point:

* * * the aggregate annual consumptive use (diversions less returns to the river) *of water of and from the Colorado River for use in the State of California* * * * *shall not exceed 4,600,000 acre-feet of the waters apportioned to the lower basin States by the Colorado River compact,* plus not more than one-half of any excess or surplus waters unapportioned by said compact * * *.

It will be noted that the Phipps amendment did not read "waters apportioned by article III (a) of the compact," but that the limitation applied to "waters apportioned by the Colorado River compact" plus one-half of excess or surplus, no mention being made of article III (a). This distinction becomes important, as will shortly appear.

Senator Bratton of New Mexico proposed an amendment to the Phipps amendment changing the figure "4,600,000" to "4,400,000." This amendment was agreed to (p. 387).

While the matter was in this stage, Senator Phipps gained the floor and said (p. 459):

Referring to the amendment which is now before the Senate, in order to remove any possible misunderstanding regarding the 4,400,000 acre-feet of water, *I desire to perfect the amendment* by inserting, on page 3, line 4, after the word "by", the words "paragraph (a) of article 3 of," so that it will show that the allocation of water refers directly to the 7,500,000 acre-feet of water that are mentioned in paragraph 3.

Senator Phipps referred to the additional language as a "perfecting" amendment, that is, an amendment to improve language without changing the substance of the provision.

If the right to increase set out in paragraph (b) of article III had constituted an "apportionment," the first Phipps amendment would relate to an apportionment of 8,500,000 acre-feet. If the right to increase was not an apportionment, the amendment would relate to an apportionment of 7,500,000 acre-feet. The perfecting amendment, adding the references to paragraph (a) of article III, unquestionably

related to an apportionment of 7,500,000 acre-feet. It is clear that the Senator considered the words "apportioned by the compact" to be synonymous with the phrase "apportioned by paragraph (a) of article III of the compact." He did not, therefore, consider the water referred to in paragraph (b) "apportioned" water. It is, accordingly, in the class of "excess or surplus waters unapportioned" by the compact.

Senator Phipps would not have referred to his amendment as a "perfecting amendment," if he had thought the effect would be to change the meaning so that, instead of relating to an aggregate of 8,500,000 acre-feet, it would relate to 7,500,000 acre-feet. That would be a substantial change, and not a perfecting amendment.

Senator Hayden offered no objection to the perfecting amendment, saying:

> * * * it makes it even more in conformity with the amendment that I now offer.

Senator King, of Utah, obtained the floor to comment on the Phipps amendment. The following colloquy then occurred between Senator King and Senator Johnson of California (p. 459):

> Mr. KING. If I may have the attention of the Senator from California and the Senator from Colorado, I direct attention to line 5, page 3, of the amendment offered by the Senator from Colorado. Let me read back a few words: "Plus not more than one-half of any excess or surplus waters unapportioned by said compact." I was wondering if there might not be some uncertainty as to what surplus waters were therein referred to. I think it was the intention to refer to the surplus waters mentioned in paragraph (b) of article 3 of the compact, being the 1,000,000 acre-feet supposed to be unappropriated.
>
> Mr. JOHNSON. No; that is not quite my understanding. It is by no means certain that there is any other, and it is by no means certain that there is the 1,000,000; but the language referred to any other waters.
>
> Mr. KING. Speaking for myself, I have no objection; but I was under the impression that the purpose was to link it with paragraph (b), so as to be sure that California was to receive one-half of the 1,000,000 acre-feet.
>
> Mr. JOHNSON. Not necessarily. This gives one-half of the unapportioned water, and I think it is a better way to leave the matter.
>
> Mr. KING. If it is sufficiently certain to suit the Senators of the lower basin, I have no objection.
>
> Mr. JOHNSON. I think it is.

It was clear to Senator King that the III (b) water was "surplus."

The effect of Senator Johnson's comments was to deny any distinction between the 1,000,000 acre-feet of III (b) water and any other excess or surplus. Understanding the word "unappropriated," as used by Senator King, as meaning "unapportioned," Senator Johnson construed the Phipps amendment, read in connection with the compact, as giving California one-half of all the unapportioned water, inclusive of the 1,000,000 acre-feet. He was not sure that there would be as much water in the surplus as a million acre-feet, any more than Senator Bratton had been, but whatever the surplus amounted to, California was to be entitled to one-half, under the language proposed by either Senator Hayden or Senator Phipps or Senator Bratton.

On December 12, 1928, immediately after the foregoing colloquy, Senator Hayden offered an amendment to authorize a lower basin compact. It was in the language which now appears in the act, except that instead of being permissive it requires the proposed three-State compact to appear in the California Limitation Act. In that respect

it was like Senator Hayden's original amendment of December 5, of which I have handed you a photostat. If you will note on page 2, line 20 of that photostat, it required that the said ratifying act—that meant the California ratification—"shall further provide," and so on "that if by tri-State agreement hereafter entered into," and so on.

Unlike Senator Hayden's amendment of December 5, 1928, his new one of December 12 omitted any proposal for an allocation of one-half of the million acre-feet of III (b) water to Arizona.

In explanation of this amendment, Senator Hayden said, as to this point (p. 460):

> The second proposal in my amendment is that the State of Arizona may annually use one-half of the surplus or unapportioned water, which is likewise a corollary to the proposal made by the Senator from Colorado, which likewise disposes of the total quantity of surplus or unapportioned waters in the lower basin.

Senator King, in a further effort to remove any possible misunderstanding, put this question to Senator Hayden of Arizona (p. 460):

> *Does the Senator interpret the compact to mean that if there is any unappropriated water in addition to the 1,000,000 acre-feet referred to in the compact, that that is subject to the same disposition or division as the 1,000,000 acre-feet?"*

Senator Hayden replied:

> *There is no question about it, in the light of the statement I have just read * * *.*

In reviewing the record of the Senate debates in which the text of the Project Act was hammered out, it is apparent that the Senators who participated in the discussion of section 4 (a) of the act, used the word "apportioned" as applying to the 15,000,000 acre-feet referred to in article III (a) of the compact and considered all additional water to be in the class of unapportioned excess or surplus water. In adopting the Limitation Act, with this record before it, the California Legislature was entitled to view the matter in the same light. The intent of the parties to the resulting statutory compact is clear and controlling.

I should like to emphasize, Mr. Chairman, that it was not section 4 (a) of the Boulder Canyon Project Act which made effective the limitation upon California's use of water. It was the acceptance of that proposal by the California Legislature which made the limitation operative. There are two parties to the resulting statutory compact: the Congress of the United States and the legislature of California.

I should like to emphasize also that before the Senate finally acted on section 4 (a), on the motion of Senator Pittman, the language which made the inclusion of the tri-State proposed compact mandatory in the California Self-Limitation Act was stricken out. He called to the attention of the Senate the fact that that would be coercive; that Congress could not dictate to the State of California what that State should enact as part of an agreement with other States. It might only describe what should be the reciprocal compact between the Congress and the legislature of California. So, the language of the Hayden amendment, which would have required that the terms of the proposed three-State compact appear in the California Limitation Act, was deleted. Instead, there was substituted an authorization, a permissive authorization, for a compact.

On December 12, 1928, Senator Pittman asked Senator Hayden to perfect his amendment, with the following colloquy (p. 469):

But there is one thing in this amendment—and I want the attention of the Senator from Arizona to this—which I do not like. I do not like the form of it. I do not like the method of getting at it. It provides:

"The said ratifying act shall further provide that if by tri-State agreement hereafter entered into by the States of California, Nevada, and Arizona the foregoing limitations are accepted and approved as fixing the apportionment of water to California, then California shall and will therein agree."

That does not seem to be the regular form of entering into an agreement, to have California first proceed to limit herself as to what she will do as a consideration for the passage of this measure. I think it should be a mutual agreement between the three States. I do not think we should bind up this tri-State agreement with ratification. I did believe that it was essential to have California limit herself as to the amount of water she would take in a ratification, in view of the fact that possibly Arizona would never ratify. But this is attempting to have the State of California in advance, as a condition of the taking effect of this measure, state that she will enter into certain agreements with Arizona. In other words, it is coercive.

Mr. HAYDEN. Is it any greater coercion, if the Senator will permit me, than for the State of California to insist that, as a condition to her ratification of the main contract, Congress shall do certain things, to wit, provide storage to the extent of 20,000,000 acre-feet of water in the main stream?

Mr. PITTMAN. I do not consider that coercion.

Mr. JOHNSON. It was impossible to hear what the Senator from Arizona said. All I heard was "the State of California."

Mr. HAYDEN. I withdraw the remark, because I do not want to have any remark I might make misinterpreted.

Mr. PITTMAN. I do not think that the demand on the part of California that there should be a storage of at least 20,000,000 acre-feet of water is coercion. I think it is essential, as shown by the report of the commission. A demand for what is essential is not coercion.

This is what I suggest, that we provide for an agreement between the three States, and let them enter into it if they want to, but if they do not want to, let them stay out of it. That is not coercing a State.

This is what I propose, to strike out all of the Hayden amendment down to and including the word "agree," on page 1, in line 6, and in lieu thereof insert the following:

"The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide—

"Then go ahead and put down the provisions of the Hayden amendment, and at the end of the Hayden amendment put in a seventh paragraph, which shall read:

"Said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada."

Senator Hayden thereupon accepted the Pittman suggestion and perfected his amendment by incorporating the proposed change (p. 469).

The perfected Hayden amendment was accepted by Senator Johnson in the following colloquy (p. 472):

Mr. JOHNSON. * * * With the distinct understanding that this authorization is one that is after all an authorization that is wholly unnecessary, because the parties may, in any fashion they desire, meet together and contract and subsequently come to Congress for ratification of that contract; that there is no impress of the Congress upon the terms, which might be considered coercive to any one of those States, I am perfectly willing to accept the amendment.

Again, at page 472:

Mr. JOHNSON. That is all right; but what I want to make clear is that this amendment shall not be construed hereafter by any of the parties to it or any of the States as being the expression of the will or the demand or the request of the Congress of the United States.

Mr. PITTMAN. Exactly, not.

Mr. JOHNSON. Very well, then.

Mr. PITTMAN. It is not the request of Congress.
Mr. JOHNSON. I accept the amendment, then.

On December 14, 1928, the following colloquy took place (p. 576):

Mr. KING. But, as I understand, that limitation of 4,400,000 acre-feet exists only in the event of a six-State compact, not a seven-State compact. We hope, of course, that there will be a seven-State compact, because, if not, the upper States will not be fully protected.

Mr. PITTMAN. But now, under the so-called Hayden amendment, there is exactly the same apportionment of the water.

Mr. KING. Assuming that that shall be accepted by California and Arizona?

Mr. PITTMAN. Exactly.

Mr. KING. But, of course, we may not coerce either of those States into an acceptance of the so-called Hayden-Pittman amendment.

Mr. PITTMAN. If there is a seven-State compact, it will be in accordance with the treaty which the Senate consented to, which gives the same amount of water to California that she would get under a six-State compact, and it provides also that the six-State compact ratification holds, unless all three of those States do ratify.

Mr. KING. I concede that.

The CHAIRMAN. May I interrupt at this point to say that, except for the time occupied by the Chair in one or two questions, an hour and a half has now elapsed.

Mr. ELY. That is right.

(Discussion off the record.)

Mr. ELY. On December 14, 1928, the Senate approved the Swing-Johnson Act. Both Arizona Senators voted against the measure which Arizona says now settled all of the issues with California, particularly the disposition of the III (b) water and the measurement of consumptive use, in Arizona's favor.

On December 21, 1928, President Coolidge approved the bill, and it became the Boulder Canyon Project Act.

Following the enactment of the Project Act, a series of efforts were made to negotiate a lower-basin compact. They failed. The records of proposals and counterproposals make clear (1) that both States recognized that under the Limitation Act California was entitled to half the 1,000,000 acre-feet of III (b) water, and (2) that Arizona should be accountable for actual consumptive uses on the Gila, which were assumed by both sides to be about 2,500,000 acre-feet.

For example, "consumptive use" was defined by the Arizona-Colorado River Commission as follows in 1929 (Arizona-Colorado Commission, Explanation of Terms in the Colorado River Controversy between Arizona and California, by Hon. Charles B. Ward, chairman of the Colorado River Commission, August 1, 1929, p. 5):

(d) *Consumptive use.*—This term means where water is consumed. An illustration of consumptive use is where a farmer takes through a ditch 4 acre-feet of water a year. He puts it all on his land, but 1 acre-foot runs off through his waste ditch back into the river. Another acre-foot runs down through the land striking a gravel bed and drains back into the river. Thus, there has been only 2 acre-feet consumed. This 2 acre-feet used up is called consumptive use.

Arizona had never thought of the depletion theory. She construed "consumptive use" as meaning the same in her case as Congress had defined it to mean in California's case—"diversions less returns to the river."

I now come to the fourth topic, the Colorado River Supreme Court cases.

IV. THE SUPREME COURT CASES

A. The "Injunction" case

In *Arizona* v. *California* (283 U. S. 423), Arizona retained eminent counsel, Hon. Dean Acheson (now Secretary of State) and Hon. Clifton Mathews (now a judge of the Ninth Circuit Court of Appeals), and sued to enjoin construction of Hoover Dam, alleging that the Boulder Canyon Project Act and the Colorado River Compact were invalid. This was a curious way to treat documents which Arizona now says settled all issues in her favor. Arizona's pleadings and briefs shed considerable light on this controversy.

1. As to the quantity of consumptive uses on the Gila River with which Arizona is chargeable: Arizona's bill of complaint in *Arizona* v. *California* (283 U. S. 423 (1930), art. VII), alleged (p. 7):

> * * * Of the appropriated water so diverted, used and consumed in Arizona, 2,900,000 acre-feet are diverted from the Gila River and its tributaries * * *

Arizona's brief in *Arizona* v. *California* (283 U. S. 423), said (p. 16):

> * * * Prior to June 25, 1929, there had been appropriated in Arizona 3,500,000 acre-feet of water from the Colorado River and its tributaries below Lee Ferry, of which 2,900,000 acre-feet had been appropriated from the Gila River.

2. As to whether the uses on the Gila are accountable under article III (a) or article III (b) of the compact: Arizona alleged and argued that the uses on the Gila River, being perfected rights, were accountable under article III (a) and hence reduced by that amount the quantity of III (a) water which Arizona might claim out of the main stream if she ratified the compact. Thus (bill, art. VII, p. 8):

> *All of the water of the Gila River and its tributaries was appropriated and put to beneficial use in Arizona and New Mexico prior to June 25, 1929.* There was not on said date, nor has there been since, nor is there now, any unappropriated water in the Gila River or any of its tributaries.

Article XIV of the bill of complaint alleged (p. 17):

> (3) Said compact defines the term "Colorado River System" so as to include therein the Gila River and its tributaries, of which the total flow, aggregating 3,000,000 acre-feet of water annually, was appropriated and put to beneficial use prior to June 25, 1929. * * * *Since said compact provides that the water apportioned thereby shall include all water necessary to supply existing rights, the effect of including the Gila River and its tributaries as a part of said system would be to reduce by 3,000,000 acre-feet annually the quantity of water now subject to appropriation in Arizona.*

Arizona now repudiates Mr. Acheson's statement, both as to the classification and the quantity of the uses on the Gila.

Article XIX of the bill of complaint, referring to the tri-State compact authorized by section 4 (a) of the Boulder Canyon Project Act, alleged (p. 22):

> Said proposed apportionment of 2,800,000 acre-feet of water is less than the quantity of water already appropriated in Arizona, and would provide no water for future appropriation in said State.

Arizona's brief stated (p. 38):

> All existing uses must be satisfied from the 7,500,000 acre-feet apportioned by article III (a). Arizona has existing uses totaling 3,500,000 acre-feet.

From a previous quotation it is clear that the 3,500,000 is made up of 2,900,000 on the Gila, and the balance elsewhere.

3. As to whether the waters referred to in article III (b) of the compact are "apportioned" or "surplus" Arizona's bill of complaint (art. XIV) alleged:

(2) Said compact does not apportion or attempt to apportion all of the water of said Colorado River system, but *attempts to apportion only 15,000,000 acre-feet thereof, and leaves unapportioned the remaining water of said system*, aggregating 3,000,000 acre-feet annually.

Arizona's brief, in 283 U. S. 423, stated (p. 4):

To each basin is apportioned the annual beneficial consumptive use in perpetuity of 7,500,000 acre-feet of water, which must satisfy all existing appropriations as well as all future appropriations. There are existing appropriations totaling 6,500,000 acre-feet annually in the lower basin and 2,500,000 acre-feet annually in the upper basin. The upper-basin States agree not to deplete the flow of the mainstream at Lee Ferry below 75,000,000 acre-feet for any period of 10 consecutive years reckoned in continuing progressive series. *The flow of the system in excess of 15,000,000 acre-feet annually is not apportioned.*

Arizona's brief further stated (p. 33): And this is very significant language. This is one of the very clear statements as to the intent and meaning of the Colorado River compact, in my opinion—

Under the compact, then, the only water of which the right to exclusive beneficial use in perpetuity may be acquired in the lower basin is the water apportioned to that basin. Such apportionment is limited to 7,500,000 acre-feet of water per annum by article III (a). The Colorado brief, page 40, contends that paragraph (b) of article III operates to increase this apportionment to 8,500,000 for the lower basin. This, we submit, is not the case. *If it had been intended to apportion the larger amount, the compact could easily have said so.* The difference in language between paragraphs (a) and (b) is plain, and the difference in meaning is clear. Paragraph (b) *does not apportion in perpetuity*, as does paragraph (a), any beneficial use of water. It is very careful not to do this. It is to be read with paragraph (c) and relates solely to the method of sharing between the basins any future Mexican burden which this Government might recognize. This burden is to be satisfied first out of "surplus" waters, and surplus waters are defined, not as surplus over quantities "apportioned," but as surplus over quantities "specified in paragraphs (a) and (b)." Any deficiency remaining is to be borne equally by the two basins. Thus the lower basin, which without paragraph (b) might use water in excess of its apportionment without acquiring any exclusive right in perpetuity thereto, is enabled to retain such uses to the extent of 1,000,000 acre-feet per annum against the first incidence of the Mexican burden. Thereafter it is entitled to require the upper basin to share from its apportionment equally in the satisfaction of any deficiency. *In other words, all that paragraphs (b) and (c) accomplish is to require the upper basin to reduce its apportionment in favor of Mexico before the lower basin is required to do so, the lower basin being entitled to contribute first, to the extent of 1,000,000 acre-feet, water which it may have used but to which it has no exclusive right in perpetuity—that is, water not apportioned to it.* The water apportioned is that to which exclusive beneficial use in perpetuity is given in paragraph (a), less any deductions which may have to be recognized as provided in paragraphs (b) and (c).

We think Mr. Acheson's analysis is correct. Arizona, reversing the position thus formally stated to the Supreme Court, now rejects Mr. Acheson's interpretation. Her present counsel argue that III (b) water is apportioned, and that it is found flowing in the Gila River, not the main stream. This presents interesting consequences to the old-established uses on the Gila, if their uses are of III (b) water, and hence, on Mr. Acheson's analysis, are to be sacrificed to Mexico before the III (a) water is yielded by the lower basin. Of course, these Gila uses are not of III (b) water at all, but are perfected rights protected

in perpetuity by article III (a), and it is fanciful to say, as Arizona now does, that the III (b) water is to be found flowing in the Gila.

4. As to the status of the 75,000,000 acre-feet guaranteed by the upper basin under article III (d) of the compact: Arizona's brief (p. 32) stated—this is still the first case:

> The provision in paragraph (d) of article III that the upper-basin States will not cause the flow of the river to be depleted below 75,000,000 acre-feet over 10-year periods, has, as the Colorado brief, page 41, correctly states, no bearing on the amount of the apportionment to the lower basin. This 75,000,000 acre-feet is not apportioned to the lower basin. Only so much of it may be appropriated as together with existing and future appropriations of water in or from tributaries entering the river below Lee Ferry will total 7,500,000 acre-feet per year. The 75,000,000 acre-feet includes all surplus waters which under paragraph (c) must first bear any Mexican burden, which may not be appropriated, and which are subject to apportionment after 1963. *It is fundamental to an understanding of the compact that the annual beneficial consumptive use in perpetuity of 7,500,000 acre-feet of water apportioned by it to the lower basin includes all beneficial consumptive use in perpetuity which may be made from the whole river system, and is not merely an apportionment of such uses in main-stream water flowing at Lee Ferry.* The agreement not to deplete the flow at Lee Ferry below the specified amount does not mean, and cannot under the plain words of the compact be construed to mean, that the guaranteed flow is apportioned to the lower basin or may be appropriated there. *As to this, at least, there can be no shadow of doubt.*

Here, again, Arizona now repudiates Mr. Acheson. She now says that article III (a) is effective only as to 7,500,000 acre-feet of main-stream water and article III (b) operative only on the Gila.

The statement in the brief of Colorado, New Mexico, and Nevada, referred to by Arizona above, was (p. 41):

> The balance of water supply between the two basins is preserved by a guaranty by the upper-basin States that they will not cause the flow of the river at Lee Ferry, to be depleted below an aggregate of 75,000,000 acre-feet for any period of 10 consecutive years reckoned in continuing progressive series. This guaranty has no direct relation to the aggregate allocation of 8,500,000 acre-feet per annum to the lower basin which is to be supplied out of that part of the whole Colorado River system within the lower basin.

That is the point, I think, Mr. Chairman, upon which the Chair engaged in colloquy with Mr. Debler the other day.

The Court refused the injunction, requested by Arizona, holding that Congress had constitutional power to authorize the construction of Hoover Dam. The Court did not construe the compact, saying that Arizona was not a party to it.

As to all of these questions discussed by Messrs. Acheson and Mathews in 283 U. S. 423, note the close correspondence with the views expressed by Judge Sloan in 1923, and, for that matter, with our own.

The CHAIRMAN. Did California controvert any of these points in that case?

Mr. ELY. Not with respect to the specific points that I have quoted here, so far as I recall. My recollection, Mr. Chairman, is that the issue made between California and the other States on the one hand, and Arizona on the other—at least from California's viewpoint—were primarily as to the validity of the project act and the right of Congress to authorize construction.

The CHAIRMAN. Would you be good enough to examine the California pleadings in this particular case and file with the committee for the record a statement indicating to what extent, if at all, these contentions that you have cited here on behalf of Arizona, as made by counsel, Mr. Acheson, were controverted by California?

Mr. ELY. I shall be happy to do so, sir. It may very well be there were some differences at that time, that I have forgotten, but in any event I will put in the extract you wish.

WASHINGTON 5, D. C., *May 5, 1949.*

Hon. JOSEPH C. O'MAHONEY,
Chairman, Senate Committee on Interior and Insular Affairs,
Senate Office Building, Washington, D. C.

MY DEAR SENATOR: Near the conclusion of my testimony on S. 75 and Senate Joint Resolution 4 on May 2, 1949, you asked me to present a statement as to whether in the case of *Arizona* v. *California* (283 U. S. 423) (the Boulder Dam injunction case) California in its briefs or otherwise controverted the views expressed in the Arizona brief, to wit, first, that the water of Colorado River referred to in article III (b) of the Colorado River compact was not "apportioned" water, and, second, that Arizona had made consumptive use of waters of the Gila River system in excess of 2,300,000 acre-feet per annum.

A careful examination made of the California briefs in that case discloses that California made no statement, directly, by inference, or by reference, controverting the positions of Arizona above mentioned.

Respectfully,

NORTHCUTT ELY.

There was controversy over water, but not over the meaning of the basic documents.

May I interrupt here, Mr. Chairman, to say that Arizona has made the point several times that California did not seek litigation before the California contracts were signed or before the projects were built in California. No such issues as those now raised by Arizona had been presented by her then. Anyone examining the Arizona pleadings, or the decision of the first Supreme Court case, will not find there the issues now presented by Arizona. There was no occasion to take any case to court to get the construction of the compact. We were all in accord as to what it meant, because it meant what we now say it means, and because Arizona then thought it meant that. She wanted no part of it; she did not like it.

B. The Perpetuation of Testimony case.—In the second Colorado River case, *Arizona* v. *California* (292 U. S. 341), Arizona sought to perpetuate the testimony of the negotiators of the Colorado River compact, because as the Court said (p. A786 of The Hoover Dam Documents):

Arizona claims that this paragraph, which declares:
"In addition to the apportionment in paragraph (a), the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum," means:
"That the waters apportioned by article III (b) of said compact are for the sole and exclusive use and benefit of the State of Arizona."

The Court rejected that construction, after considering what it called Arizona's "elaborate argument" (p. A788, The Hoover Dam Documents).

The CHAIRMAN. What was the date of that case?

Mr. ELY. That decision was handed down in 1934.

The CHAIRMAN. In the previous case?

Mr. ELY. In 1931.

The CHAIRMAN. Thank you.

Mr. ELY. The two decisions appear in full text in the Hoover Dam Documents, and are indexed there.

The CHAIRMAN. Yes, but I wanted those pages to appear in the record.

Mr. ELY. Yes, sir.

The Court said:

> Arizona is one of the States of the lower basin, and any waters useful to her are by that fact useful to the lower basin. But the fact that they are solely useful to Arizona, or the fact that they have been appropriated by her, does not contradict the intent clearly expressed in paragraph (b) (nor the rational character thereof) to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone.

At a later point, the Court said:

> Even if the construction to be given paragraph (b) of the compact were relevant to the interpretation of any provision in the Boulder Canyon Project Act, and such provision were ambiguous, the evidence sought to be perpetuated is not of a character which would be competent to prove that Congress intended by section 4 (a) of the 1928 act to exclude California entirely from the waters allotted by article III (b) of the lower basin and to reserve all of those waters to Arizona.

In this case Arizona did not make the claim which she makes now that the III (b) water is apportioned. She carefully avoided doing that. In 17 places in her brief, which I examined with some care, she said that this 1,000,000 acre-feet was water which the lower basin was "permitted to use." Apparently she feared that the Supreme Court might say that this water was apportioned, but that the California Limitation Act applied to only 4,400,000 acre-feet of apportioned water, namely, that apportioned by article III (a), leaving the III (b) water unrestricted.

If so, Arizona's fears may have been well grounded. The Court said:

> *The act (the Boulder Canyon Project Act) merely places limits on California's use of waters under article III (a) and of surplus waters;* and it is "such" uses which are "subject to the terms of said compact."
>
> There can be no claim that article III (b) is relevant in defining surplus waters under section 4 (a) of the act; for both Arizona and California apparently consider the waters under article III (b) as apportioned.

In a footnote the Court says:

> The Secretary of the Interior, in his brief, seems to be of the opinion that waters under article III (b) might be surplus waters under section 4 (a) of the act.

The briefs—there was no oral argument—are clear that neither Arizona nor California claimed that the III (b) water was "apportioned," and that the language quoted, whether it helps or hurts either State, is dicta.

I might say that Mr. Howard, Mr. Shaw, and I were of counsel for California in that case.

If the act "merely places limits on California's use of waters under article III (a) and of surplus waters," to use the language of the Court, and if the III (b) waters are apportioned as Arizona likes to say now, but are not "waters under article III (a)" nor "surplus waters," then it may very well be that Arizona has argued herself into the position that the Court, by these dicta, meant to say that the million acre-feet of III (b) water was in an unrestricted classification, open to appropriation by California without limitation. But whether or not the Court meant to open the whole million acre-feet to California, it is perfectly clear that the Court rejected Arizona's claim that all the III (b) water belonged to her, saying the intent of the compact was "to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone." And, having

reached that conclusion, it is fanciful to assume that the Court intended, without saying so, to reeverse that result and give Arizona indirectly the million acre-feet by casually calling it "apportioned." If the Court had so intended, it would have said so. It used the word "apportion," on which Arizona lays such stress, in the very sentence denying Arizona's claim to the exclusive use of that water.

The Court rejected what it called Arizona's "elaborate argument" and dismissed her suit.

C. The Equitable Apportionment case

I am omitting the Parker Dam suit which intervened here (*United States* v. *Arizona*, 295 U. S. 174 (1935)), because it does not bear on these points.

In the third Colorado River case, *Arizona* v. *California* (298 U. S. 558), Arizona, being dissatisfied with the results of the second case, decided to revert to Mr. Acheson's original position. She retained eminent counsel, Mr. James R. Moore, and sued the six States of the basin for an equitable apportionment on the premise that the project act and the compact meant what they said and she wanted none of them. The depletion theory, and the idea that the Limitation Act excluded California from III (b) water, were not suggested.

It is interesting to inquire here why, if Arizona is now correct in asserting that the Boulder Canyon Project Act decided all of the issues between California and Arizona in her favor, it was necessary for the State of Arizona to institute this third suit. All of the events upon which she now relies had occurred before the institution of that action.

In this case Arizona's pleadings and briefs make the following assertions:

Senator DOWNEY. Mr. Chairman, if I could announce to Mr. Ely that I believe he should consume whatever time is necessary, without reference to additional witnesses, I would be concurred in by Mr. Howard?

Mr. HOWARD. I yield to Mr. Ely.

Senator DOWNEY. I think it would be well to complete this phase of the testimony, and if unfortunately we cannot put on the other witnesses we have here, to allow the witnesses to insert their testimony.

The CHAIRMAN. May I say for the record that any part of this statement which Mr. Ely omits reading will be printed in the record as though read. I am sure there will be no objection to that.

Mr. ELY. Thank you sir. I desire, however, to leave adequate time for Mr. Howard.

(Discussion off the record.)

Mr. ELY. (1) As to the quantity of consumptive use on the Gila River with which Arizona is chargeable, the bill of complaint and brief were just as candid as Mr. Acheson's. The bill of complaint (art. VI) alleged (p. 12):

The average annual virgin flow of the Gila River into the Phoenix, Ariz., area is 2,359,000 acre-feet. Irrigation development has reduced the escape of such flow to approximately 644,000 acre-feet annually and has reduced the annual average discharge of the Gila into the Colorado River near Yuma to about *350,000 acre-feet. Further development on the Gila in the neighborhood of Phoenix now under construction will reduce the escape from that area to an average of about 300,000 acre-feet* and the discharge into the Colorado at Yuma to about 100,000 acre-feet annually, which will occur as the peaks of extraordinary floods which cannot practicably be conserved.

Article VII alleged (p. 13):

* * * *Of the virgin flow of the Gila in the Phoenix area, 2,885,000 acre-feet per year have been used and appropriated in Arizona and 15,000 in New Mexico. A large quantity of the waters of the Gila used for irrigation in and above the Phoenix area returns to the stream and is again diverted and used, with the result that the diversions exceed its virgin flow.*

That these figures are excessive may be granted. The difference between them and the figure of 2,300,000 acre-feet hereinabove stated as the inflow into, and the consumptive use in, the Phoenix area is explained by the following allegations in the third case (par. VI, p. 12):

The average annual virgin flow of the Gila River into the Phoenix, Ariz., area is 2,359,000 acre-feet.

And (par. VII, p. 13):

A large quantity of the waters of the Gila used for irrigation in and above the phoenix area returns to the stream and is again diverted and used, with the result that the diversions exceed its virgin flow.

It must be made crystal clear that under the California view there is no double charge by reason of use and reuse of the same water. The inflow into the Phoenix area is 2,300,000 acre-feet and substantially all of it is consumed. This could not happen by one diversion of that quantity, for some return flow to the Gila is inevitable. No matter how many times the water is rediverted, Arizona is chargeable only with the original inflow, which has been consumed. But of that amount, and not some theoretical virgin flow into the Colorado, Arizona has made beneficial consumptive use and with that amount Arizona should be charged.

This third case is interesting also as developing Arizona's theories about the California water contracts, which had been executed by the Secretary of the Interior in 1930-31. These contracts are referred to in more detail later. They aggregate 5,362,000 acre-feet. Bearing that figure in mind, note Arizona's allegations in her bill of complaint (pp. 25–27):

* * * the maximum quantity of Colorado River water which California may legally divert and consumptively use is:

Of water apportioned by par. (a), art. III, compact	4,400,000
One-half waters unapportioned	1,085,500
California's maximum legal rights	5,485,500

The foregoing quantities are in acre-feet per year and are based upon average annual discharges of the Colorado and Gila for the last 37 years for which records are available.

XIX

WATER CONTRACTS BETWEEN SECRETARY OF INTERIOR AND CALIFORNIA CORPORATIONS

The Secretary of the Interior, pursuant to the provisions of section 5 of the Boulder Canyon Project Act, during the years 1931 and 1933 entered into contracts with the California corporations named below for the storage in Boulder Reservoir and the delivery of Colorado River water for domestic and irrigation purposes in California, in acre-feet per annum, as follows:

Metropolitan Water District	1,100,000
Imperial Valley and others	3,850,000
City of San Diego	112,000
Palo Verde	300,000
Total	5,362,000

Plaintiff alleges that the total of the waters for the storage and delivery of which it was so contracted is *substantially the entire amount which may legally be diverted from said river and consumptively used in the State of California under the terms of said statutory contract between the State of California and the United States, and is far in excess of California's equitable share of said waters.*" [Emphasis supplied.]

In short, Arizona, in this suit, admitted that the Project Act and the Limitation Act constituted a "statutory contract" between California and the United States; that under it California had "maximum legal rights" of 5,485,500 acre-feet; and that the aggregate of the California contracts was less than this. She complained, not as she does now, that the California contracts exceed the quantity allowed by the Limitation Act, but that the Limitation Act allowed California too much. This suit was filed after the compact, the Project Act, the Limitation Act, and two Supreme Court cases had all become accomplished facts, and Arizona wanted the statutes made inoperative. If they meant what Arizona now says they mean, she should have ratified the compact instead of filing this third suit.

The Court's opinion, using the figures furnished by the bill of complaint, stated, in *Arizona* v. *California* (298 U. S. 558 (p. 564)); the Hoover Dam Documents, page A808:

The compact was duly ratified by the six defendant States, and the limitation upon the use of the water by California was duly enacted into law by the California Legislature by act of March 4, 1929, supra. By its provisions the use of the water by California is restricted to 5,484,500 acre-feet annually.

Page 564, note 5 (the Hoover Dam Documents, p. A808):

5. The surplus water of the river in the lower basin, unapportioned by the compact, is 2,171,000 acre-feet, one-half of which, or 1,085,500 acre-feet, California is entitled, under the Boulder Canyon Project Act, and her own statute, to add to the 4,400,000 acre-feet which they specifically allot to her, making a total allotment of 5,485,500 acre-feet annually.

Page 571 (the Hoover Dam Documents, p. A813):

Every right which Arizona asserts is so subordinate to and dependent upon the rights and the exercise of an authority asserted by the United States that no final determination of the one can be made without a determination of the extent of the other.

Page 572 (the Hoover Dam Documents, p. A814):

The petition to file the proposed bill of complaint is denied. We leave undecided the question whether an equitable division of the unappropriated water of the river can be decreed in a suit in which the United States and the interested States are parties. Arizona will be free to assert such rights as she may have acquired, whether under the Boulder Canyon Project Act and California's undertaking to restrict her own use of the water or otherwise, and to challenge, in any appropriate judicial proceeding, any act of the Secretary of the Interior or others, either States or individuals, injurious to it and in excess of their lawful authority.
Petition denied.

The foregoing review of the three Colorado River cases in the Supreme Court demonstrates, we think, the existence of a deep and serious controversy over the meaning and intent of the documents constituting the law of the river. It has been demonstrated by the diametrically opposite positions taken by Arizona herself in these actions.

V. THE WATER CONTRACTS

As mentioned in the case last cited, the Secretary of the Interior, during the period 1930–34, had entered into contracts with five public bodies of California, which the Court summarized as follows (p. 564); the Hoover Dam Documents, page A808:

> The Secretary of the Interior, acting under authority of section 5 of the Boulder Canyon Project Act, has entered into contracts with California corporations for the storage in the Boulder Dam Reservoir and the delivery, for use in California,[4] of 5,362,000 acre-feet of water annually, * * *

Page 570 (the Hoover Dam Documents, p. A812):

> * * * Section 5 provides that "no person shall have or be entitled to have the use for any purpose of the water stored as aforesaid except by contract made as herein stated." Section 5 also provides that the Secretary of the Interior may contract for the storage of water and for delivery thereof upon charges which will provide revenue, and section 5 (c) directs that "contracts for the use of water * * * shall be made with responsible applicants therefor who will pay the price fixed by the Secretary with a view to meeting the revenue requirements herein provided for." Acting under this authority the Secretary of the Interior has substantially completed the project and has entered into contracts, so the bill of complaint alleges, for the delivery of 5,362,000 acre-feet of stored water to California corporations, and for the financing and construction of Parker and Imperial Dams and the All-American Canal to facilitate the use of this water in California.

In short, all of the contracts which Arizona now attacks had been executed prior to the third case. All of them are referred to in her pleadings, and were before the Court for consideration. Arizona did not attack their validity.

All of these California contracts were written subject to availability of water under the Boulder Canyon Project Act and the Colorado River compact, and none purported to interpret those documents. They were all written, however, in terms of beneficial consumptive use, not depletion.

In 1942 and 1944, the Secretary entered into water contracts with the State of Nevada (pp. A571–579 of the Hoover Dam Documents), aggregating 300,000 acre-feet, likewise subject to availability under the compact and the act.

As there has been no compact or Supreme Court determination allocating among the five States of the lower basin—Arizona, California, Nevada, Utah, and New Mexico—the waters available to the lower basin under the compact, these contracts, like the Arizona contract next discussed, do not specify the classifications under the compact of the waters to be delivered. Utah and New Mexico presumably will not receive their water from Lake Mead, and hence are not within the contract framework. The contracts, as stated by the Court, are made under section 5 of the Boulder Canyon Project Act, and relate to waters stored by Hoover Dam.

On February 9, 1944, Arizona entered into a Hoover Dam water contract with the Secretary (the Hoover Dam Documents, p. A559), and this is one of the documents on which she relies here. California

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[4] See the following:

	Acre-feet
Metropolitan water district	1,100,000
Imperial Valley and others	3,850,000
City of San Diego	112,000
Palo Verde	300,000
Total	5,362,000

and the other lower basin States are not parties to it, but, as pointed out later, it contains certain commitments for the protection of California, Nevada, and the other lower basin States. This contract was preceded by negotiations, commencing in 1942, some of which Arizona cites here.

Arizona calls attention to the regulations promulgated by Secretary Wilbur, February 7, 1933 (the Hoover Dam Documents, p. A553), which she says were an "administrative determination." The regulations contained the full text of a proffered contract, which Arizona refused. It offered to deliver

> * * * so much available water as may be necessary to enable the beneficial consumptive use in Arizona of not to exceed 2,800,000 acre-feet annually by all diversions affected from the Colorado River and its tributaries below Lee Ferry (but in addition to all uses from waters of the Gila River and its tributaries), *subject to the following provisions.*

Arizona omits the language we have italicized.

The following provisions included article 10 (c) (the Hoover Dam Documents, p. A554):

> (c) It is recognized by the parties hereto that differences of opinion may exist between the State of Arizona and other contractors as to what part of the water contracted for by each falls within article III (a) of the Colorado River compact, what part within article III (b) thereof, what part is surplus water under said compact, what part is unaffected by said compact, and what part is affected by various provisions of section 4 (a) of the Boulder Canyon Project Act. Accordingly, while the United States undertakes to supply water from the regulated discharge of Hoover Dam waters in quantities stated by this contract as well as contracts heretofore or hereafter made pursuant to regulations of April 23, 1930, amended September 28, 1931, this contract is without prejudice to relative claims of priorities as between the State of Arizona and other contractors with the United States, and shall not otherwise impair any contract heretofore authorized by said regulations.

That is, the California contracts.

This was not an "administrative determination" that the water Arizona was to get under this offer—which she rejected—was 2,800,000 acre-feet of III (a) water; it was a plain warning of a dispute over the classification of that water, and moreover stated that the contract offered "shall not impair any contract heretofore authorized" under the previous regulations which authorized the California water contracts.

Arizona rejected that offer, but sought to reinstate it in 1934 in somewhat different form.

In a hearing before the Secretary of the Interior December 17, 1934, on Arizona's proposed water contract, Mr. Carson, counsel for Arizona, read from a prepared statement as follows:

> The contract does not include and there will not be affected by it the use of water from the tributaries in Arizona, estimated at 2,500,000 to 3,000,000 acre-feet (p. 21).

A photostat of this statement was furnished me by the Interior Department, where it is on file.

The other States objected to Mr. Carson's draft, and no contract was signed. But here is one more admission, as late as 1934, that the uses on the Gila amounted to "2,500,000 to 3,000,000 acre-feet," as they do, measured by diversions minus return flow. The depletion theory had not yet been invented. This is in accord with the allegation of uses made in the third Supreme Court case, previously referred to, which was filed about a year after this hearing.

On February 9, 1944, 10 years later, Arizona did execute a water contract with the Secretary. But Secretary Ickes, like Secretary Wilbur, was careful to make no assumption as to the classification of the water Arizona was to get. This contract, for the storage and delivery of water to the State of Arizona, in the maximum amount of 2,800,000 acre-feet reads (art. 7 (h); the Hoover Dam Documents, p. A561):

> Arizona recognizes the right of the United States and agencies of the State of California to contract for storage and delivery of water from Lake Mead for beneficial consumptive use in California, provided that the aggregate of all such deliveries and uses in California from the Colorado River shall not exceed the limitation of such uses in that State required by the provisions of the Boulder Canyon Project Act and agreed to by the State of California by an act of its legislature (ch. 16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

Article 10 reads (p. A563):

> RESERVATIONS
>
> 10. Neither article 7 nor any other provision of this contract shall impair the right of Arizona and other States and the users of water therein to maintain, prosecute, or defend any action respecting, and is without prejudice to, any of the respective contentions of said States and water users as to (1) the intent, effect, meaning, and interpretation of said compact and said act; (2) what part, if any, of the water used or contracted for by any of them falls within article III (a) of the Colorado River compact; (3) what part, if any, is within article III (b) thereof; (4) what part, if any, is excess or surplus waters unapportioned by said contract; and (5) what limitations on use, right of use, and relative priorities exist as to the waters of the Colorado River system: *Provided, however*, That by these reservations there is no intent to disturb the apportionment made by article III (a) of the Colorado River Compact between the upper basin and the lower basin.

If any more complete disclaimer was needed, it was afforded by the memorandum decision of the Secretary of the Interior in approving the contract (The Hoover Dam Documents, p. A567):

> I have considered carefully the objections made by California in its printed brief and at the hearing before me on February 2. California is fearful that subdivisions (*a*) and (*b*) of article 7 construed together create an inference that the maximum of 2,800,000 acre-feet which the United States agrees to deliver under subdivision (*a*) is water apportioned to the lower basin under article III (*a*) of the compact and that Arizona could contend, to California's prejudice, that this constituted an administrative determination that Arizona was entitled by this contract to 2,800,000 acre-feet of III (*a*) water. I am convinced that California's fears in this respect are unfounded for at least two reasons. First, I wish to make it clear and to emphasize that the delivery of water under both subdivision (*a*) and subdivision (*b*) of article 7 is expressly "subject to its availability under the Colorado River compact and the Boulder Canyon Project Act." The proposed contract does not attempt to obligate the United States to deliver any water to Arizona which is not available to Arizona under the terms of the compact and act. Secondly, article 10 was purposely designed to prevent Arizona, or any other State, from contending that the proposed contract, or any provision of the proposed contract, resolves any issue on the amounts of waters which are apportioned or unapportioned by the compact and the amounts of apportioned or unapportioned water available to the respective States under the compact and the act. *It expressly reserves for future judicial determination any issue involving the intent, effect, meaning, and interpretation of the compact and act.* The language of article 10 is plain and unequivocal and adequately reserves all questions of interpretation of the compact and the act.

The Arizona water contract resolved no issue in Arizona's favor. It did not assume that the project act or the limitation act or any of the Supreme Court decisions had resolved any issues in Arizona's

favor. If it was an "administrative determination," as Arizona now says, it was a determination that these issues still existed as of 1944 and would continue to exist until there was a "future judicial determination of any issue involving the intent, effect, meaning, and interpretation of the compact and act."

If the central Arizona project is built, the water for it will presumably be delivered under this contract.

The Arizona contract makes no mention of how her uses are to be measured. It seems reasonably obvious that deliveries out of Lake Mead to Arizona, Nevada, and California, made under substantially identical contracts authorized by the same section of the Boulder Canyon Project Act (sec. 5, "the Hoover Dam Documents," p. A217), must be measured identically, and if measured by diversions minus return flow on the California side, they must be measured by diversions minus return flow on the Arizona side. Whatever may be the case as to the Gila River, we are dealing with main-stream water in discussing those contracts, and the central Arizona project is to be served out of main-stream water.

If there is any statutory authority for the Arizona water contract, it is found in section 5 of the Boulder Canyon Project Act. This section authorizes the Secretary of the Interior to contract for the storage and delivery of water "under such general regulations as he may prescribe." Contracts respecting water for irrigation and domestic uses are to be for permanent service "and shall conform to paragraph (*a*) of section 4 of this act." Section 4 (*a*) defines consumptive use as "diversions less returns to the river." That is the only definition of that term appearing in that section, or elsewhere in the act.

VI. THE MEXICAN WATER TREATY

On February 3, 1944, less than a week before the Arizona water contract was signed, the Mexican Water Treaty was made public. It allocates to Mexico a guaranteed quantity of 1,500,000 acre-feet annually, measured at the boundary, plus added quantities under specified conditions, but provides:

Article 10 (b) (the Hoover Dam documents, p. A852):

> In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) a year, the water allotted to Mexico under subparagraph (*a*) of this article will be reduced in the same proportion as *consumptive uses* in the United States are reduced.

Article 1 of the treaty defines "consumptive use" as follows:

> (j) "Consumptive use" means the use of water by evaporation, plant transpiration or other manner whereby the water is consumed and does not return to its source of supply. *In general it is measured by the amount of water diverted less the part thereof which returns to the stream.*

The Mexican Water Treaty defines "divert" and "return flow" as follows:

> ART. 1 (d) "To divert" means the deliberate act of taking water from any channel in order to convey it elsewhere for storage, or to utilize it for domestic, agricultural, stock-raising, or industrial purposes whether this be done by means of dams across the channel, partition weirs, lateral intakes, pumps or any others methods."
>
> * * * * * * *

ART. 1 (h) "Return flow" means that portion of diverted water that eventually finds it (sic) way back to the source from which it was diverted.

The Arizona water contract was signed 6 days after the Mexican Water Treaty. It was signed with knowledge that this treaty defined consumptive use as "measured by the amount of water diverted less the part thereof which returns to the stream." It would be remarkable if two documents of this importance, dealing with the same subject matter, containing the same phrase, and negotiated concurrently, were intended to apply diametrically opposite meanings to the phrase which the treaty defined.

VII. RATIFICATION OF THE COLORADO RIVER COMPACT BY ARIZONA

On February 24, 1944, the Arizona Legislature in two acts, approved the same day, ratified the Arizona water contract (Laws Arizona 1944, pp. 419–427; p. A559, The Hoover Dam Documents) and ratified the Colorado River Compact (Laws Arizona 1944, pp. 427–428; p. A165, The Hoover Dam Documents). Arizona now says that she ratified the compact "relying on the protection thus afforded her" by the Boulder Canyon Project Act and the California Limitation Act (although 22 years after the compact and 16 years after the project act), and relying on the interpretation of the compact she says was placed in effect by the project act. The fact is that the Arizona statute which ratified the water contract concurrently with the Colorado River compact contains the full text of the contract, including the reservations in section 10 which we have previously quoted.

Thus Arizona, as recently as 1944, by statute as well as by contract, has recognized the continued existence of the controversies she now says were settled in her favor 16 years earlier by the project act. She cannot say that she ratified the compact "relying on the protection thus afforded her"; she ratified it on the same day that her legislature ratified a contract, in full text, proclaiming that these controversies still existed, and with knowledge of a departmental decision stating that the reservation so written into the Arizona contract and Arizona statute (p. A568, The Hoover Dam Documents):

* * * Was purposely designed to prevent Arizona, or any other State, from contending that the proposed contract, or any provision of the proposed contract, resolves any issue

and that (p. A568, The Hoover Dam Documents):

* * * It expressly reserves for future judicial determination any issue involving the intent, effect, meaning, and interpretation of the compact and the act. The language of article 10 is plain and unequivocal and adequately reserves all questions of interpretation of the compact and the act.

Arizona by so legislating so agreed.

The only later judicial expression throwing light on any of the issues so reserved was the decision of the United States Supreme Court in *Nebraska* v. *Wyoming*, (325 U. S. 589,600), saying:

Consumptive use represents the difference between water diverted and water which returns to the stream after use for irrigation,

exactly California's definition.

VIII. THE ARIZONA PROJECTS

Arizona says that California asks that:

The compact must be so interpreted that the Gila River is practically all of the water to which Arizona is entitled.

To the contrary, at least three great Arizona projects on the Colorado River are under active enlargement at this moment: the Yuma project, the Gila project, and the Parker Indian project.

The Yuma project, irrigated by diversions from Laguna Dam, a dam built in 1909, serving Arizona but paid for by California, will use 250,000 acre-feet. In 1935, without objection from California, Congress authorized the Headgate Rock Diversion Dam, to deliver approximately 300,000 acre-feet to the Colorado Indian Reservation in Arizona. Projects on other Arizona tributaries, such as the Bill Williams, account for another 130,000 acre-feet. In 1948, Congress authorized the Gila project in Arizona, to use another 600,000 acre-feet from the main stream. This bill passed both Houses of Congress by unanimous consent, after hearings in each House. These main stream projects account for over 1,250,000 acre-feet, or more than five times as much as Arizona was using before the construction of Hoover Dam. This is in addition to the use of 2,350,000 acre-feet used on the Gila River. At the time of passage of the Gila bill in the Eightieth Congress, the House Committee on Public Lands, in Report No. 910 July 14, 1947, on House Resolution 1597 (reauthorizing the Gila project), referring to the controversy between Arizona and California, said:

* * * The committee feels the dispute between these two States on the lower Colorado River Basin should be determined and settled by agreement between the two States or by court decision because the dispute between these two States jeopardizes and will delay the possibility of prompt development of any further projects for the diversion of water from the main stream of the Colorado River in the lower Colorado River Basin.

Therefore the committee recommends that immediate settlement of this dispute by compact or arbitration be made, or that the Attorney General of the United States promptly institute an action in the United States Supreme Court against the States of the lower basin, and other necessary parties, requiring them to assert and have determined their claims and rights to the use of the waters of the Colorado River system available for use in the lower Colorado River Basin.

Arizona elected to sponsor the Gila project, to use 600,000 acre-feet, on notice that if she did so she was utilizing the last uncontested water available to her, and on notice that if she did so the central Arizona project could not be considered without a lawsuit first.

It is these other Arizona projects, authorized or constructed, to which the Secretary of the Interior referred when, in his report on the central Arizona project bill (hearings, House Judiciary Committee, H. J. Res. 225, 80th Cong., pp. 22, 26) he said:

The water which California projects, Federal or other, now in existence or under construction will require when they are in full operation is a great deal more than the amount which that State is entitled to use if all of Arizona's contentions are taken to be true. Similarly, the water which Arizona projects now in existence, under construction, or authorized will require when they are fully developed is much more than the supply available to that State if all of California's contentions are taken to be true.

And that situation exists without taking into account the proposed central Arizona project, which would add a burden of 1,200,000 acre-

feet upon a water supply inadequate for the projects already existing or authorized in the two States. Manifestly, in these circumstances, if water is found for a new project it must be taken from an old one.

California says that the projects already constructed or authorized, at an aggregate expense of hundreds of millions of dollars, cannot be deprived of water without a day in court, and that Congress should grant that day in court before giving serious consideration to a new project dependent upon that same water. The interests of the United States, whose treasury is invited to bear a billion-dollar risk in the new project, as well as the rights and equities of the projects already authorized and existing, justify the prompt litigation and determination of these issues in the Supreme Court. The consent of Congress is necessary to make that possible because the United States is a necessary party. To that end, we ask the passage of the resolution now pending, granting such consent.

May I have permission, Mr. Chairman, to add certain exhibits, and inserts, to which I referred, at the end of my statement?

The CHAIRMAN. That permission is accorded.

LOS ANGELES DEPARTMENT OF WATER AND POWER,
May 4, 1949.

Mr. NORTHCUTT ELY,
Washington 5, D. C.

DEAR MR. ELY: I have recently received from Mr. Rex Hardy a copy of the letter of April 26, 1949, from the Arizona Power Authority to Secretary of the Interior Julius A. Krug, in which application was made for all electric energy that may be generated and developed at Bridge Canyon or so much thereof as may by law, rules, and regulations be made available for use within the State of Arizona, which letter was filed as a part of the hearings of the Senate Committee on Interior and Insular Affairs on April 30, 1949.

With respect to this letter, I desire to make comments with the thought that you may make such use of these comments as seems desirable in connection with the present hearings on S. 75 and H. R. 934.

Although Arizona makes the claim that throughout its history it has been short of electric power and has consequently suffered great damage, nevertheless, up to the present time it has not availed itself of the opportunity that has existed since 1936 to take some of the energy available to it from the Hoover Dam project. This right amounts to approximately 18 percent of the total firm energy developed at Hoover Dam and is approximately 750,000,000 kilowatt-hours annually. In the meantime, the city of Los Angeles and the Southern California Edison Co. have guaranteed the payments to the Government for such energy and have held it available for Arizona. Arizona has received a very substantial proportion of the energy at Parker power plant and will receive approximately one-half of Davis Dam power. The availability of these two sources of energy has undoubtedly caused some hesitancy on the part of Arizona in withdrawing power in accordance with its rights at Hoover, and probably indicates some degree of uncertainty as to the rate of growth and need for energy.

In the letter reference is made to a recent power survey for the State of Arizona. It is my understanding that possibly two surveys have been made. One such survey is being carried on by the Federal Power Commission, and although preliminary data have apparently been made available to the State of Arizona, they have not yet been made available to others. It is interesting to note that in connection with such surveys the Federal Power Commission does not have funds sufficient to publish its own reports but is having to depend on local State authorities to make publication after the survey is completed. It appears that Congress might well make some adjustments to cure this situation, which has the effect of limiting the value of such survey. The other survey is probably that given in Mr. Wingfield's statement presented before the House Public Lands Committee in hearings on H. R. 934, to which report reference will now be made.

In the historical years under consideration in this report and for some time

previous, Arizona has been experiencing operations under the dry portion of the cycles of water flow and has also faced the necessity of making considerable development involving pumping for irrigation, in order to meet the wartime demand for agricultural products and thereby profit from the correspondingly high prices received for such products. The unusual electrical demands thereby incurred have a tendency to indicate a rate of electrical load growth which may not be sustained.

It appears that if the central Arizona project were to be developed, part of the object of such development is to reduce irrigation pumping, and under such circumstances the higher rates of load growth shown in Mr. Wingfield's report might not be experienced.

Furthermore, since the proposed project will only increase the agricultural economy by something less than 200,000 acres in comparison with a present development of approximately three times that amount, it is doubtful if the ultimate growths indicated, which are in excess of double the present level, would be realized, or at least whether they would be realized as soon as shown in the Wingfield report. In the event the central Arizona project is not built, and if Arizona makes the most advantageous use of its underground reservoir and local water supply, there undoubtedly would be some increase in pumping during the dry cycle to effectively use such reservoir, and some increases in power would be shown above present uses for such purposes. There would also be the same expansion in the agricultural economy but probably not sufficient to reach twice the present development as shown in the report.

It is my general conclusion that if Arizona were depended upon to take the total output from Bridge Canyon the taking of such energy would probably be postponed considerably beyond the point of first availability of such energy with consequent detriment to the economy of the project.

Sincerely,

WILLIAM S. PETERSON,
Assistant Chief Electrical Engineer.

DEPARTMENT OF WATER AND POWER, THE CITY OF LOS ANGELES,
Los Angeles 54, May 4, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate, Washington, D. C.

MY DEAR SENATOR O'MAHONEY: I have recently received copies of the statements presented before your committee by Mr. V. E. Larson and Mr. E. G. Nielsen, engineers with the Bureau of Reclamation. I have gone over these statements and wish to briefly comment on them in line with the testimony which I presented before your committee on approximately April 13, 1949.

First I will comment on the testimony of Mr. V. E. Larson.

In connection with the statements regarding power market as given on page 7 of his statement I desire to emphasize that the power market discussed by Mr. Larson is that including Arizona, southern California, southern Utah, and Nevada, and that of the total population in excess of 4,500,000, approximately only 500,000 is found in Arizona and that any equitable division of such power would contemplate sale at a reasonable rate and with equitable division between the populations concerned in the market area.

On pages 17 and 18 of his statement Mr. Larson discusses the silt inflow into Bridge Canyon and into the reservoirs at Bluff and Coconino. Using Mr. Larson's figures I desire to point out that of the total of 127,000 acre-feet of silt per year that would flow into Bridge Canyon 23 percent, or 29,200 acre-feet, would be intercepted by the Bluff Reservoir. This is in agreement with the figure of 29,300 acre-feet which I used. Similarly, Mr. Larson states that the Coconino Dam will intercept 22 percent of the same silt load or 27,900 acre-feet, which is in close agreement with the figure of 27,500 acre-feet which I used in my testimony. Subtracting the sum of these two from the total that would otherwise go into the Bridge Canyon Reservoir site the remainder is 69,100 acre-feet per year. This amount is substantially in agreement with the figure I used of 70,200 acre-feet. The minor variations occurring in the above figures are inconsequential and have no practical effect on making the results any different from those which I presented.

My statement that Bridge Canyon will be essentially completely silted up in 53 years is still correct and is on the basis that the Bluff and Coconino Dams are

constructed and operating. In further discussion of the silt problem I wish to make reference to pages 12 and 13 of Mr. Nielsen's statement. Both Mr. Nielsen's statement and my own assume the existence of the Bluff and Coconino Reservoirs for the protection of the Bridge Canyon Reservoir.

Mr. Nielsen mentions the silt delta that might exist at the head end of the Bridge Canyon Reservoir and thus give opportunity for some silt storage in addition to the water capacity of the Bridge Canyon Reservoir. In this assumption Mr. Nielsen fails to take into account that the reservoir level will shift violently during each year as, due to its small capacity and the method of operation proposed, a large percentage of its capacity will be withdrawn each year. When the water level becomes low and the high-flow season follows there will be a strong tendency for the silt delta to be moved farther down into the reservoir. In any event with the steep slope above Bridge Canyon the silt delta cannot be a substantial percentage of the total capacity of the reservoir. In addition the reservoir becomes quite ineffective before it is totally filled

As stated by me to the committee it is true that the erection of Glen Canyon Dam or other upper basin dams will have the effect of protecting Bridge Canyon against silting. The point I desire to make is that Glen Canyon is not a part of this project and that on its own basis as proposed herein and with only the expenditures that have been indicated, the central Arizona project will be silted up in approximately 50 years and will be unable to return commercial revenues to complete the paying out of the project. The more logical development is to have a combined project wherein it is definitely assured that the needed silt protection will go in at the time the total project is built and the financial stability becomes thereby assured. It is my conception that the Bridge Canyon project has no right to lean for free advantages on other projects either past or present, without proper credits being given.

On pages 30 to 36 of his statement Mr. Larson indicates the annual costs, direct returns, and benefits that are associated with this project. In this connection some new figures have been offered which differ in detail from those taken from the Secretary's report and used in my statement. These changes do not greatly modify the total picture but it will be desirable to point out the results briefly somewhat in line with my previous presentation.

The total annual revenues as shown on page 30 of Mr. Larson's statement are as follows:

Irrigation water	$3,147,900
Municipal water	527,900
Power	12,635,000
Total	16,310,800

Such revenues must first cover the items of operation and maintenance and the reserve for replacement which items are as given on page 36 of Mr. Larson's statement and are as follows:

Operation and maintenance	$4,551,200
Reserve for replacement	2,212,400
Total	6,763,600

If we subtract these items from revenues there remains a balance of $9,547,200. This item is to be compared with the item for amortization of all project construction costs amounting to an annual cost of $19,691,600 as given on page 36 of Mr. Larson's statement. It will be noted that the remainder of the revenues of $9,547,200 fails to cover the total amortization figure by $10,144,400 annually. This represents the annual subsidy by the United States Government for this project.

It is indicated on page 35 of Mr. Larson's statement that the amortization referred to has been over a 70-year period as contrasted with the original 78-year period in the Secretary's report. For the 70-year period the Federal Government's contribution or subsidy then becomes 70 times $10,144,400 or $710,108,000. This figure is comparable with the figure which I presented of $725,113,000 to cover the Government's nonreimbursable capital, the cost of operation, maintenance and replacement on nonreimbursable capital items and the cost of interest to be borne by the United States Treasury during the amortization period.

The project is thus essentially as costly as presented in my statement and the subsidies by power still remain 6 to 7 times the value of the land after re-

celving this benefit and the subsidy of the Federal Government over and above that provided by power is of the order of 7 to 10 times the value of the land after the benefit is applied.

I now make reference to pages 8 and 9 of Mr. Nielsen's statement where he says, "Mr. Peterson failed to develop fully the national interest in this or any other project built under public policies which have held for many, many years." The policy under which the Government has acted on reclamation projects has been largely that expressed in the Reclamation Act which is still the current guide. This act does not provide for consideration of benefits on the basis of the gross crop presentation made in the Secretary's report and in Mr. Larson's statement. In connection with the gross crop value being used as the justification for the total expenditures I merely indicated that in most business enterprises the choices of methods and procedures are based on a comparison of competitive alternatives and justification is found in the effect on profits and not on total returns. I indicated that I was not a professional economist and that it was my intent to only raise the question as being one on which the Senate should conduct its own investigation and use its own judgment as to whether gross crop returns could be used as a justification for the subsidy of one of the costs entering into production of crops. I again make reference to my general statement that the annual subsidies represented by the costs to the Federal Government not otherwise covered are considerably in excess of the annual profits per acre to the farmer and several times in excess of the income tax received on such profits.

Finally, with respect to this consideration of gross-crop values, I would make the point that the Bureau of Reclamation in their report or in subsequent testimony have not adequately developed the economic theory with respect to crop-cost values so as to demonstrate that it has any application in this instance.

Another point of policy is, of course, the matter of providing interest-free capital for irrigation projects. This matter was covered fully in my testimony and indicated that my opposition was not to interest-free money, in principle, for irrigation but that in this instance the costs were much higher than had hitherto been found feasible. A more reasonable example was cited by reference to the Salt River Valley Water Users Association project where the costs were of the order of $200 per acre rather than by total subsidies approximating $5,000 an acre in this project when consideration is given to the power subsidy as well as the Government subsidy.

With respect to the statements on pages 9 to 11 of Mr. Nielsen's statement regarding the firm energy capability of the project I wish to indicate that the study made by the department of water and power took into account the same reservoir controls as those used by the Bureau of Reclamation. It also took into account the removal of flood control from Lake Mead so as to give a greater volume of reservoir capacity for the integration operation. Reference to my statement will indicate that 1¼ billion kilowatt-hours per year were credited to the Bridge Canyon project as a result of this shift of flood control. Mr. Nielsen's rebuttal statement in this regard is completely in error. However, we endeavored to conduct our study on a more realistic basis, having fully in mind the unpredictable character of the flow in the Colorado River. Under present actual operation under the forecasts that are given by the Bureau of Reclamation, no such perfection of operation is achieved for the Hoover power plant as was shown for the combined integrated system in the report which developed the firm-power outputs of the four plants under the central Arizona project scheme. Such perfection of operation, I am sure, can only be achieved when the flows are known accurately for the entire minimum-flow period such as 10 years, which program will never be accurately duplicated again as to sequence and amount. I confidently reiterate that the firm-power output of the project will be approximately 1,000,000,000 kilowatt-hours per year less than that given in the report.

Mr. Nielsen also states on page 12 of his statement that under my plan of operation "energy made secondary by his definition would be produced and purchased each year, and then actually utilized as firm energy." Secondary energy is that energy which is not continuously available from year to year. It is undependable energy. Therefore, other generating equipment is put on the system in hydroelectric or steam capacity to carry the load. When secondary energy becomes available, steam capacity is shut down or operated at light load and the secondary energy thereby becomes merely fuel-saving energy. This process is spoken of as "firming" the secondary energy. If it were not for such

generating capacity in the system to "firm up" such secondary energy, the secondary energy would have essentially no value unless some customer were found who could use energy irregularly available.

Mr. Nielsen's rebuttal to my testimony on silt on pages 12 and 13 of his statement have already been discussed earlier in this statement in connection with my discussion of Mr. Larson's presentations on silt.

I request that this letter be made a part of your record in the hearing on Senate bill S. 75 and I appreciate your nearest consideration of my statements.

I desire to express my appreciation for the opportunity which I have had of discussing this matter with your committee.

Sincerely yours,

WM. S. PETERSON,
Assistant Chief Electrical Engineer.

The CHAIRMAN. Are there any questions to be addressed to Mr. Ely?

Senator MCFARLAND. Mr. Chairman, I might state this with regard to questions, as I know the desire of the chairman. Mr. Ely's testimony is in the nature of an argument. Any questions I would have to ask would be arguments with the witness, as his statement is of the nature of argument rather than evidence; it is in the nature of a brief on argument.

I would like to point out that we will call attention to evidence establishing the fact that Mr. Ely's testimony and quotations are not complete. Half of a quotation does not, of course, bring out the truth. The whole evidence shows that the compact commissioners had the same opinion which Arizona holds, as was pointed out by the Colorado witnesses, including Mr. Tipton, an engineer who is thoroughly familiar with this matter, and as pointed out by Mr. Brietenstein and Judge Stone of Colorado, and others.

With regard to the evidence concerning Senator Hayden, we will point out that Mr. Ely failed to read all of the story, and that when you take it as a whole the evidence clearly shows that Senator Hayden and the other Senators knew that III (b) water was apportioned water. The evidence also shows that Senator Hayden put in the record the statement of Herbert Hoover to that effect, which statement was relied on by the Senators at that time.

Just to give an example without arguing the matter of Mr. Ely's inconsistencies, as we just want to point this up because we do not want to leave the committee with a false impression here as given by Mr. Ely. When he singles out and quotes with favor the Supreme Court case to perpetuate testimony, in disposing of the question of whether this III (b) water was apportioned to Arizona, he speaks of the briefs as making no claim that III (b) water is apportioned, and concludes that the holding of the Court was therefore dicta. On the contrary, it is the very language of the Supreme Court in disposing of and deciding one of the principal questions, where the Court holds III (b) water to be apportioned water. I refer to that part which Mr. Ely quoted:

> But the fact that they are solely useful to Arizona, or the fact that they have been appropriated by her, does not contradict the intent clearly expressed in paragraph (b)—nor the rational character thereof—to apportion the 1,000,000 acre-feet to the States of the lower basin and not specifically to Arizona alone. It may be that, in apportioning among the States the 8,500,000 acre-feet allotted to the lower basin, Arizona's share of waters from the mainstream will be affected by the fact that certain of the waters assigned to the lower basin can be used only by her; but that is a matter entirely outside the scope of the compact.

In other words, that is the very language by which they decided the issue; the language is not dicta.

As to the Arizona water contracts, of course, we will call attention to the fact that Mr. Ely—I presume it was Mr. Ely; he was Assistant Commissioner—and the other interested members of the Department of the Interior, offered a contract which would give to Arizona all of the water of the Gila and 2,800,000 acre-feet of water from the main stream of the Colorado. This was when Mr. Wilbur was Secretary, as I pointed out in my other testimony. All of these contracts made by California are subject to availability of water, and they are subject, of course, to the California Limitation Act.

We can do that better by briefs, just as Mr. Ely has done it, and will clearly show that his statements are incorrect.

The CHAIRMAN. Then the Senator from Arizona has no questions?

Senator MCFARLAND. That is correct. I will make appropriate rebuttal in the form of a brief.

The CHAIRMAN. That completes your statement, Mr. Ely?

Mr. ELY. Yes, Mr. Chairman. Thank you for your consideration.

The CHAIRMAN. All right, Mr. Howard.

STATEMENT OF JAMES H. HOWARD, GENERAL COUNSEL, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Mr. HOWARD. Mr. Chairman, I am moved to remark at the outset that the exchange between Mr. Ely and Senator McFarland rather points up one proposition that may have been lost sight of. As we conceive it, it is not the function of the Congress, or of this committee to determine whether Arizona is right or California is right. Our burden here is to show—and I think we have fully sustained our burden—that there exists a deep and long-standing controversy over the interpretation of certain contract documents and that before the Congress undertakes an investment running into $750,000,000 or $1,000,000,000, those controversies should be finally and authoritatively settled. If we are wrong, it is time that we knew it.

I have had prepared, Mr. Chairman, a fairly lengthy statement directed to the proposition that the Congress cannot settle interstate controversies of the type blocking development of the lower Colorado River Basin.

As this hearing has progressed, it has become apparent to me that that point is probably not in controversy. I have not heard any member of the committee even suggest that it is the function of the Congress to resolve these issues.

Senator MCFARLAND. Pardon me, Mr. Howard, but I am not quite clear on what you said.

Mr. HOWARD. Mr. Carson misquoted me in quoting from a statement which I made to the House Judiciary Committee, saying that I had agreed it was the function of Congress to determine those issues. What I said was this, and this is quoted from the statement which I made to the House Judiciary Committee:

> In order that I may not be misunderstood, let me say that it is unquestionably within the power of Congress, as an administrative and legislative matter, to ascertain the existence of facts required as a basis of legislative action. Every time the Congress authorizes a reclamation project it necessarily considers the engineering feasibility which includes the availability of water supply. It is hard to imagine Congress authorizing a project calling for a large amount of water from a river system capable of producing the required water. Such legislative determination, however, falls far short of being an adjudication or final determination of water rights.

The CHAIRMAN. The Congress, of course, does have the right, in fact, the obligation, of construing the statutes that may be existing at any particular time in making up its mind to the solution of the issues involved.

Mr. HOWARD. That is, to make an extreme case, let us assume for the moment that the committee was of the view that California's position here was entirely frivolous and not based on anything substantial at all. You might well brush us off and arrive at your conclusion. We might well get into court, as I think we will some day, sooner or later—if not in this session of Congress, at some later session—and we would have the privilege of letting the court throw us out. But the issues are of a judicial nature and not fundamentally of a legislative nature.

I think in discussing the matter with legislators of the experience of the men on this committee, it is unnecessary to say that the legislative branch always has the privilege and obligation of considering the facts and the law applicable for the purpose of framing its legislative policy; but that does not mean in any way that it usurps the function of the judicial branch, and finally adjudicates the rights of the parties involved.

The CHAIRMAN. May I say, Mr. Howard, the longer the hearing has progressed, the more sincere has become my hope that Arizona and California might see how much they could save the Congress and the Court if only they would reach a settlement of the controversy themselves.

You may proceed with your statement, sir.

Mr. HOWARD. Mr. Chairman, my remarks will be addressed primarily to the proposition that the Congress cannot finally settle interstate controversies of the type now blocking further development in the lower Colorado River Basin. That is true whether the controversy is considered, as I believe it to be, one of contract law, or as it is generally discussed, as a matter of disposition of water of an interstate stream.

That a serious controversy exists and that settlement is necessary is clearly pointed out by the Secretary of the Interior. In his letter to the President pro tempore of the Senate, dated September 16, 1948, transmitting the project report on central Arizona project (No. 3–8b. 4–2), the Secretary said, among other things:

> Assurance of a water supply is an important element of the plan yet to be resolved. * * * If the contentions of the State of Arizona are correct, there is an ample water supply for this project. If the contentions of California are correct, there will be no dependable water supply available from the Colorado River for this diversion. * * * The Bureau of Reclamation and the Department of the Interior cannot authoritatively resolve this conflict. It can be resolved only by agreement among the States, by court action, or by an agency having jurisdiction. * * *

Although not stated, the implication of the last clause is that Congress may resolve the conflict. The same suggestion is implicit in the letter from the Director of the Bureau of the Budget dated February 11, 1949, addressed to Senator O'Mahoney and in the letter of March 18, 1949, addressed to Senator O'Mahoney over the signature of Mr. Chapman, Acting Secretary of the Interior. In these documents, and in argument in committee during the session of the Eightieth Congress, the idea was suggested that, in the absence of an agreement between

the States, it is competent for the Congress to settle the controversy between Arizona and California.

It is my purpose to demonstrate that there is no possibility of an authoritative or final determination of the controversy by the Congress and that in the absence of agreement between the States, the only remedy is resort to the courts.

In order that I may not be misunderstood, let me say that it is unquestionably within the power of the Congress, as an administrative and legislative matter, to ascertain the existence of facts required as the basis of legislative action. Every time the Congress authorizes a reclamation project it necessarily considers the engineering feasibility, which includes the availability of a water supply. It is hard to imagine Congress authorizing a project calling for a large amount of water from a river system incapable of producing the required water.

Such legislative determination, however, falls far short of being an adjudication or final determination of water rights. In the event that anyone believed that its rights on a river system had been invaded, by a project built in response to congressional authority, his remedy in court would be open to him. This statement is subject to one qualification. In the event that the United States is a necessary party, as is the case here, the Congress would be called upon to waive the immunity of the United States to suit, as a prerequisite to court action.

As the Secretary of the Interior points out, if Arizona is correct in certain contentions with respect to the Colorado River, there is water available for the project: if California is correct, there is no dependable water supply available.

The controversy is one which will be determined by interpretation of contract documents. True, the use of water is the subject matter of the contracts involved, but the controversy is nonetheless one of contract interpretaion.

A preceding witness has outlined the points of difference between Arizona and California. The decision will turn on the meaning of "beneficial consumptive use," as those words are used in the Colorado River compact, and upon the meaning of the California Limitation Act, particularly as to whether or not that act excludes California from participation in the 1,000,000 acre-feet of water by which, under article III (b) of the Colorado River compact, refers to a net diversion for use in California, or subjects the 4,400,000 acre-feet of III (a) water to reduction in a prorated amount of evaporation losses at Lake Mead.

To these may be added the question of whether or not the resolution adopted unilaterally by the State of Arizona in 1944, purporting to ratify the Colorado River compact, in fact accomplished its purpose.

A mere statement of the issues demonstrates the fact that the controversy relates to the interpretation of documents contractual in character. There can be no question but that an interstate compact, such as the Colorado River compact, is a contract (*Green* v. *Biddle*, 8 Wheat. 1; *Virginia* v. *Tennessee*, 148 U. S. 503).

The California Limitation Act also is contractual in character. By the Boulder Canyon Project Act, and as a prerequisite to the effectiveness of the Colorado River compact, and the act, the State of California, in the absence of Arizona from the Colorado River com-

pact, was offered the alternative of adopting an act limiting its use of waters of the Colorado River system. The Project Act, section 4 (a), provides as an alternative to a seven-State compact, that the Project Act shall not take effect unless there be a six-State compact, and until the State of California by an act of its legislature shall agree irrevocably and unconditionally with the United States for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this act, that the annual consumptive use of water in the State of California shall be limited in a specified manner.

The words of a contract are present. The Limitation Act is an agreement and a covenant, a consideration is named, the parties are named, and the third party beneficiaries are named. In response to the opportunity offered by the Project Act and in consideration of the passage of the act, the State of California made such an agreement and covenant in the exact terms of section 4 (a) of the act. This arrangement constitutes a statutory compact or contract, evidenced by reciprocal legislation. In the words of contract law, the Project Act made the offer. The California Limitation Act was the acceptance. The limitation on California's use of water is given life, not by the offer, but by the acceptance of the offer. Compacts expressed by reciprocal legislation between States of the Union and the United States have uniformly received recognition at the hands of the Supreme Court.

The interpretation of the Limitation Act, or, as it really should be expressed, the "statutory compact," evidenced by the Project Act and the Limitation Act, will determine the controversy over the status of the million acre-feet referred to in article III (b) of the Colorado River compact, and the question of whether or not the 4,400,000 acre-feet of the 7,500,000 acre-feet of water apportioned to the lower basin by article III (a) of the Colorado River compact is net or is subject to evaporation losses at Lake Mead.

The question of Arizona's presence as a party of the Colorado River compact is obviously a question of contract law.

Both the Colorado River compact and the California Limitation Act being contractual in character, and the determination of the rights of the parties being dependent upon the interpretation of certain words and phrases used in those contracts, the situation clearly calls for an exercise of the judicial function.

In the most recent letter, March 18, 1949, from the Secretary of the Interior to Senator O'Mahoney, chairman of committee, the following statement occurs:

> In that letter (referring to a letter dated May 13, 1948) it was pointed out that the United States is an indispensable party to any litigation that may be brought to decide the dispute which now exists among the States of the lower basin of the Colorado River and that that dispute appears to have the elements of a justiciable controversy.

The same letter goes on to suggest that if it be the judgment of the Congress that the dispute can be disposed of by it, such action should be taken before resorting to litigation. We have in that letter a contradiction of terms. If the dispute has the elements of a justiciable controversy, it is not subject to legislative settlement, but must be settled by the judicial branch of the Government.

In the letter of May 13, 1948, reporting on Senate Joint Resolution 145 (hearings, p. 363), the Secretary of the Interior, after outlining the issues between the States, said:

> The bare statement of these questions, the knowledge that there is a disagreement between Arizona and California about the answers to be given them, and the fact that, if the contentions of either State are accepted in full and if full development of the upper basin within the limits fixed by the Colorado River compact is assumed, there is not available for use in the other State sufficient water for all the projects, Federal and local, which are already in existence or authorized would seem to indicate that there exists a justiciable controversy between the States. * * *

Later, in the same letter, the Secretary said:

> * * * The controversy, nevertheless, appears to be of the sort that would justify the Court's determining the rights of the parties and definitely adjudicating their respective interests in the waters available to the lower basin. It matches in every particular the requirements for a case or a controversy in the constitutional sense of these words as those requirements were spelled out by the Supreme Court in *Aetna Life Insurance Company* v. *Haworth* (300 U. S. 277, 240 (1937)). "A 'controversy' in this sense," the Court said, "must be one that is appropriate for judicial determination. * * * The controversy must be definite and concrete, touching the legal relations of parties having adverse legal interests. * * * It must be a real and substantial controversy admitting of specific relief through a decree of a conclusive character, as distinguished from an opinion advising what the law would be upon a hypothetical state of facts. * * * Where there is such a concrete case admitting of an immediate and definitive determination of the legal rights of the parties in an adversary proceeding upon the facts alleged, the judicial function may be appropriately exercised, although the adjudication of the rights of the litigants may not require the award of process or the payment of damages. * * *"

On the question of whether the controversy is a justiciable one, the Department of Justice advised the committee (hearings, S. J. Res. 145, p. 11):

> It has been suggested that there is some question as to the existence of a justiciable controversy. That question itself can be determined authoritatively only by the Supreme Court. Cogent arguments can be made in support of, and also against, the existence of a justiciable controversy. Presumably, all aspects of this question will be thoroughly presented and vigorously maintained by the different States in case the question is presented to the Supreme Court.

Time does not permit, nor would it be appropriate, for me to undertake to advise the experienced legislators constituting the committee in any academic fashion as to the divisions of the functions, in the language used by the United States Supreme Court in the case of *Kilbourn* v. *Thompson* (103 U. S. 168). The Court said (p. 387):

> It is believed to be one of the chief merits of the American system of written constitutional law, that all the powers entrusted to governments, whether State or National, are divided into the three grand departments of the executive, the legislative, and the judicial. That the functions appropriate to each of these branches of government shall be vested in a separate body of public servants, and that the perfection of the system requires that the lines which separate and divide these departments shall be broadly and clearly defined. It is also essential to the successful working of this system, that the person entrusted with power in any one of these branches shall not be permitted to encroach upon the powers confided to the others, but that each shall by the law of its creation be limited to the exercise of the powers appropriate to its own department and no other. * * *
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> The Constitution declares that the judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain. If what we have said of the division of the powers of the Government among the three departments be sound, this is equivalent to a declaration that no judicial power is vested in the Congress or either branch of it, save in the cases specifically enumerated to which we have referred.

It would seem too obvious to require argument, that the determination of issues of contract law between States of the Union is of justiciable character, hence that under article III, section 10, of the Constitution, exclusive and original jurisdiction to determine the controversy rests in the Supreme Court of the United States.

A few days ago we were before the Public Lands Committee of the House. The committee was hearing the proponents of the upper Colorado River Basin compact (H. R. 2325). That compact embodies or implies certain interpretations of the basic Colorado River compact. The question arose as to whether the granting of congressional consent to the upper Colorado River Basin compact would constitute a congressional interpretation of the basic compact. My good friend and occasional adversary, Mr. Jean S. Breitenstein of Colorado, was asked the following question by Mr. Engle of California:

Mr. ENGLE. In your opinion, does the Congress have the authority or the power to interpret such interstate compacts?

Mr. BREITENSTEIN. No, sir (typewritten transcript, p. 156).

On this particular point I find myself in hearty agreement with Mr. Breitenstein. In the same proceeding, Judge Clifford H. Stone, also of Colorado, in urging approval of the upper Colorado River Basin compact, emphasized that there are two ways, and only two ways, of settling interstate controversies, one by agreement evidenced by interstate compact, and the other by litigation.

While, as has been pointed out, the controversy between the States of Arizona and California is really one of contract interpretation, it happens that the subject matter of the contracts involved is the use of water.

As I have said, the Arizona-California controversy which has raged for a quarter of a century, will be determined ultimately by the interpretation of the words of contract used in the Boulder Canyon Project Act and in the California Limitation Act, the use of water being the subject matter of the contracts.

However, the statement has been made, and frequently repeated, that the Congress apportioned the waters available to the lower basin under the Colorado River compact by legislative action, that is, the Boulder Canyon Project Act, in 1928, and that what the Congress did, the Congress can repeat, and interpret without the aid of the judicial branch. A glance at the text of the project act completely refutes the statement that the Congress asserted any right to or did apportion or allocate water or the use of water between the States.

It will be noted in the first paragraph of section 4 (a) that, in the absence of a seven-State Colorado River compact, the President might proclaim the act effective on the basis of a six-State ratification, including that of the State of California, plus an agreement on the part of the State of California to limit its diversions from the river. The limitation on California became effective, not by the act of Congress, but by the act of the State legislature of the State of California. The California Limitation Act, while statutory in form, is contractual in character. If it were merely legislative, it could of course be amended or repealed, but constituting a compact between the States of California and the United States, made for the benefit of the other States of the basin, it is not subject to amendment or repeal. In other words, it is an irrevocable contract. All that the Congress did was to make an offer to the State of California which, if accepted by the State, would

permit the proclamation on the part of the President putting the project act into effect.

If any confirmation of the proposition that the Congress had no intention to apportion water is required, a reference to the debates on the floor of the Senate offers convincing evidence. In referring to the amendment making the offer to California, Senator Pittman of Nevada said (Congressional Record, 70th Cong., 2d sess., December 11, 1948, p. 386):

> The Phipps amendment does not do anything else except that it states how California shall ratify. The Congress of the United States could not impose it upon California unless California assented to it, because California already has sovereign rights over the water, and the law recognizes her right to use as much as she can put to beneficial use. Consequently the Senator from Colorado (Mr. Phipps) has simply taken the amendment which was recommended by the committee and put it in legal language and provided a legal method for California to ratify it.

There was no dissenting voice. The entire debate confirms Senator Pittman's statement.

In the latter part of section 4 (a) of the project act, authority, which has never been exercised, was given to the lower basin States to enter into a compact. The terms of the proposed compact are stated with some particularity, and quantities of water are mentioned. Here, again, both the text of the act which is a mere authorization, and the legislative history confirm the proposition that there was no intent on the part of the Congress to make any division or apportionment of Colorado River water in or by the Boulder Canyon Project Act. The entire matter was considered as one to be settled in the first instance by agreement among the States. When the amendment was before the Senate, the following colloquy occurred (Congressional Record, 79th Cong., 2d sess., pp. 471–472, December 12, 1928):

> Mr. JOHNSON. Here is the difficulty which strikes me in the matter: First of all, we are authorizing the doing of something that already the States have the right to do. Secondly, we are stating the things that the three States are to do, and we are making a sort of Procrustean bed upon which they must lie in the determination of matters that are suggested within this amendment, without any elasticity, without any opportunity to alter phraseology or possibly terms. What is done by the amendment is to put the impress of the Federal Government upon the necessity of agreement, and if one of the States should not agree, leave that State in a position which would not be particularly enviable.
>
> With the distinct understanding that this authorization is one that is after all an authorization that is wholly unnecessary, because the parties may, in any fashion they desire, meet together and contract and subsequently come to Congress for ratification of that contract; that there is no impress of the Congress upon the terms, which might be considered coercive to any one of those States, I am perfectly willing to accept the amendment.
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> Mr. PITTMAN. There is nothing necessary at all, of course, so far as the adoption of this amendment is concerned, unless the element of time is considered valuable. If it should happen, mind you, that 2 weeks from now the legislatures of the three States, being in session, should be perfectly satisfied with the terms of this proposed agreement and should ratify it, they could on the next day also ratify the seven-State agreement. On the other hand, if we do not adopt this amendment now, but allow the three States to meet together and agree and they should agree, then it will be necessary for them to come to Congress next fall; and we might find that Congress next fall would not ratify the agreement entered into by the three States, might we not?
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> Mr. JOHNSON. That is possible.
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> Mr. PITTMAN. Suppose, for instance, a majority of the Senate found there were certain things in the agreement it did not like.
>
> Mr. JOHNSON. That is all right; but what I want to make clear is that this amendment shall not be construed hereafter by any one of the parties to it or

any of the States as being the expression of the will or the demand or the request of the Congress of the United States.

Mr. PITTMAN. Exactly not.

Mr. JOHNSON. Very well then.

Mr. PITTMAN. It is not the request of Congress.

Mr. JOHNSON. I accept the amendment then.

It is apparent, both from the text of the Boulder Canyon Project Act itself and from the legislative history, particularly of section 4 (a) of the Boulder Canyon Project Act, that the Congress did not, as has been asserted, attempt to apportion water or the use of water to the several States. It was fully recognized then, as it should be now, that the States, by agreement, might apportion the water among themselves, or that the State of California, by agreement with the United States, and for a consideration, might limit its otherwise unlimited right to appropriate water of the Colorado River, but that such limitation could not be forced on California. It was also fully recognized that the suggested lower-basin compact was a suggestion only, not an exercise of power nor even a request.

In my study of the matter I have not been able to discover any instance in which the Congress of the United States has attempted to apportion water among States of the Union. The traditional treatment of the rights to the use of water in the West and Mountain States is directly contrary to any such practice. It has been the policy of the United States from the beginning to recognize that control of such uses of water vested in the States, and that differences between the States with respect to such uses should be settled preferably by compact, but if agreement is not possible, then by litigation.

The act of July 26, 1866 (14 Stat. 251, R. S. sec. 2339, 43 U. S. C., sec. 661) declares broadly:

Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same.

Ten years later the Desert Land Act of 1877 (19 Stat. 377) held open to public appropriation all unappropriated waters "upon the public domain and not navigable." The act of March 1891 (26 Stat. 1095), granted ditch rights-of-way, but was careful to provide that nothing should—

interfere with the control of water for irrigation and other purposes under authority of the respective States or Territories.

The Reclamation Act of 1902 (32 Stat. 388, 43 U. S. C. 391, et seq.) applies to the 17 Western States including the 7 Colorado River Basin States. Section 8 of the Reclamation Act provides:

That nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof.

The Reclamation Act was enacted in fulfillment of the pledge in the 1900 Republican platform to enact—

adequate national legislation to irrigate the lands of the United States, reserving control of the distribution of water to the respective States and Terriories (36 Congressional Record, 6672, 6676).

President Roosevelt, in December 1901, strongly recommended enactment of such a measure but was emphatic that the legislation should offer affirmative protection to State laws and vested rights (35 Congressional Record 6676, 6775–6776).

Senator Clark, of Wyoming, speaking specifically of the great navigable rivers of the West, commended the Reclamation Act then being considered because, as he stated:

in distribution of those waters it is right and proper that the various States and Territories should control (35 Congressional Record, 2222).

The statutes demonstrate beyond question a congressional intent that water rights in the arid West shall be and remain under control of the States.

Water rights on western streams have been adjusted by interstate compacts with congressional approved in the following interstate compacts:

1. La Plata River Compact, Publication No. 346, States of Colorado and New Mexico; approved by Sixty-eighth Congress.
2. South Platte River Compact, Publication No. 37, States of Colorado and Nebraska; approved by Sixty-ninth Congress.
3. (First) Rio Grande River Compact, publication No. 370, States of Colorado, New Mexico, and Texas; approved by Seventy-first Congress.
4. Red River of the North Compact, Publication No. 456, States of South Dakota, North Dakota, and Minnesota; approved by Seventy-fifth Congress.
5. (Second) Rio Grande River Compact, Publication No. 96, States of Colorado, New Mexico, and Texas; approved by Seventy-sixth Congress.
6. Republican River Basin Compact, Publication No. 60, States of Colorado, Kansas, and Nebraska; approved by Seventy-eighth Congress.
7. Belle Fourche River Basin Compact, Publication No. 236, States of South Dakota and Wyoming; approved by Seventy-eighth Congress.
8. Cordilla Creek Compact, Publication No. 408, States of Colorado and New Mexico; approved by Seventy-ninth Congress.

In addition there is, of course, the Colorado River compact approved by the Congress in 1928.

The Congress, as the legislative branch of the Federal Government, has carefully left the matter of water rights to State control and interstate adjustment by compact. The executive branch of the Federal Government has likewise been careful to follow this example in administrative practice. The Department of the Interior has frequently recognized the validity of State water rights in navigable streams.

The Supreme Court has in numerous cases noted that Congress has recognized the supremacy of State law in respect of the acquisition of water for the reclamation of public lands of the United States and that the Secretary of the Interior in acquiring water rights under

the reclamation laws must proceed in conformity with State laws in appropriating water for irrigation purposes.

Power Company v. *Cement Company* (295 U. S. 142, 164).
Nebraska v. *Wyoming* (295 U. S. 40, 43).
Nebraska v. *Wyoming* (325 U. S. 589, 614).
Ickes v. *Fox* (300 U. S. 82).
Wyoming v. *Colorado* (259 U. S. 463, 66 L. Ed. 1013).

The United States Government, both by statute and administrative policy, has made it clear that water rights in western rivers shall be determined under State law and where the several State interests conflict on an interstate river, these disputes shall be determined either by interstate compact or by Supreme Court, under the express terms of the Constitution.

I need not emphasize to this committee the implications of the reversal of traditional treatment of western water rights, even assuming that the Congress has the power to bring about such a reversal. A century of development of water law would be upset. State sovereignty over the rights of the use of water would be destroyed. Instead of resorting to compact or to courts, contending States would resort to the Congress, which, obviously, is not equipped to hear and consider the intricate questions of fact and law involved in the determination of such disputes.

What has been suggested here is either that the Congress undertake to adjudicate the rights of the States under contracts made in 1929, and to finally determine and declare those rights—this is obviously a judicial function beyond the power of the legislative branch of Government—or that the Congress, as a party to one of the contracts, for instance, the statutory compact limiting California's use of Colorado River water, make a unilateral declaration of its intent in 1928 (such a declaration being unilateral, would not be binding on the other party to the contract; that is, the State of California; the California Legislature, with equal effectiveness might declare its intent as of 1928); or that the Congress now attempt to make or affirm an apportionment of the use of waters among the States, a function which has always been considered a function of the States.

As the Secretary of the Interior said, the controversy exists. It constitutes a bar to development of the river. It is justiciable in character. If California is right, there is no water for the central Arizona project. If Arizona is right, there is water available. Nothing in the departmental reports suggests that the controversy is not substantial and real. In fact, the contrary is indicated.

It would certainly appear to be extremely unwise to authorize a $1,250,000,000 project on an infirm water right. Even if the present Congress should authorize the project and decline to waive Federal immunity to suit, I have enough confidence in American institutions to believe that long before the project could be put into operation, but possibly after vast amounts of money had been spent, some future Congress would grant us our day in court. That is all we ask.

Senate Joint Resolution 4 should be approved and enacted.

The foregoing completes my prepared statement.

Mr. Ely made reference to one matter that I would like to call to your attention. Part of the discussion that went on at the time the Boulder Canyon Project Act was enacted in December 1928 was as to the proposed three-State contract which was before the Senate. I

mention this because of the repeated statements that have been made here that the Congress, contrary to the position I have just stated, attempted to adjudicate or determine the respective rights of the several Sates of the Colorado River and that that determination is expressed in the proposed three-State compact. That argument is defeated by the very terms of the project act itself wherein the States are given the opportunity to agree.

But the Congress recognized, as I think we all recognize, that it is primarily the function of the several States to determine issues of water rights between themselves or, failing an agreement, to secure an adjudication.

When this proposed three-State compact was before the Senate the following discussion occurred between Senator Johnson and Senator Pittman of Nevada. This appears in the Congressional Record, Seventieth Congress, second session, pages 471–472. Senator Johnson was addressing his remarks to the offered three-State compact. He said this:

Mr. JOHNSON. Here is the difficulty which strikes me in the matter: First of all, we are authorizing the doing of something that already the States have the right to do. Secondly, we are stating the things that the three States are to do, and we are making a sort of Procrustean bed upon which they must lie in the determination of matters that are suggested within this amendment, without any elasticity, without any opportunity to alter phraseology or possibly terms. What is done by the amendment is to put the impress of the Federal Government upon the necessity of agreement, and, if one of the States should not agree, leave that State in a position which would not be particularly enviable.

With the distinct understanding that this authorization is one that is after all an authorization that is wholly unnecessary, because the parties may, in any fashion they desire, meet together and contract and subsequently come to Congress for ratification of that contract; that there is no impress of the Congress upon the terms, which might be considered coercive to any one of those States, I am perfectly willing to accept the amendment.

Mr. PITTMAN. There is nothing necessary at all, of course, so far as the adoption of this amendment is concerned, unless the element of time is considered valuable. If it should happen, mind you, that 2 weeks from now the legislatures of the three States, being in session, should be perfectly satisfied with the terms of this proposed agreement and should ratify it, they could on the next day also ratify the seven-State agreement. On the other hand, if we do not adopt this amendment now, but allow the three States to meet together and agree and they should agree, then it will be necessary for them to come to Congress next fall; and we might find that Congress next fall would not ratify the agreement entered into by the three States, might we not?

Mr. JOHNSON. That is possible.

Mr. PITTMAN. Suppose, for instance, a majority of the Senate found there were certain things in the agreement it did not like.

Mr. JOHNSON. That is all right; but what I want to make clear is that this amendment shall not be construed hereafter by any one of the parties to it or any of the States as being the expression of the will or the demand or the request of the Congress of the United States.

Mr. PITTMAN. Exactly not.

Mr. JOHNSON. Very well then.

Mr. PITTMAN. It is not the request of Congress.

Mr. JOHNSON. I accept the amendment, then.

Now, I read that in response to the suggestion made to this committee from time to time during these hearings that the Congress expressly willed or desired and, in effect, parceled out the water to the several States. It distinctly did not do so and it was so stated on the floor of the Senate.

The CHAIRMAN. Would you agree that it was sort of an informal suggestion?

Mr. HOWARD. It was a suggestion but as Senator Johnson says:

That is all right; but what I want to make clear is that this amendment shall not be construed hereafter by any one of the parties to it or any of the States as being the expression of the will or the demand or the request of the Congress of the United States.

That leaves the opportunity for suggestion still open.

Senator DOWNEY. Mr. Howard, do you desire to ask permission that that statement be printed in full in the record?

Mr. HOWARD. Yes; I would.

The CHAIRMAN. It will be so ordered.

Mr. HOWARD. Some of the material I want to comment on was developed during the course of the hearing quite recently. But I want to say something now on the general equities of the situation.

I noted that Senator Kerr in a very able and astute cross-examination of one of our witnesses created the impression in the record that California was a very grasping State and was seeking an extraordinarily large percentage of the 75,000,000 acre-feet of water to be delivered every 10 years at Lee Ferry. That examination was based upon two misapprehensions, I think: First, that the 75,000,000 acre-feet to be delivered every 10 years at Lee Ferry is identical with the 7,500,000 acre-feet of water apportioned to the lower basin by article III (a) of the compact; and also upon the misapprehension that five States were concerned with that 75,000,000 acre-feet of water.

As a matter of fact, the water which Utah and New Mexico would use out of the lower basin share of the Colorado River system is water that will never pass Lee Ferry, so that only three of the States are concerned in the matter.

I want to point out to the committee the condition that confronted the States in 1922 when this compact was made. All of the States involved in this controversy—and I think the same statement could be made of all of the reclamation States—operate on what we call the doctrine of appropriation, so far as the use of water is concerned, that is, first in time, first in right.

The doctrine of riparian rights that was derived from the old common law of England was found to be inapplicable to conditions existing in the West so the States, I think, have all gone over to the doctrine of appropriation. It merely means that the man who can get there first with a project putting the water to beneficial use can establish a right to it, entirely independent of drainage areas, so long as he can have access to the stream.

There is one phase of that doctrine that has not been mentioned before this committee and which may have been overlooked. I say that because there has been mentioned from time to time the amounts of water which California and the other States were using in 1922, actually diverting and using. The phase of the appropriation doctrine that I want to mention is frequently referred to as the doctrine of "relation back." That is a man's rights to the use of appropriated water relate back to the time when his appropriation is initiated, assuming that he proceeds with diligence in proportion to the magnitude of the work to put that water to beneficial use. The time involved, of course, depends upon the magnitude of the project involved.

In 1922 when these compact commissioners sat down to consider this problem the Colorado River, so far as its useful unregulated flow

was concerned was fully, in fact, somewhat overappropriated. There were years when not enough water came down to fully satisfy the appropriations.

The availability of additional water was entirely dependent upon storage.

Whether you believe in the doctrine of appropriation rights or not, you may think it is not the proper doctrine, but nevertheless it is the doctrine of the reclamation States.

Senator DOWNEY. You mean the doctrine of prior appropriation?

Mr. HOWARD. That is right, sir. It is the doctrine which has been recognized by all of these States.

Under that doctrine the State of California had filed upon waters of the Colorado River, which I would like to review. In using these figures, Mr. Chairman, I am doing so in hope of avoiding discussion about a few acre-feet one way or the other. I am going to deal in rather round figures.

We had the Imperial and Coachella appropriations which dated back to 1895 and 1896. The project was for 800,000 acres of land approximately. We will use the round figure of 800,000 acres of land. None of the water diverted to that area returns to the stream system so that the entire diversion is, by our definition, consumptive use. However, the actual consumptive use on the land is less than the actual diversion. So, referring to the diversion duty of water necessary to serve that acreage I have used the figure 4.75 acre-feet per acre as diversion duty which, you will understand, is distinguished——

The CHAIRMAN. What was the date of this?

Mr. HOWARD. 1895 and 1896.

The CHAIRMAN. And you used 4.75?

Mr. HOWARD. Yes, sir, as the diversion duty.

The CHAIRMAN. For 800,000 acres?

Mr. HOWARD. For 800,000 acres. The diversion works were constructed to a capacity of 10,000 second-feet. Of course, anyone with any irrigation experience at all realizes that those canals do not flow to their full capacity at all times. The water is taken as and when needed, but there are times when peaking capacity would require that amount of capacity in the diversion works.

So that although the appropriation to the State of California under the then California law was not in terms of acre-feet per annum but was in terms of diversion in second-feet, which you will recognize is the rate of flow, the appropriation being limited by the beneficial use of water would be controlled by the acreage in that project. That is, under the doctrine of appropriation you just cannot put a marker on water for uses that will never be realized.

Applying the diversion duty of 4.75 you come out with an appropriation for the Imperial and Coachella areas, which date back to 1895, of 3,800,000 acre-feet per annum. That was a right which, although I do not think they ever attained full use of that water in any one year——

The CHAIRMAN. You made a contract with the Secretary for 3,850,000 acre-feet.

Mr. HOWARD. That includes other waters. What I am getting at now is the condition that existed at the time the compact was made. We might test it this way: Assuming for the moment that California

had gone into the Supreme Court to secure an equitable apportionment instead of having gone into compact negotiations, under the *Wyoming* v. *Colorado* case which came out at about that time, the appropriative rights would have been recognized regardless of State lines.

So that in addition to that right the Palo Verde project had been started. That is a much older project. I think it undoubtedly is the earliest appropriative right on the river. I know it is on the lower river. It goes back to the 1870's and was for 100,000 acres. In that instance that area is so close to the river that there is a return flow. If you apply the duty of water there, the consumptive use of water of 3.3 acre-feet per acre you come out with a figure of 330,000 per annum.

In addition to that there was the old Yuma area of about 20,000 acres and the figures the engineers have given me for that appropriation would be about 50,00 acre-feet per annum.

So that California at that time could probably have sustained in court, had it had occasion to go into court, appropriative rights amounting to 4,180,000 acre-feet per annum for irrigation alone.

The CHAIRMAN. Those were the claims, were they not, Mr. Howard?

Mr. HOWARD. They were the appropriative rights which could have been asserted and would probably have been recognized.

The CHAIRMAN. But they were not actually exercised.

Mr. HOWARD. Yes, Senator, they were being exercised. The projects were being developed and that is why I mentioned the doctrine of relation back. Under the doctrine of relation back the appropriation is recognized as of the date of its initiation, assuming that it is being developed with diligence depending upon the magnitude of the project.

What I am talking about are the rights which under that doctrine of relation back could have been asserted and sustained by California.

There were, of course, in the upper basin rights which may have been and probably were more or less contemporaneous. That is, in order to resolve the conflict under the *Wyoming* v. *Colorado* case they would have to have been interlocked and interrelated and various priorities ascertained. But there were appropriations, actual uses of water in the upper basin and some on the Arizona side.

Senator DOWNEY. What did they amount to, Mr. Howard?

Mr. HOWARD. It is rather difficult to say because of the inadequacy of the records, but the best figures we can get are somewhere around 2,000,000 to possibly 2,500,000 acre-feet.

There again I think the doctrine of relation back would have applied. Most of them were relatively small projects and the figures are not exact. I have not been able to turn them up in any form that I could use.

So that had California gone into court at that time it could have—and I think would have—been successful in sustaining that position.

The CHAIRMAN. Even so, Mr. Howard, is it not a matter of fact that without the construction of the Boulder Dam and these works necessary to store this water, in preference to wasting it into the gulf, that there would not have been water enough to do that job?

Mr. HOWARD. If California could have sustained its priorities, and I believe it could have, the natural flow of the river would have satisfied those rights.

The CHAIRMAN. Do you mean to say that California would have been better off if it had never contributed to the building of the Hoover Dam?

Mr. HOWARD. If you accept Mr. Debler's figures we would have been.

The CHAIRMAN. I am talking about you and me right now.

Mr. HOWARD. Mr. Debler had his figures down to——

The CHAIRMAN. Let us not talk about Mr. Debler.

Mr. HOWARD. I would rather not.

The CHAIRMAN. I am talking about your point of view.

Mr. HOWARD. My point is this, Senator, that if we had gone in on the doctrine of appropriation with all of its ramifications and implications as of 1922, I think we could have sustained a California appropriative right in the river of somewhere around 4,000,000 acre-feet of water, regardless of storage. So that all we are asking out of the storage made available by the Boulder project, the Hoover Dam, is an additional 1,400,000 acre-feet, which is not really an inequitable share of the additional waters made available by large storage.

The CHAIRMAN. I might cite at this point the fact that last Friday we had a hearing before the Interior Committee. Not all of the members of the committee were able to be present but it was on the Arkansas River compact between the States of Colorado and Kansas. That stream has been the subject of litigation for about 40 years. A very large storage reservoir was built by the Army engineers in Colorado. The basis of that compact, I thought, was a very interesting one.

The basis of it was that the stored waters should be used to their utmost but that in time of drought or absence of water then the old priorities would be asserted.

So the compact specifically states that in Colorado above the dam the water users may use all the water that is available there without regard to their prior right, but when the water goes down and it is not available then the priorities below the dam must be asserted and recognized.

Mr. HOWARD. That is a situation which is quite distinct and different from this situation.

The CHAIRMAN. Oh, yes, it is very distinct but it shows how a long-standing controversy can be settled upon the basis of the improvements which modern engineers can erect on a river system.

All we are trying to do here eventually is to utilize to the best advantage of all concerned the normal flow of the stream when stored and held over from year to year for more use. Apparently everybody will agree, I think, that there are two types of rights dealt with, or two types of water dealt within this compact; first, the rights that are recognized in perpetuity, and, secondly, those rights which are contingent upon the presence of water in the system.

Mr. HOWARD. As the chairman points out the effect of the Colorado River compact is to defeat, to a large degree—except as to excess and surplus water—the doctrine of appropriation. That is, the upper basin States are accorded a right in perpetuity which could be exercised at any time in the future to consumptively use 7,500,000 acre-feet of water and no matter what we do down below by putting unused upper basin water to use we could never acquire an appropriative right to it which would defeat the upper basin right. To that extent the doctrine of appropriation has been cut across.

Another feature that enters into and is related to what the chairman said is that the entire Colorado River compact device was predicated on the idea that the river should be controlled. It would not have been possible to apportion anything like the amount of water that was dealt with had the commissioners not contemplated control.

I was mentioning a moment ago the accumulated appropriative rights in the lower basin. I did not put a figure on the rights on the Arizona side out of the main stream, but they are generally assumed to have been somewhere in the neighborhood of 500,000 acre-feet. The Yuma project in Arizona and the Indian projects, and one thing and another on that side.

That is reflected as though the aggregate appropriative rights of the lower basin were no doubt considered by the compact commissioners because in the compact in article 8, it is provided:

> Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this contract. Whenever storage capacity of 5,000,000 acre-feet shall have been provided on the main Colorado River within or for the benefit of the lower basin, then claims of such rights, if any, by appropriators or users of water in the lower basin against appropriators or users of water in the upper basin shall attach to and be satisfied from water that may be stored not in conflict with article III.
>
> All other rights to beneficial use of waters of the Colorado River system shall be satisfied solely from the water apportioned to that basin in which they are situate.

I mention that section because, Mr. Chairman, it reflects the aggregate amount of the appropriative rights which were indirectly recognized by the Colorado River commissioners in writing the Colorado River compact and they provided, in effect, that those established rights might be transferred to storage instead of having it taken out of the main stream. That was done in order to make it possible for the upper basin States to develop, which they could not have done had the lower basin asserted its full appropriative rights under the recognized law of appropriation.

I think that is the basis for that section.

If you take that 5,000,000 and consider what was actually going on in the way of appropriation—as I pointed out there was somewhat over 4,000,000 on the California side and an amount exceeding 500,000, probably, on the Arizona side, with some incidental appropriations—you can see why it was that they arrived at that round figure of 5,000,000.

The point of what I am trying to say here is to demonstrate that in seeking an additional 1,400,000 acre-feet, or something of the sort, out of the controlled river, California's position is not unduly grasping. In order to comprehend the whole picture we have to take into consideration the facts that existed as of 1922.

Going on further with the general equities of the California position: After the compact had been ratified by six of the States and rejected by the State of Arizona, the Limitation Act had been put into effect and the Boulder Canyon Project Act, California proceeded to enter into an intrastate priority agreement which puts the Metropolitan area in a position of junior priority. That amount of 1,212,000 acre-feet contracted for by the metropolitan water district is junior to the old appropriative rights which were by agreement among the California agencies, and in the light of the limitations

that have been imposed upon us, scaled down to 3,850,000 acre-feet and accorded a priority over the metropolitan uses.

During all of that time, as Mr. Ely has pointed out and fully documented, there was no real difference of opinion between the Arizona representatives and California representatives as to the meaning of the compact and the Limitation Act. In fact, the Arizona representatives considered it unreasonable and harsh and were unwilling to proceed. But whether it was unreasonable or harsh it was the controlling law.

So we proceeded to construct very costly works in reliance upon those documents. Mr. Carson in his statement points out—at least he misquotes me; I checked the record and found that he did—he said I maintained we had made our water-delivery contracts after the pleadings in the first central Arizona case were filed, and that that was not true, that we made our first contract in 1930. My statement was that our contract was made at about the time the Arizona case was filed. We were relying upon a contemporary interpretation that had been expressed in various ways, in various conferences but was finally crystallized in the bill that was filed by the State of Arizona and fully briefed by Mr. Acheson and Judge Matthew, as Mr. Ely has pointed out.

When we were spending the money to build these works we were relying upon an interpretation of the compact and limitation act with which the official representatives of the State of Arizona agreed, and made the basis of actions in the Supreme Court. We feel that having done that it is too late for them now to shift over, completely reverse the official position then taken, assert that III (b) water is entirely unavailable to California and assert that Arizona's use of water should be measured by depletion rather than consumption, and by that construction exclude us from whatever we relied upon at the time we made the contracts.

As I say, I do not ask this committee to solve these issues in favor of California. I do not think it would be competent for the Congress to do it; it would not be effective for the Congress to do it. All I am asking is that we be given a day in court when we can present, in an orderly manner to the court, the legal problems that arise out of this controversy. We may find we are wrong. I do not think so, I am fully confident of our position.

But I do feel that before a project is constructed which, as Mr. Ely has pointed out, must get its water by taking water away from authorized and existing projects, we should have these issues determined and resolved. That is all we are asking in connection with Senate Joint Resolution 4. Even if we should be denied that privilege now I have no doubt it will be accorded to us sometime and it seems to me logical we should secure a settlement of those points of controversy before, rather than after, the huge amounts of money are spent which would be necessary to construct the Central Arizona project.

I fully appreciate the extent to which California has imposed upon the good nature of the chairman and this committee and do not desire to carry on this discussion any further. But I do want you to recognize that we have not only a basically equitable position but that the issues of law before the committee are such as should be resolved by the court.

The CHAIRMAN. May I ask you one or two questions?

How much water is the metropolitan district actually using out of the Colorado now?

Mr. HOWARD. I think in the last calendar year we pumped over the hill about 150,000 acre-feet. I think it figures out about 12 percent of our contract right.

The CHAIRMAN. What about the city of San Diego?

Mr. HOWARD. That is included. The city of San Diego was annexed to the metropolitan water district.

The CHAIRMAN. Oh, yes; I recall that.

Mr. HOWARD. Its contract right was merged with our basic contract.

The CHAIRMAN. What about the Palo Verde district?

Mr. HOWARD. I would have to refer that question to one of the engineers, or representatives of the Palo Verde area. I would not undertake to quote that figure. I think Mr. Elder would probably know it.

Mr. ELDER. It is in the neighborhood of 300,000 acre-feet with some return flow reaching the river out of that amount.

The CHAIRMAN. That is actually being used now?

Mr. ELDER. Yes, sir. The return flow has not been determined with any satisfactory accuracy.

Mr. HOWARD. May I say for the record that Mr. C. C. Elder is hydrographic engineer for the metropolitan water district and one of my advisers.

The CHAIRMAN. And how much is actually being used in the Imperial Valley?

Mr. HOWARD. That is a question I would again refer to the engineer.

Mr. ELDER. Out of the main stream?

The CHAIRMAN. Yes; I am thinking of the contracts you have.

Mr. MATTHEW. It is 2,900,000 acre-feet.

The CHAIRMAN. Would you be good enough to prepare and insert in the record the exact figures in response to these questions?

Mr. HOWARD. That will be done.

(The matter referred to follows:)

Colorado River water for California projects

Project	Consumptive use from Colorado River, 1948	Diversions from Colorado River, 1922
	Acre-feet	*Acre-feet*
Palo Verde district	[1] 315,700	150,000
Coachella district	146,500	
Imperial district	2,800,000	[2] 2,890,000
Yuma, Calif. (Bard) district	[1] 40,000	30,000
Metropolitan water district of southern California	196,000	
Total	3,498,200	3,070,000

[1] Total diversions less surface waste and drain flow. Percolating return flow not determined at present so actual net consumptive use is less than listed amounts.

[2] From records of Imperial Irrigation District (including 540,000 acre-feet for Mexican lands).

The CHAIRMAN. Are there any other questions?

Senator KERR. I would like to ask a question or two, if I may.

California wants all of the water which, under the law of the river, the various contracts and legislative enactments in force and effect entitle her to; does she not?

Mr. HOWARD. Substantially; yes. We are a little bit short of what we consider ours.

Senator KERR. I say, she wants all of the water she is entitled to?

Mr. HOWARD. All we can lawfully get.

Senator KERR. You do not want to take the position here of asking for more than you are lawfully entitled to?

Mr. HOWARD. Certainly not, sir. We are well within our lawful rights.

Senator KERR. As one member of the committee, I had the feeling it is eventually going to have to be decided by the Court, and that is not different from the position you take, is it?

Mr. HOWARD. No; I think it will have to be decided by the Court.

Senator KERR. Now, then, let us leave California for a moment and go to Arizona. She naturally wants all the water she is entitled to under the law.

Mr. HOWARD. Quite right.

Senator KERR. And, as far as California is concerned, she is willing for her to have it, if under the law she is entitled to it?

Mr. HOWARD. That is correct, sir.

Senator KERR. Now, if under the law she has water available to her sufficient to provide the water required for the so-called central Arizona project, and if the committee and the Congress find that having the water available to her that is a feasible project, then California would not arbitrarily object to the authorization and the building of the project, would she?

Mr. HOWARD. Assuming the feasibility. I might reserve my right as a taxpayer to complain on that point, but if you assume the feasibility of the project——

Senator KERR. Having been shown to the satisfaction of this committee and the Congress?

Mr. HOWARD. If that were shown and assuming there were a water supply for the project, I think we would have no objection to it.

Senator KERR. Suppose that this committee recommends the Congress pass a law which does this: Authorizes, on the basis of feasibility having been shown—and, so far as I am concerned, I will say that is not a deciding matter—but assuming it authorizes the project on the basis of its being constructed in two forms, one the power project which is desired, as I understand it, by everybody; and second, if and when the matter has been decided by the Court that the water is available, that part of it that has to do with taking her the water, but further gives California what she asks for here, that is, permissive legislation that the United States be made a party to an action in which the rights to the water might be determined, would California's position be prejudiced or would her rights be denied under that kind of legislation?

Mr. HOWARD. I do not think the representatives of California—and I use a phrase we use in court—could stipulate——

Senator KERR. You were talking about the equities involved, as I understand it.

Mr. HOWARD. I would not want to say that the California representatives would stipulate that the bill might be passed authorizing it.

Senator KERR. I did not ask you if you would stipulate; I asked you if, under those circumstances, her rights would be prejudiced.

Mr. HOWARD. Such an act would probably have the effect of throwing the weight of the United States back of the Arizona position.

Senator KERR. If the act specified that it was not to be so construed?

Mr. HOWARD. If the act specified that it was not to be construed as in any way prejudicial to the rights of either of the contending parties, or any party, so far as that is concerned.

Senator KERR. Then the rights of California could not be injured thereby?

Mr. HOWARD. It is rather difficult to foresee all the consequences; but, if it were sufficiently well guarded in the way of avoiding prejudice or throwing the weight of the United States and the Attorney General into the scales against California, it is possible and probable that the Court would resolve the conflicting issues with the same ultimate effect as though we were in Court in the first instance without the authorization of the project.

Senator MCFARLAND. I have one or two questions.

The CHAIRMAN. May I ask one question first in connection with what Senator Kerr has just asked.

Senator MCFARLAND. Yes, sir.

The CHAIRMAN. What, in your opinion, is the feasibility of the power projects included within the bill we have here before us, forgetting for the moment the irrigation features?

Mr. HOWARD. I believe if the Bridge Canyon project were constructed as a power project, very much on the same theory that the Boulder project was constructed—that is, making the energy available for commercial sale—that it would be a wonderful thing for the Southwest; that we should use all of the energy we can get out of that river and thereby cut down the sale of oil.

The CHAIRMAN. Do you believe, then, that is a feasible project and not too expensive, so far as power is concerned?

Mr. HOWARD. My qualifications as an engineer are subject to question, Mr. Chairman, but from all that I have heard in the discussions of the engineers and the reports I have read I consider it a good dam site, a feasible project, and one which would produce a substantial amount of energy, with one qualification, that is, I believe it should be backed up by greater storage.

You will recall that the storage capacity of the dam at Bridge Canyon is quite small. It is 3,500,000, or something of the sort.

The CHAIRMAN. Yes; there should be another reservoir.

Mr. HOWARD. There should be a reservoir upstream which would not only catch some of the silt but which would provide integration. The Bureau of Reclamation seems to assume that Bridge Canyon can be integrated with the Hoover project in such fashion as to produce firm energy considerably in excess of that which we think could be produced there without a revision or an amendment of the existing contracts.

You will recall that under the Boulder Canyon Project Act all of the energy, both firm and secondary, to be produced at the Boulder project was sold. My client has interests in it, in the firm energy and in the secondary. The city of Los Angeles Department of Waterpower and the Edison Co. have interests.

The CHAIRMAN. I am merely trying to find out from you, as a representative of the Metropolitan Water District and also of California,

whether, in your opinion, an expenditure of the sums it is estimated these power features would cost would be a justifiable expenditure.

Mr. HOWARD. I think, assuming that point, it is a feasible and desirable project, assuming adequate upstream protective and regulatory works.

The CHAIRMAN. I am asking the question because of all the talk we hear nowadays about wasteful Federal spending. Therefore, I would want to know whether California regards an expenditure of this kind as justifiable.

Mr. HOWARD. I understand that the Senator divorced the matter of irrigation subsidy from the question.

The CHAIRMAN. I did.

Mr. HOWARD. Taking out the irrigation subsidy, I would certainly consider Bridge Canyon and Glen Canyon a very desirable and feasible project.

The CHAIRMAN. Your objection is to the use of the power revenues for the purpose of subsidizing irrigation in Arizona?

Mr. HOWARD. And dedicating that amount of energy to what I would consider an uneconomic purpose—that is, taking one-third of the energy of Bridge Canyon, which might otherwise be sold commercially, and used commercially, and using it to lift water 985 feet, pumping it as far as from here to New York and then using it to grow alfalfa. It just does not seem to me to be a desirable or economic use of the energy. We should find better uses for it.

The CHAIRMAN. What has been running through my mind, Mr. Howard, is that I rather think southern California is growing as a metropolitan area. It is going to require, and does even now require, food supplies from outside its boundaries. I rather imagine a good deal of the food supply may even come from the boundaries of the State, and it may be that the economic problem of even the whole basin can be treated as one unit instead of dividing it into States.

Mr. HOWARD. Speaking not too seriously, Senator, if you would move that water over on the California side we would not have to pump it so far, and we could grow just as good vegetables.

Senator KERR. That would make that irrigation project feasible? Off the record.

(Discussion off the record.)

(The following was submitted for the record:)

DEPARTMENT OF THE INTERIOR

INFORMATION SERVICE

Bureau of Reclamation
For immediate release March 28, 1949

LETTER ON CALIFORNIA EAST MESA DISPATCHED

Secretary of the Interior J. A. Krug has dispatched a letter informing the Imperial irrigation district, El Centro, Calif., that, in view of land classification and repayment feasibility reports, irrigation development of public lands on the east mesa by either the Government or the district "would be inimical to the public interest." The east mesa area lies within the Imperial irrigation district served by the All-American Canal in southern California.

While the lands were originally withdrawn from public entry in the hope that they could be successfully developed, detailed investigations which have since been made revealed them to be not practicable of irrigation and reclamation. The detailed land investigations were made by the Department of Agriculture, the University of California, and the Bureau of Reclamation.

The letter was addressed to Mr. Evan T. Hewes, president of the district's board of directors. The text follows:

"MY DEAR MR. HEWES: The Commissioner of Reclamation has brought to my attention the correspondence between your district and Regional Director Moritz, concerning assumption by the district of the care, operation, and maintenance, under the All-American Canal contract of December 1, 1932, of the common section of the Coachella canal between engineer station 0 and approximately station 2603.

"Particularly, your letter of December 6, 1948, suggests the necessity for clarification of the position of this Department with respect to the desire of your district to install turn-outs in the common section of the Coachella canal at such locations, with such capacities, and at such time or times as the district may determine, following transfer of the canal to the district.

"The district's expressed desire for a free hand in constructing turn-outs in the common section of the Coachella Canal necessarily raises the question of whether the district may have the consent of the United States, express or implied, to construct turn-outs designed to serve public lands on east mesa. In view of the conclusions reached in the land-classification and development report of April 1947, and in the repayment-feasibility report issued in March 1948, both of which you have received and which I have approved, it is evident to me that the irrigation development of public lands on east mesa, either by the United States or by Imperial irrigation district, would be inimical to the public interest, inasmuch as such lands are not "practicable of irrigation and reclamation." Accordingly, after full consideration, I am compelled to advise you I do not contemplate that any public lands on east mesa will be opened to reclamation homestead entry and settlement, and, therefore, I could not approve the construction of canal turn-outs designed to serve these lands. In reaching this conclusion, I am not unmindful of the provisions of article 23 of the contract of December 1, 1932, insofar as they relate to east mesa lands. I have been advised by the Solicitor of this Department concerning the legal issues raised by this article. A copy of the Solicitor's opinion is enclosed.

"This decision has been made with reluctance, insofar as it may disturb the existing contractual relationship with your district, but I am sure that my responsibility under the reclamation and public-land laws permits me no choice in the premises. I assure you that I am prepared to consider a proposal from your district for a modification and equitable adjustment of the contract of December 1, 1932, in order to bring the contract into accord with the facts as we know them today, and to join with the district in submitting to the Congress appropriate recommendations to this end.

"Sincerely yours,

"J. A. KRUG, *Secretary of the Interior*."

The CHAIRMAN. Are there any other questions?

Senator MCFARLAND. I just had one other question.

The CHAIRMAN. Senator McFarland.

Senator MCFARLAND. Mr. Howard, you spoke of this 4,000,000 acre-feet or 3,800,000 acre-feet for which you said a right could have been established back at the time the dam was built?

Mr. HOWARD. Yes, sir.

Senator MCFARLAND. That included water for the east and west mesas?

Mr. HOWARD. Yes; that was included within the original boundaries of the project.

Senator MCFARLAND. That land never has been irrigated except for a few acres for experimental purposes?

Mr. HOWARD. I think that is correct.

Senator MCFARLAND. That includes the 225,300 acres of the east mesa which the Interior Department has declared to be nonirrigable, except for a little over 3,000 acres of class 2 lands, and 14,830 acres of which are class 3 lands?

Mr. HOWARD. You are getting a little out of my province, Senator.

Senator McFARLAND. The record will speak for itself upon that. You do not have to answer it unless you want to. It is perfectly all right.

Mr. HOWARD. As a matter of fact, I am not familiar with what the Interior Department did do. I was not aware that there was any issue up or any occasion for making a finding in the matter.

Senator McFARLAND. We will place that in the record along with some other matters.

I have one more question. I am only going to keep you for 2 minutes.

The water which was being diverted at that time, part of it was also going to Mexico, was it not?

Mr. HOWARD. Under the contract which Imperial had with the Mexican company, in routing the water through Mexico they were required to leave part of it in Mexico. But, as you will recognize, under the law of appropriation, so long as no one is hurt the place of use may be changed.

Senator McFARLAND. I did not mean it was going through Mexico; I meant that part of the water being diverted was being used in Mexico.

Mr. HOWARD. Yes; that was a loss which the Imperial people were bound to sustain as a consequence of the contracts they then had, but which was remedied by the All-American canal. Under the law of appropriation, you can change the place of use of water so long as it does not impair the rights of others. So I think that was in the nature of a loss which they have succeeded in wiping out.

Senator McFARLAND. Do you know how many acre-feet were being diverted at that time?

Mr. HOWARD. I think the figure is about 3,000,000. I would like to be checked on that.

Senator DOWNEY. The chairman asked for those figures.

Mr. HOWARD. Yes; the chairman asked for those figures, which will be supplied.

Senator McFARLAND. That is perfectly all right.

Mr. HOWARD. The chairman asked as of now, I think. We will also include, with the Chair's permission, as of 1922.

The CHAIRMAN. Yes; I would like to have you do that.

Senator McFARLAND. Pardon me for rushing, but I am under a two-minute limitation here.

Senator KERR. Which is already expired.

Senator DOWNEY. I want 30 seconds after he gets through.

Senator McFARLAND. Evidence has already been submitted which proves that the land of the Imperial East Mesa is not as good as the land in the central Arizona project and could not produce as good crops, although I do not think it has any applicability to the facts in this case. For example, the land classification and development report on this mesa clearly shows the soil situation in that area. The report of the Doane Agricultural Service, Inc.—pages 1 and 10—and the testimony of witnesses like Victor I. Corbell—pages 130, 133, 134, hearings on S. 1175—clearly establish the superior quality of the lands within the central Arizona project.

Mr. Chairman, Congressman Patten has been here upon several occasions and wanted to file a statement. While he was here it just

did not happen to be an opportune time; so I would like to present his statement at this time, to be printed in the record after Arizona closes, probably after Mr. Carson's testimony.

The CHAIRMAN. It will be so included.

Senator MCFARLAND. With that, and with the statements which we will file, I believe those are all the questions I want to ask.

Mr. ELY. Mr. Chairman, may I say that, had time permitted, Mr. M. J. Dowd, consulting engineer for Imperial irrigation district, and perhaps myself, would have asked time to appear to answer the allegations made with respect to Imperial irrigation district and the East Mesa, occurring in earlier Arizona testimony. Since there is not time for that, we shall of necessity present our case in that respect in the House.

Senator DOWNEY. I would like permission, if it is all right, and if we desire, to place a statement in the record concerning that.

The CHAIRMAN. There will be no objection to that.

California has no other testimony at this time?

Senator DOWNEY. No; except that I will personally present this report of the USGS.

The CHAIRMAN. Yes; that is agreeable, but that is to be filed.

Arizona has no further testimony?

Senator MCFARLAND. No; except the statements we are going to file. As I understand it, the case is to close this week, and we will therefore file them this week.

The CHAIRMAN. I am speaking of oral testimony. The oral testimony has been concluded with the possible exception of giving an opportunity for Senator Malone of Nevada to present certain testimony with respect to the use of water in the State of Nevada, which he indicated at an earlier meeting he might want to do. I want the record to show that the hearing is not being closed without opportunity to Nevada to present any material that may be pertinent.

STATEMENT OF HON. HAROLD A. PATTEN, REPRESENTATIVE IN CONGRESS FROM THE SECOND DISTRICT, STATE OF ARIZONA

Mr. PATTEN. I am well aware that the numerous engineering, legal, financial, and technical details related to the central Arizona project as proposed in S. 75 either have been or will be amply presented to the committee by individuals expert in those fields; I therefore will refrain from amplification of those aspects of the case.

At the risk of being deemed completely ingenuous, I should like to say that I am convinced that this committee and the Members of Congress at large are going to concentrate their attention upon the central and essential elements of the right and justice of this matter, and that they will thus cast aside the many specious and technical arguments, however skillfully advanced, which are being raised by the opponents of the proposed legislation. Looking at the case in this fashion, it is clear that Arizona desperately requires her share of the waters of the Colorado River, and that she requires them now, today, to preserve her own civilization and her own way of life in the sisterhood of the various States.

It is preposterous to assume that in the division of the Colorado system water available to the lower basin States, it was ever intended

or agreed that Arizona should be forced to content herself with little more than the waters of the Gila River, all of which had theretofore been appropriated and put to use within the boundaries of my State. Conversely, it is equally obvious that the division was intended to be—should, and must be—made upon a basis giving Arizona a substantial quantity of the waters of the main stream of the Colorado.

California by her own legislative action has limited herself to a maximum of 4,400,000 acre-feet per year of the waters of the main stream which were apportioned by article III (a) of the compact, plus one-half of any excess or surplus that might exist. That is the lion's share of a very large lion. Without laboring the point further, and without engaging in any extended mathematical computations, I think it plain that Arizona is entitled to sufficient water from the main stream of the Colorado River to supply the central Arizona project; namely, 1,200,000 acre-feet, and that this would be the conclusion of any impartial group who would examine the case either superficially or in the most minute detail.

I can see no justification in common sense for, nor does the law uphold, the argument advanced by our opponents which seeks to obtain action favorable to California upon the basis that California's need is a greater need than the need of Arizona. However, because California has devoted and is continuing to exert great attention to the proposition that she is in some dire, urgent, and present necessity, I feel it proper if only in the interest of a dispassionate appraisal of the facts to point out that California is in truth in no such need, and that she is not likely ever to be in such need if she will merely refrain from the doing of a palpably unwise act. It is entirely within her power to refrain from such act and is to her distinct advantage as a State, and will occasion her no substantial (if any) losses.

I refer to California's avowed intention to transport waters of the Colorado River to the east and west mesas of the Imperial Valley, where she proposes in future to develop huge irrigation projects.

On the basis of conceded or undisputed facts, California finds herself in a somewhat rare circumstance. In the afternoon of April 6, the distinguished counsel for the metropolitan water district, Mr. James H. Howard, was testifying before a subcommittee of the Judiciary Committee of the House of Representatives, and the chairman of the subcommittee by a series of questions drew from Mr. Howard the admission that the contemplated requirements for additional water to be used by the metropolitan water district for municipal purposes in the city of Los Angeles and the other large urban areas along the coast of that region, would not develop beyond the supply for which it has a present contractual right, until a time some 60 years hereafter.

California has elsewhere admitted (that is, during the hearing on S. 1175, see p. 377) that the present total annual use by California of the Colorado River water is approximately 3,000,000 acre-feet. California also admits that she intends to develop and to place under irrigation a total of some 300,000 acres in the areas which I have mentioned as being within the east and west mesas of the Imperial Valley. They have not denied, and they cannot deny, that if these 300,000 acres are not placed under cultivation California will have, in ample degree, all the water of the Colorado River which she is likely to need.

The Bureau of Reclamation in concert with the University of California and the United States Department of Agriculture has been conducting a detailed study of the two mesas. The Bureau has already formulated and filed its report on the Imperial East Mesa, which report is entitled "Land Classification and Development Report, Imperial East Mesa, All-American Canal Project, California." The report is a thorough treatment of the subject, and it appears to be well documented and substantiated. The Bureau has likewise prepared a report concerning the ability of the east mesa to repay the cost of California's proposal for the development thereof. That report, I believe, is entitled "Report of Repayment Ability, Imperial East Mesa, All-American Canal Project, California."

I do not pretend to have made an exhaustive personal study of these reports, but I do wish to present their essence in a summarized manner.

In a letter whereby the regional director transmitted the land-classification and development report, as to the east mesa, to the Commissioner of the Bureau of Reclamation the following language appears:

> 2. The report shows that of 225,300 acres covered in the survey, only 35,900 acres or 16 percent were classified as irrigable. Most of this acreage (30,550) is class 3, and the remaining acreage (5,350) is class 2. The class 2 and 3 lands are scattered throughout the east mesa. Only 18,612 acres of irrigable lands are so grouped that they could be included in the seven potential areas considered most feasible of development. The remainder of the class 2 and 3 lands, 17,288 acres, is considered, from an economic standpoint, to be beyond the reach of a distribution system.

It also follows, that the balance of these lands on the east mesa, an area of some 189,400 acres, were not irrigable, and they were so classified in the report. The report also points out that due to the circumstance that the irrigable lands are scattered here and there, the cost of irrigation is extraordinarily high, so high as would appear to render irrigation unfeasible.

The lands on the west mesa are reported to be inferior to those of the east; however, assuming that the lands are generally equal, and applying the finding that 16 percent of such east-mesa lands are irrigable, it follows that there would be on the west mesa some 12,000 irrigable acres. The net result is that of the total area on both mesas, more than 250,000 of the 300,000 acres are nonirrigable whereas only some 48,000 are susceptible of irrigation. Assuming a water need of 6 acre-feet per acre per year, the application of this water requirement to the 48,000 irrigable acres indicates a requirement of 288,000 acre-feet of water per year.

Add this 3,000,000 acre-feet of the maximum use which California has thus far made annually of the Colorado River to the 288,000 acre-feet which would be required at some indefinite future time if California persists in her plan to irrigate the east and west mesas, and you have a total of 3,288,000 acre-feet. The difference between that quantity and the 4,400,000 acre-feet to which California has limited herself leaves approximately 1,112,000 acre-feet to be applied to other future requirements, apart from any share of excess or surplus waters which might be deliverable to California; which makes it manifest that California will have ample water to cover any losses or diminutions which she would have to stand, including losses from evaporation.

The foregoing remarks are based upon the favorable position California takes for itself. I do not at all concede that California has an absolute right in any event to 4,400,000 acre-feet per year of the III (a) water; that quantity appears to me to be just what the California statute says; that is, a limitation.

I think the committee will recall that Senator McFarland pointed out that the amount of Colorado River water wasting into the Salton Sea from Imperial Valley irrigation activities is some 1,074,150 acre-feet per year according to information furnished by the Bureau of Reclamation. Certainly, California will make a serious effort to avoid this extravagant waste; and although I am no engineer, I am of the opinion that at least half of this loss can and should be averted. If so, she will have more than a 1,500,000 acre-feet of water with which to increase her uses and to offset losses and depreciations such as evaporation and the like.

I offer the following excerpts taken from the report of repayment ability, bearing date of March 1948:

This report presents an analysis of the repayment capacity of lands classified as irrigable within seven potential development units on the Imperial east mesa division of the All-American Canal project in California. Irrigation water would be supplied from the Colorado River and delivered through the All-American and Coachella Canals. Of the 33,872 acres in the potential units 32,440 acres are publicly owned lands withdrawn from entry. A complete discussion of the land classification of the area and anticipated farming problems is given in the East Mesa Land Classification and Development Report, dated April 1947. This report shows that 18,612 acres of the 33,872 acres in the potential units have been classified as irrigable; 3,782 acres are class 2 and 14,830 acres are class 3 (p. 1).

Project development costs are estimated to average $615 an acre, which includes $390 for distribution system and $225 for predeveloping the lands (p. 1).

On the basis of a budget analysis it has been shown that class 3 lands would not be able to pay for the cost of constructing a distribution system (p. 2).

However, the class 2 lands are so interspersed with class 3 and 6 lands that their separate development would be physically impractical. If all 80-acre tracts of predominately class 2 and 3 lands were developed, it is estimated that less than 20 percent of the total construction and predevelopment cost would be recoverable from the settlers (p. 2).

This classification shows a total of 35,900 acres of class 2 and 3 lands, of which 18,612 acres are located within seven potential development areas. Most of the lands tentatively classified as irrigable are of marginal character, and were designated as class 3. The class 2 and 3 lands not located within the development areas represent isolated tracts scattered throughout the mesa, which could not be served by a distribution system without the inclusion of a large acreage of class 6, nonirrigable land (last paragraph, p. 3).

It appears likely that the irrigation of any substantial acreage of the mesa lands would tend to enhance seriously the drainage facilities in Imperial Valley unless additional drainage facilities are constructed (p. 4).

Most of the mesa is publicly owned land under reclamation withdrawal. Of the 33,872 acres in the potential units, 32,440 acres are publicly owned lands, withdrawn from entry. There are 1,219 acres of privately owned lands located within unit 1; 84 acres of State land; and 129 acres owned by the Southern Pacific Co. (last paragraph, p. 4).

On March 28, 1949, the Secretary of the Interior announced that the irrigation development of public lands on the east mesa would be inimical to the public interest; and in a letter written to the president of the board of directors of the Imperial irrigation district at about the same time, the Secretary among other things states that he is compelled to advise the district that he does not contemplate that any public lands on the east mesa will be open to reclamation homestead entry and settlement, and that he therefore could not approve the construction of

canal turn-outs designed to serve these lands. Whether certain interested persons in California will stubbornly persist in their efforts to place the lands of the east and west mesas under cultivation is a matter which remains to be seen; however, there can be no doubt that the continuation of such efforts is an unwise thing. Certainly California should not be heard to cry forth her urgent need for water if this is the sort of project which is to be included in the substantiation of her supposed necessity.

I think I might repeat that the report specifically stated that "of the 33,872 acres in the potential units" of the Imperial east mesa "32,440 acres are publicly owned lands withdrawn from entry."

I am in no position to state that all of California's claims are as spurious as her claim that she now needs and must have practically all of the water flowing in the Colorado River below Lee Ferry, except that which may be required to meet the Mexican requirements under the international treaty; but these simple facts of the case certainly should deflate the ever-ballooning claim of the California propagandists and apologists that their State is presently drawing upon what they are pleased to call "their last water hole" and that the great civilization of the golden empire is about to wither and blow away. Has the Los Angeles Chamber of Commerce heard about this?

STATEMENT OF M. J. DOWD, CONSULTING ENGINEER, IMPERIAL IRRIGATION DISTRICT, CALIFORNIA

Mr. Chairman and members of the committee, my name is M. J. Dowd. I am appearing on behalf of Imperial Irrigation District of California. I have been connected with the district for the past 27 years. For 17 years of that time I held the position of chief engineer and general superintendent, and for the past 7 years I have served as consulting engineer to the district.

Imperial Irrigation District and Imperial Valley are synonymous in that they cover the same area. The district comprises some 900,000 acres which includes practically all of Imperial Valley. All of the cities and towns in the valley are included within the district, as well as all of the area under the All-American Canal. The district is a public agency of the State of California, not a private corporation. It is managed by a board of directors elected by the people living within the district so it may be said that I am appearing as a representative of the people of Imperial Valley.

I would like to discuss certain features of the proposed central Arizona project, and also reply to the attacks which have been made upon my district and the people of Imperial Valley by Arizona interests before this committee, in the press, and in numerous pamphlets and other propaganda which those interests have broadcast over the country.

I speak for these people of Imperial Valley who went into one of the most arid and barren desert sections of our country and converted it into the great agricultural producer it is today. It took a lot of "blood, sweat, and tears"—to borrow a phrase from Winston Churchill—to bring this about. They had to battle floods, silt, heat, dust, drought, and the complications of having a foreign government control their water supply. Theirs has been a truly great accomplishment.

DISTRICT AREA

Of the 900,000 acres included within the district the central portion of some 600,000 acres was a part of the delta of the Colorado River and is the part which is now developed. Most of it lies below sea level. At the international boundary, along the southerly side of the area, the elevation is approximately sea level, the valley sloping to the north to Salton Sea, the present elevation of which is 240 feet below sea level. On either side of this central portion and at a somewhat high elevation are mesas known as the East and West Mesas, respectively. Of the 900,000 acres, 770,000 acres are irrigable of which 270,000 acres are not yet developed.

EARLY DEVELOPMENT OF VALLEY

As early as the middle of the last century the possibilities of diverting water from the Colorado River to develop Imperial Valley were realized, but plans proposed at that time could not be carried through. In the early nineties a private irrigation company was organized and after many years of effort, secured finances to start development. In June 1901 the first water reached the valley from the Colorado River 60 miles away.

The progress of development during the first few years was seriously handicapped due to a very unfavorable soil report issued by the Federal Government, and by a break of the Colorado River into the valley. The break occurred in 1905 and for nearly 2 years the entire flow of the river poured into the valley. It appeared for a time that the entire area might be submerged.

It happened that at the time the adverse soil report was issued (1902) several thousand acres were already growing crops successfully and other thousands of acres had been leveled and prepared for crop. The people had faith in the valley and did not accept the soil report; otherwise the 450,000 acres would not now be irrigated and producing annually agricultural products having a value of over $100,000,000.

CANAL LOCATION

The first surveys made by the irrigation company, which was organized in 1892, were for the bringing of Colorado River water into Imperial Valley by a canal diverting from the river at Potholes—the present location of Laguna Dam—and following much the same route as the present All-American Canal. However, finance was the stumbling block, such a canal being too costly for private financing at that time to handle. So the engineers dropped down the river to a point just above the Mexican boundary and from there constructed the canal on a much less costly route through Mexico for some 60 miles, then back into Imperial Valley. It was not until the All-American Canal was built in 1941, or 50 years later, that the original plans of the engineers finally became a reality.

ORGANIZATION OF DISTRICT

The construction of the original canal through Mexico required the securing of a concession or permit from the Mexican Government to

transport the water through that country. This was granted in 1904 in the name of a Mexican company organized for that purpose as a subsidiary of the American irrigation company. The cost of closing the break in the river, which I have referred to, together with other unforeseen expenses, caused both the parent company and its subsidiary company to go into bankruptcy and they were taken over by receivers, one for each company. This proved to be a most unsatisfactory arrangement and irrigation operations became intolerable. So it was that in 1911 the people of Imperial Valley organized the Imperial Irrigation District under State law and the district purchased the properties of both receivers.

ALL-AMERICAN CANAL

With the passing years, the necessity for an All-American Canal became more and more apparent and beginning about 1915 plans for such a canal became very active. It may be interesting to note that the All-American Canal was the forerunner of the Boulder Canyon project. One of the first bills, in this regard, was introduced in Congress in 1919. It provided for construction of only the All-American Canal with no provision for storage. This bill was based on recommendations made in the 1918 report of the All-American Canal Board of which Dr. Elwood Mead, later Commissioner of the Bureau of Reclamation, was Chairman. Although extensive hearings were held, no action was taken on the bill, it being the opinion of Government officials that storage works should be included as a part of the project.

As a result, the Secretary of the Interior was authorized by the Kincaid Act, passed in that year (1919), to investigate and report on all phases of the Imperial Valley situation. This resulted in the Fall-Davis report of 1921 on "The Problems of Imperial Valley and Vicinity" (S. Doc. 142, 67th Cong., 2d sess.), which recommended, as had the All-American Canal Board, the construction of the All-American Canal and in addition, a high dam on the Colorado River "at or near Boulder Canyon."

Legislation was introduced in Congress in 1922 to carry out this recommendation and during subsequent years, a series of bills were introduced all for the same purpose. During this period many additional reports were considered and many congressional hearings were held by both House and Senate committees resulting finally in the adoption by Congress of the Boulder Canyon Project Act in December 1928. It is doubtful if there has ever been another reclamation project before the Congress which has been given the years of study and consideration such as this one received. It is interesting to note that the act as passed authorized the construction of the All-American Canal and the high dam—Hoover Dam—substantially as recommended by the 1922 report. Both of these features have now been constructed and have been in operation for a number of years.

WATER RIGHTS

Imperial irrigation district's water rights are among the oldest on the Colorado River. These rights were initiated in 1892 through the activities of the irrigation company organized in that year. From 1895 to 1899 a series of water appropriation filings were made all of

which specified an appropriation of 10,000 cubic feet per second and covered all of the area now included within the district.

Considering the size of the project and the record of its development, it has never been even suggested that Imperial has not used "due diligence," as referred to in water law, in putting that water to use. This being the case, under the rule of "relation back" Imperial's rights are not measured by what it may have been using, for instance, in 1920 or 1930 but by its rights under its original appropriations.

The same principle holds true for the Palo Verde irrigation district and the portion of the Yuma project in California. This principle is the basis of the schedule of priorities established for use of Colorado River water in California. In that schedule, the first 3,850,000 acre-feet per year is apportioned to Palo Verde, Yuma (California), and All-American Canal projects in recognition of their old established rights.

I know that this committee appreciates the great importance and value to an irrigation project of its water rights. In most cases, and particularly in Imperial Valley where rainfall averages only about 3 inches per year, water rights are the foundation upon which rests the whole structure of an irrigation developement. It is because of this that I feel sure this committee can appreciate and understand why the people of Imperial Valley after having preserved these rights down through the years will now resist, to the utmost of their ability, any attempt to invade those rights.

LITIGATION VERSUS STORAGE

At the approach of the twenties it became apparent that Imperial's senior water rights were being interfered with by junior appropriators in other parts of the Colorado River Basin. To correct this situation, Imperial had the possibility of adopting one of two courses. Imperial could bring an action in the Supreme Court for an adjudication of all water rights throughout the Colorado River Basin and thus establish its senior position. On the other hand, if storage could be obtained on the river to conserve floodwaters, such could be used to supply Imperial's rights to the natural flow thereby releasing the latter for use by junior appropriators. It was also recognized that the construction of such storage could, in addition, control floods and silt on the lower river and benefit all projects in several other ways. However, it was only after it seemed assured by the recommendations of the Fall-Davis report that such storage would be provided, that Imperial decided not to follow the first course of action. It was this threat of possible court action and the probable consequences to junior appropriators, particularly in the upper basin, that accounts for the inclusion of article VIII in the Colorado River compact.

NO CHANGE IN ORIGINAL PROJECT

I have gone into this history at some length to make it clear that from the inception of development of Imperial Valley, the East and West Mesas were part of the project and that their water rights are a part of the old established rights of Imperial Irrigation District. Also, I want to make it clear that there is nothing new about the All-

American Canal project. It is the same today as was considered and reported on by the All-American Canal Board in 1918. It is the same as was considered at the time of the Santa Fe compact in 1922. It is the same as considered by Congress in the many years of hearings on the Boulder Canyon project. It is the same project today that Congress authorized in 1928. In contrast, during all this period, no serious consideration was ever given to the diversion of Colorado River water into central Arizona and no plans were advanced for such a project because of its total infeasibility. It is just as infeasible today as it was then.

AVAILABLE WATER REQUIRED FOR EXISTING PROJECTS

Now, however, Arizona charges that Imperial Irrigation District is attempting to take water away from Arizona. Such a statement is ridiculous and without any justifiable basis to support it.

It is Arizona which seeks, in effect, to confiscate Imperial's established water rights. It is generally agreed, and this Arizona does not deny, that the existing projects in the lower basin will require all of the water available, under the Colorado River compact, for use in that basin. In view of this situation, if Arizona is to secure a water supply for the central Arizona project and if the compact is not to be violated, such water supply can be made available only by taking water away from one or more of the existing projects in the lower basin. It is for this reason that Arizona would now stop all development in Imperial Valley and by this means endeavor to show that there will be a water supply for its fantastic central Arizona aqueduct.

EAST AND WEST MESAS

What about the East and West Mesas of Imperial Valley which Arizona says should not be developed? As already pointed out, the All-American Canal has been constructed, as authorized by the Congress, with capacity required to serve the entire area of Imperial Irrigation District of which the East and West Mesas are an integral part, and many of the diversion structures required to serve the mesa lands were built into the canal. The cost of these works represents an investment of millions of dollars which the people of Imperial Valley have mortgaged their farms and homes to repay to the Federal Government under the terms of a contract the district was required to sign prior to the construction of the All-American Canal.

The gross area of the East Mesa is 220,000 acres of which 150,000 acres net are irrigable. The gross area of the West Mesa is 140,000 acres of which 100,000 acres net are irrigable.

We say that the lands of both mesas are good. We recognize that some question has been raised as to the East Mesa, but there appears to be little question as to the feasibility of developing the West Mesa. The West Mesa is somewhat warmer in winter than the East Mesa, as determined from tests carried on for several years. Also, some years ago a number of settlers developed several thousand acres of land on the West Mesa using water pumped from wells. The supply of ground water, however, proved inadequate and in a short time the farms had to be abandoned, but not before the productivity of the land was proved. These owners have been waiting ever since to resume

operations as soon as water from the All-American Canal can be made available to them.

While the new soil studies now under way on the West Mesa have not yet been completed, there is little doubt but that they will bear out previous favorable soil reports on that area and thereby remove any question as to proceeding with development.

EAST MESA

This leaves for consideration the East Mesa which has received so much attention from Arizona witnesses. Prior to the construction of the All-American Canal, a soil survey was made of this area by the Bureau of Soils and the University of California. The report of the survey referred to the East Mesa as "an area of great possibilities, where the investment of funds to supply water for irrigation will make possible a material extension of our agricultural lands, the development of new rural communities, and the establishment of a large number of settlers on farm units of high potential value."

Not only was capacity constructed in the All-American Canal for this area and many of the diversion structures, as previously mentioned, but the Bureau of Reclamation had proceeded with the design of a lateral system to serve the first unit of some 40,000 acres, when the Bureau decided that another soil investigation should be made. This occurred in the early forties, about the time investigation of the central Arizona project became active. The new land classification report on the East Mesa is dated April 30, 1947, and was followed by a report on the repayment ability of East Mesa lands dated March 1948.

In the meantime, because of the urgent appeal of the Government for the production of more food to meet World War II requirements, the district in 1943 suggested that the United States lease it 10,000 acres of East Mesa public lands for a 10-year period. The district agreed to arrange for developing and farming the area for that period and then release it back to the Government to be opened for settlement. The suggestion was accepted by the Interior Department and the district proceeded with arrangements with a group of Imperial Valley farmers to develop and farm the land at their own expense. However, while a draft of the lease was under consideration, the proposal was turned down by the Commissioner of the Bureau of Reclamation who gave as his reason that, in view of the current emphasis being placed on post war settlement, particularly soldier settlement, it would be inadvisable to tie the Bureau to a 10-year commitment since, if the war should end in the meantime, the closing of public lands to post-war settlement might have an unfavorable reaction on the Bureau.

DEMONSTRATION FARMS

A year or two later the Bureau of Reclamation itself started the development of a 500 acre demonstration farm on the East Mesa and proceeded to put it into cultivation. Most of the tract was leveled and some 80 acres planted to alfalfa, but the work had to be abandoned within about 18 months due to a lack of funds.

In view of the conflict between the earlier soil report and the new report, the district realized that the only answer would be a practical

demonstration of the East Mesa potentialities. At this point, let me make it clear that, in so far as these two recent reports are concerned, not only the district but the Imperial County farm bureau and other interested groups in the valley, are in disagreement with them. The repayment report in particular is based very largely on the results of only 18 months of growing alfalfa on the Bureau's demonstration farm. The report itself recognizes the meagerness of the data upon which it is based. It states in several places that it may be subject to considerable modification upon results obtained from further demonstrations of farming operations on the East Mesa. In fact, no good reason has been given why the report was issued at that time in view of this situation and the program which had been already agreed to and which I will now refer to.

Upon discussing the situation with Bureau of Reclamation officials, it appeared that they too were in favor of a practical demonstration of the agricultural possibilities of the East Mesa as the best means of determining the question. To this end, in May 1947 the district entered into a 10-year lease with the Bureau for a tract of about 500 acres of public land on the East Mesa to be used for demonstration purposes. The tract was selected jointly by District and Bureau officials in order to have a representative area for the demonstration.

All work in connection with this demonstration is being done by and at the expense of the district. To date we have expended about $250,000 in building the necessary supply canal from the All-American Canal, together with appurtement structures, levelling and grading the land, installing a farm irrigation system and fertilizing and planting of crops. We are well satisfied with the results to date.

Also as a part of this program, in July 1947, another 10-year lease was made with the Bureau under which the district took over the 500 acre demonstration farm which the Bureau had started to develop, but which it had to abandon due to lack of funds. In turn, the district leased this farm to local valley farmers to be operated on a commercial farming basis. These operators had to invest considerable funds of their own in releveling part of the tract, in completing the development work, and in getting operations underway. As a result of their operations to date, the operators seem confident of success.

I should add here, that this 10-year program has the endorsement of and is being carried on in cooperation with the Imperial County Farm Bureau, the local American Legion and other interested valley groups.

SECRETARY KRUG'S LETTER OF MARCH 25, 1949

This brings me down to the latest event relating to the East Mesa. I refer to a letter dated March 25, 1949, from Secretary of the Interior Krug to the district stating that he did not intend that any public lands on the East Mesa would be opened for entry and settlement. The first the district learned of the matter was from a press release issued by the Bureau of Reclamation on March 28th, several days before the district received the letter or had any opportunity to reply to it.

Since neither the district nor any other group in Imperial Valley was requesting that any of such lands be opened for entry, we were

at a loss to understand the reason for the decision at this particular time. Moreover, the district had already expended $250,000 on the 10-year demonstration program, concurred in by the Bureau of Reclamation, which is just now getting under way, and there had been an understanding that any further question relative to opening public lands on the East Mesa would await the results of the demonstrations.

These facts prompt the question, "What was the necessity for the Commissioner of Reclamation recommending to the Secretary that he make a decision at this particular time?" This is the question asked by the district and to which the Commissioner has been unable so far to give any satisfactory answer.

Of course, other than perhaps affording some comfort to Arizona by its release at this particular time, this decision in nowise has any effect on the East Mesa matter. The decision is not final and, of course, is not binding on any future Secretary of the Interior. Imperial is satisfied that the results which will be shown by the demonstrations now under way will fully justify proceeding with the development of East Mesa lands as intended by the Congress when it authorized the All-American Canal.

SALTON SEA

Another subject which has been given considerable attention by Arizona is that of return flow from Imperial Valley to Salton Sea. As I have mentioned before, the elevation of Salton Sea is about 240 feet below sea level. It is the only drainage outlet for a large area in Southeastern California including Imperial and Coachella Valleys and also for a considerable area in Lower California, Mexico.

Much smoke is raised over the fact that records indicate, at this time, an inflow to Salton Sea of about 1,000,000 acre-feet per year. This is nothing that just recently occurred. There has been more or less about the same inflow to Salton Sea for the past 20 years. Of course, all of this 1,000,000 acre-feet does not result from operations of Imperial irrigation district. Some of it—not a very large amount—comes from Mexico and some is natural inflow from storms over the watershed. However, for purpose of this discussion, we will assume that the entire quantity is chargeable against the district.

For a number of years I was in direct charge of water distribution for the district. Based on that experience, I know that the operations of the district under existing conditions are fully justified and that there is no wasting of water, as such, to the Salton Sea. The inflow into Salton Sea, in other words, is not a waste, but an ordinary operational loss. It is, in my judgment, based on over 25 years of experience and observation, a normal loss under the conditions and is well within reasonable and ordinary standards of good irrigation practice. In any event, there can be no question but that the past and present amounts of water diverted from the Colorado River by the district are well within and a part of Imperial's established rights.

In considering this matter of return flow, let me point out that at the present time there is a return flow into the Colorado River of over 200,000 acre-feet per year from the 50,000 acre Yuma project in Arizona. This is a much greater return flow per acre irrigated than that for Imperial; the comparison is 4.0 and 2.25 acre-feet per acre, respectively. Moreover, testimony by Mr. Tipton on behalf of Arizona

in the hearings on S. 1175 shows that even under ultimate conditions the return flow from the Yuma project—assumed to be the entire project in both Arizona and California of about 70,000 acres—will be not less than 190,000 acre-feet annually (p. 538, Senate hearings on S. 1175). This would be a return flow of 2.7 acre-feet per acre which is higher than that even at the present time for Imperial of 2.25 acre-feet per acre.

But even assuming the 1,000,000 acre-feet of inflow to the Salton Sea is as Arizona claims entirely unnecessary and improper. What of it? And what if it may be, as Arizona likes to point out, enough for the central Arizona project? At the present time, there is some 6 to 8 million acre-feet of unused Colorado River water reaching the Gulf of California every year. That is several times the requirements of the central Arizona project. I mention this to show that it is immaterial at the present time what the inflow to Salton Sea may be. There is no question of there being ample water available in the river at the present stage of development of the basin; everyone knows there is.

CONDITIONS WITH BASIN DEVELOPMENT COMPLETED

Present conditions are not what count. It is conditions under full development that must be considered. For example, the larger part of the water now reaching the Gulf is water that belongs to the upper basin States and, under the compact, those States have the right to withdraw their water as they desire; such water will not be flowing to the Gulf in the future.

As to the All-American Canal project; about 800,000 acres will be irrigated. The amount of water available for the project under the California Limitation Act and the schedule of priorities will be a maximum of 3,800,000 acre-feet per year. This amount will permit a diversion duty for the project of 4.75 acre-feet per acre. In comparison, the Bureau of Reclamation has estimated that for the central Arizona project, a diversion duty of 5.7 acre-feet per acre is required. For the All-American Canal project, the future estimated farm consumptive use, including rainfall, is assumed to be 3.53 acre-feet per acre and exclusive of rainfall, 3.33 acre-feet per acre. For the central Arizona project, the Bureau of Reclamation has estimated a requirement for farm consumptive use, including rainfall, of 3.75 acre-feet per acre and exclusive of rainfall, 3.20 acre-feet per acre. In other words, the required farm consumptive use for Imperial will be 0.22 acre-feet per acre less than that for central Arizona when as a matter of fact, the mean annual temperature in Imperial Valley is slightly higher than that in central Arizona, and Imperial should, therefore, require a larger consumptive use per acre.

Let's look at the picture from another angle. (1) It is just as necessary to maintain a proper salt balance for the All-American Canal project as for the central Arizona project. For the latter project, the Bureau of Reclamation assumes that the outflow waters will contain an average salt concentration of 5.5 tons per acre-foot. The same should apply to the All-American Canal project. (2) At the present time, Colorado River water diverted to Imperial Valley has a salt content of about 1 ton per acre-foot. We estimate that in the future the concentration will increase to 1.25 tons per acre-foot, when upstream developments are completed. For 3,800,000 acre-feet to be diverted

to the All-American Canal annually, this means that 4,750,000 tons of salt per year will have to be disposed of in outflow water. At a concentration of 5.5 tons per acre-foot, there will be required 864,000 acre-feet per year. (3) The Bureau has assumed that the loss of water from "nonirrigated" areas in central Arizona through evaportation and transpiration will equal 10 percent of the requirements of the acreage irrigated.

Allowing for these factors, the requirements of the All-American Canal project will be as follows:

		Acre-feet
Diversion from Colorado River (net) per year		3,800,000
Farm consumptive use, 800,000 acres irrigated at 3.33 acre-feet per acre	2,664,000	
For salt balance—4,750,000 tons at 5.5 tons per acre-foot	864,000	
Loss from "nonirrigated areas," equivalent to 10 percent of 2,664,000 acre-feet	266,400	
Total requirements		3,794,400
Difference		6,600

In the foregoing, no allowance is included to cover the water required for regulating operations of the extensive canal system which will total at least 2,500 miles in length. As a minimum of at least 200,000 acre-feet per year will be required for this purpose.

It is quite apparent that, in view of these requirements, compared to available supply, water and not land will be the limiting factor for the All-American Canal project and that maximum conservation practices will be required. The amount of water reaching Salton Sea in the future, therefore, will be only such as is necessary to drain the project lands and maintain a proper salt balance.

The Bureau of Reclamation has classified water having a salt content of 5.5 tons per acre-foot as being unusable for irrigation purposes. Since the outflow to Salton Sea will have at least that much concentration of salts, could it be used elsewhere?

As a matter of fact, it is quite fortunate for other projects along the lower river that nature located Imperial Valley where she did. Just suppose that that valley were located a short distance below Hoover Dam and the outflow from the project returned to the river not far downstream. What would happen to all other projects below that point with this nearly 5,000,000 tons of salt per year added to their water supply?

In view of all of these facts, I say there is no substance to the Arizona myth regarding the so-called waste of pure water to Salton Sea.

UNDEVELOPED LAND IN ARIZONA'S PROJECTS

Let me suggest to Arizona that if her need of Colorado River water for lands in central Arizona is so critical, why not stop development of some of her own projects; for example, the Gila project, where only a small portion of the works are constructed and where there are many thousands of acres of undeveloped land which it is proposed to irrigate some time in the future. Another example is the Parker project. Although this project was started in the seventies only about 10,000 acres out of a possible 100,000 acres are now developed. If this were done, a substantial amount of water would be made available for the

so-called rescue of at least the 150,000 acres in central Arizona. Of course, I realize that perhaps these projects may have water rights that cannot be so confiscated—the same applies with at least equal force to Imperial's water rights.

Now I would like to discuss a few of the items included in the proposed central Arizona project.

AQUEDUCT CONNECTING WITH BRIDGE CANYON DAM

Although one of the main items which this bill seeks to authorize is a tunnel and canal from the Parker-Granite Reef aqueduct to Bridge Canyon Dam, I note there has been little, if any, testimony submitted by the proponents of this bill relative to either the increased costs or financial effects on the project which would be involved. As a matter of fact, although the Department of the Interior has submitted a report to this committee on H. R. 934, I do not believe such report even mentions this item.

What are the facilities required to provide for the gravity diversion from Bridge Canyon Dam and a connection with the Parker-Granite Reef aqueduct? In the first place, there would have to be a continuous tunnel about 80 miles in length from Bridge Canyon Reservoir to the Big Sandy River—this being known as the Big Sandy tunnel. There would also have to be a second tunnel about 8.5 miles in length, called the Buckskin tunnel, and several additional miscellaneous tunnels totaling 2.2 miles in length, together with some 70 miles of aqueduct to the point of connection with the Parker-Granite Reef aqueduct. From data contained in preliminary reports of the Bureau of Reclamation and with prices adjusted to July 1947 costs, which is the basis used in the Bureau's report now before this committee, it is found that these facilities would add an additional $550,000,000 to the cost of the project.

Big Sandy tunnel (80 miles)	$489,500,000
Additional tunnels and canals (80.7 miles)	60,500,000
Total cost of additional works	550,000,000

In other words for 150,000 acres, proposed for "rescue," this additional cost alone would amount to over $3,600 per acre. Moreover, the Havasu pumping plants costing $25,973,000 and 49.1 miles of the Parker-Granite Reef aqueduct costing $26,750,000 or a total of $52,723,000, would have to be written off as these works would no longer be necessary. Under what conceivable conditions could such an expenditure, even if costs came down 50 percent, be justified.

This is only a part of what the people of Arizona are asking as a gift from the taxpayers of the United States. There is little wonder that the central Arizona project has been referred to as the most fantastic irrigation proposal ever submitted to the Congress.

KIND OF CROPS TO BE IRRIGATED

Yes, Arizona would ask that the people of Imperial Valley relinquish old established water rights, abandon years of planning and effort, throw away millions of dollars invested in facilities to carry out those plans that require but a relatively small additional investment to complete, so that Arizona could take the water, pump it up a height

of a thousand feet, or nearly twice the height of the Washington Monument, then carry it through a 315-mile aqueduct to irrigate crops in central Arizona.

Now what kind of crops are to be irrigated? For the major part, just the ordinary general farming crops as cotton, hay, grains, and the like. It may be surprising to many to learn that according to the report of the Bureau of Reclamation, for the period of 1940–44, 86 percent of the area irrigated in the central Arizona project was growing just such kind of field crops.

Here are the figures: For the period of 1940–44, out of a total of 566,000 acres average irrigated per year:

214,000 acres, or 38 percent, were growing cotton.
166,000 acres, or 29 percent, were growing alfalfa and grain hay.
109,000 acres, or 19 percent, were growing sorghums and other cereals.

This makes a total of 489,000 acres out of 566,000 acres, or about 86 percent, raising these ordinary field crops.

Moreover, the farmers who would receive this irrigation water would not pay anything toward the cost of project facilities required to deliver this water to them, somebody else would have to stand the entire cost. In addition, this water would have to be taken away from existing projects that can repay every dollar of their costs.

I wonder what the farmers in general over the Nation, and particularly those in the South and Midwest, would say about such a scheme for which they would be taxed? Is this an example of what we mean when we talk to them about western reclamation? Has the economy of our country reached such a critical point that we have to go to these extremes in order to grow ordinary field crops that can be produced in so many other parts of the Nation?

EFFECT ON NATIONAL ECONOMY

If there actually was a surplus of water in the Colorado River which, unless used for such a project as proposed in this bill, would otherwise flow unused to the sea, and if there was a surplus of hydropower in the Pacific Southwest for which there was no ready market, then perhaps the project might have a theoretical basis, at least, for consideration. But these conditions do not exist.

As already pointed out, there appears to be no disagreement as to the fact that existing projects in the lower basin will require all of the water available for use in that basin, that if 1,200,000 acre-feet is taken from the Colorado River to supply central Arizona, it can only be at a sacrifice to existing projects with a consequent reduction in their production. This reduction would offset any increase in production which might result from the use of the water in central Arizona and therefore it cannot be said that the Nation or the Southwest would gain anything in the way of increased production if this project were constructed.

We hear so much about our dwindling oil supply and, in order to conserve it, the need for developing and using every kilowatt-hour of hydroelectric power which can be produced for the commercial market. The Bureau of Reclamation's own report shows this to be true. When then rob that market of 1,390,000,000 kilowatt-hours a year to pump irrigation water through a 1,000-foot lift to central

Arizona? If used for that purpose, it would mean an equivalent amount of electrical energy would have to be generated for the commercial market by steam. This would require an additional drain on our limited petroleum supplies of over 2,250,000 barrels of fuel oil a year.

Also there would be a further national loss resulting from the use of this power for pumping. As proposed in the Bureau of Reclamation's report, this 1,390,000,000 kilowatt-hours would be delivered at the Havasu pumping plants at an average price, as I will later show, of 1.74 mills per kilowatt-hour. If Bridge Canyon power has a market value of 4.82 mills per kilowatt-hour as indicated by the Bureau's report, then the difference of 3.08 mills or a total of $4,280,000 per year is a definite national loss. Why was it not so considered in the Bureau's comparison of benefits and costs?

ABILITY OF IRRIGATORS TO PAY PUMPING POWER COSTS

According to the Bureau's report, the investment in power facilities necessary to produce and deliver this power from Bridge Canyon to the Havasu pumping plants would amount to $97,274,000 and the annual operating expenses would total $1,168,300. This is just for the delivered power and does not include any part of the cost of the pumping plants or their operating expenses.

Assuming repayment of this power investment in 78 years and without interest, as proposed by the Bureau, the total cost of the power delivered at the pumping plants would be $2,415,300 per year, made up as follows:

Amortization of $97,274,000 in 78 years (without interest)	$1,247,000
Operation, maintenance and replacements	1,168,300
Total annual cost of power	2,415,300

Sales of pumped water delivered at farm headgates in central Arizona would average 552,000 acre-feet per year. At the proposed sale price of $4.50 per acre-foot, the total revenue per year would amount to $2,480,000. Compare this with the cost of the power shown above of $2,415,300 per year and it will be observed that practically the entire water revenue would be required to meet just the cost of the power required to pump the water.

This means that the irrigators would pay nothing on either the cost of irrigation facilities or their operating expenses, somebody else would have to foot the bill for them.

I ask again, is this an example of what we mean when we talk about western reclamation?

DISCRIMINATION IN POWER RATES

In connection with the subject of power for pumping, I would like to point out what I consider would be an unfair discrimination in power rates. Referring to the total annual cost of pumping power which I have shown of $2,415,300, and applying this to the average annual energy required of 1,390,000,000 kilowatt-hours, there results a cost per kilowatt-hour of 1.74 mills. This compares to the commercial rate proposed for Bridge Canyon power of 4.82 mills per kilowatt-hour. In other words, it is proposed that the irrigators in cen-

tral Arizona would be charged only about 35 percent as much for power used for pumping irrigation water as an irrigator, elsewhere in the lower basin, using Bridge Canyon power for the same purpose.

Why this discrimination? Why are not all users of Bridge Canyon power for pumping irrigation water entitled to equal treatment? The central Arizona irrigation project is not necessary, nor does it in any way contribute to the feasibility or justification of the Bridge Canyon power project which is an entirely separate and distinct project. Why should all of the financial benefits of the Bridge Canyon power project be allocated to one irrigation project?

There is no discrimination permitted in the price for Hoover Dam power, it is all sold by the Government at the same base rate, regardless of the purpose for which it is to be used. If that is a fair and equitable provision for Hoover Dam power, and in my opinion it is, then certainly it should also apply to Bridge Canyon power.

PROPOSED IRRIGATION DISTRIBUTION AND DRAINAGE SYSTEMS

During the hearings on H. R. 934 there are two features of the proposed irrigation project which have received little, if any, attention; these are (1) the irrigation distribution system, and (2) drainage system proposed for construction.

(1) The Bureau of Reclamation's report shows that an irrigation distribution system would be required costing $54,086,000 for which the annual operating expenses would amount to $302,000. This is for transporting irrigation water from diversion points on the 315-mile aqueduct to the farms. Apparently, the cost estimates are very rough and preliminary in character, judging from the little information regarding them shown in the report. In any event, whatever these costs may be, no part of them would be repaid by the irrigators. I have already pointed out that the revenue from the sale of irrigation water would barely cover the cost only of the power required to pump the aqueduct water; all other costs, both construction as well as operating, would be presented as a gift to these irrigators from the general taxpayers of the Nation.

This is an unusual situation in regard to reclamation projects. Without exception, so far as I know, the irrigator is required to pay, at least, for the cost of construction and operation of his distribution system. This is provided for explicitly in section 9 (d) of the Reclamation Project Act of 1939, which requires that a contract from the water users to repay the cost of the distribution system be executed before any water is delivered to the land.

(2) The Bureau's report also includes an item for a proposed drainage system to cost $10,000,000, for which the annual operating expenses would amount to $178,900. The title is somewhat dressed up, by the use of the term "salinity control." Nevertheless, it is nothing more nor less than common drainage works which every irrigation project in the West must provide. There is this difference, however. In every other project that I know of such cost is paid for locally, both for construction as well as operation, while for central Arizona no part of such cost would be repaid by the irrigator. Moreover, it is proposed to write off as nonreimbursable $5,000,000 on construction cost and $89,400 on the annual operating expenses. Again may I ask, why this discrimination in favor of central Arizona irri-

gators, as against other projects in the West; particularly, what justification is there for asking that half of the construction and operating costs be paid directly by the Nation's taxpayers.

COST OF DELIVERING COLORADO RIVER WATER TO CENTRAL ARIZONA LAND

What is the over-all cost of delivering Colorado River water to irrigators in central Arizona, as proposed in the Bureau's report. I have prepared the following tabulation using data from that report to show the construction cost and annual operating expenses of the various items required for such an irrigation project.

Cost of delivering Colorado River water to irrigators in central Arizona

	Construction cost	Annual operating expenses
Havasu pumping plants (985 feet lift)	$25,973,000	$2,978,000
Aqueduct, Lake Havasu to Gila River (315 miles)	166,301,000	481,800
McDowell pumping plant and canal	3,346,000	47,000
McDowell Dam and power plant	12,335,000	378,500
Irrigation distribution system	54,086,000	302,200
Total costs	262,041,000	4,188,100

From this tabulation, it will be observed that the construction cost of the works required amounts to $262,041,000 and the annual operating expenses total $4,188,100. Now compare these amounts with the estimated total annual revenue from the sales of this Colorado River water amounting to $2,480,000. Bear in mind, that this tremendous cost would be required to supply water primarily for the farming of ordinary field crops such as cotton, hay, and grain. It will be noted that the irrigators who would get the water could not pay a dollar toward the construction cost and only about 60 percent of the annual operating expenses. Looking at it another way, just the annual operating expenses would amount to over $7.50 per acre-feet, toward which the irrigators would pay but $4.50 per acre-foot.

What further demonstration is required to show the fantastic cost and economic impossibility of the proposed irrigation project?

PRESENT ARIZONA ECONOMY MAINTAINED WITHOUT AQUEDUCT

We have heard so much about the terrible results to Arizona's economy if this project is not built that a brief comment on this phase of the subject is justified. Some of the Arizona witnesses go so far as to say that if Arizona does not get this water from the Colorado River, they might as well "give the State back to the Indians," that central Arizona will "dry up and blow away."

As has been pointed out, no objections have been made to the Bridge Canyon Dam portion of the proposed project; it may also be assumed that the feasibility of a project to include the proposed local features for further conservation and utilization of the waters of the Gila River system, with the possible exception of the Hooker Dam and reservoir, can be established. So let us view the situation with these points in mind and see the results that follow:

(1) According to the Bureau's report, if the so-called central Arizona project is not constructed, the present irrigated acreage will have to be reduced by about 150,000 acres for lack of an adequate water supply. However, if the local features I have referred to are built, they will conserve water for about 30,000 acres. In that event the reduction would amount to only 120,000 acres. This reduction would, of course, be in field crops, not permanent crops such as trees or vines, or specialty crops such as vegetables.

(2) Also, according to the Bureau's report, it is anticipated in estimating future crop returns that the present acreage in vegetables will be increased by about 40,000 acres. If so, this would occur whether or not the central Arizona project was constructed; it would result from market conditions and not from water supply. So let us assume that such will be the case and that 40,000 acres now growing ordinary field crops shift to the growing of vegetables.

Here are the results using the same crop values as shown in the Bureau's report:

	Acres
Gross reduction if project not constructed	150,000
Acreage supplied by local features, if built	30,000
Net reduction if no Colorado River supplied	120,000

Based on an average gross crop value of common crops, shown by the Bureau's report, of $66 per acre:

Loss from nonproduction of 120,000 acres (per year)	$7,920,000

Shift of 40,000 acres from common crops to vegetables:	
Gross crop value of vegetables, per acre	260
Gross crop value of common crops, per acre	66
Increased value per acre for vegetables	194
Total increase in crop returns resulting from shifting 40,000 acres to vegetables at $194	7,860,000

Thus it is seen that the loss in field crop values would be offset by the increase in vegetable crop values.

In other words, based on assumptions used in the Bureau of Reclamation's report on the proposed project and assuming that the local features only are built, we find that even though no Colorado River water is diverted to central Arizona, the present economy will be maintained. This point is well worth serious consideration.

Where then is the threatened economic ruination of the State of Arizona?

SUMMATION OF COMMENTS

May I sum up these comments on the proposed irrigation project to take Colorado River water to central Arizona by pointing out the following:

(1) There is no Colorado River water available for the project unless it be taken away from existing projects for which the works are largely constructed and rights established.

(2) Any increase in production in the central Arizona area due to the project would be offset by a reduction in production on existing projects. Therefore, this project would not add anything to national production or national economy.

(3) The proposal to pump irrigation water a height of 1,000 feet and carry it 315 miles to be used in large part for the growing of ordi-

nary crops such as cotton, hay, and grain is without economic justification.

(4) The proposed use of 1,390,000,000 kilowatt-hours a year to pump the aqueduct water would in effect increase the drain on the Nation's petroleum supply by over 2,250,000 barrels of fuel oil each year. This would be an unjustified waste of our natural resources.

(5) The price of 1.74 mills per kilowatt-hour proposed for power delivered to the aqueduct pumping plants as compared to the price in the commercial market of such power of 4.82 mills would result in a loss to the Nation of $4,280,000 per year.

(6) There should be no discrimination in the sale price of Bridge Canyon power; the base rate should be the same to all purchasers as in the case of Hoover Dam power.

(7) Total revenue from the sale to irrigators of the water pumped in the aqueduct would barely cover the cost of the power required for pumping, even at the proposed discriminatory price of 1.74 mills per kilowatt-hour. The water users would pay no part of the irrigation construction costs or other operating costs of the project.

(8) The irrigators would pay no part of either the construction cost, $64,000,000, or the annual operating expenses, $481,000, of the irrigation, distribution, and drainage systems. In other reclamation projects the water users are required to pay such costs at least. Moreover, there is no justification for writing off as nonreimbursable one-half the construction cost and annual operating expenses of the drainage system.

(9) The construction cost of works required to supply Colorado River water to irrigators in central Arizona would amount to $262,000,000 and the annual operating expenses would total $4,188,000 whereas, the estimated total annual revenue from sales of such water is but $2,480,000. Therefore, the irrigators would pay no part of the construction cost of the project and only about 60 percent of the annual operating expenses.

(10) Failure to secure Colorado River water for central Arizona would not result in the collapse of the economy of the State. Such water is not necessary to maintain the present economy of the State. The increase in crop production values resulting from a shifting of 40,000 acres to vegetables, which the Bureau of Reclamation predicts will occur, will offset the loss in crop value due to a claimed reduction of irrigated acreage if the aqueduct is not built but only local features of the project are constructed.

(11) In view of these facts, I submit that, even though a water supply was available for the proposed central Arizona project—which it isn't—and even though the 1,390,000,000 kilowatt-hours of electric power required for pumping the water could be made available from otherwise surplus energy—which is not the case—the proposed project would still be totally infeasible and economically unjustified.

I would conclude by suggesting that we of the West ask ourselves whether this project is an example of the reclamation program we are asking the country to support. If so, then the people of the Nation well might ask the question "What price reclamation." The authorization of such a project could easily result in a reaction from the taxpayers of the Nation such as to largely undo the progress which has been made during recent years in gaining support from the country as a whole for western reclamation.

The CHAIRMAN. The hearing is adjourned.

(Whereupon, at 4:50 p. m., the hearing was adjourned.)

(At the request of Senator McFarland, the following are added to the record:)

1. Letter of Bureau of Reclamation dated May 11, 1949, furnishing comparative power rates;
2. Letter written May 4, 1949, to the chairman of the Senate Committee on Interior and Insular Affairs by the Secretary of Agriculture.
3. Statement of Charles A. Carson in reply to testimony of Northcutt Ely and James H. Howard.
4. Supplemental statement of Senator Ernest W. McFarland.

UNITED STATES DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington 25, D. C., May 11, 1949.

Hon. ERNEST W. MCFARLAND,
United States Senate.

MY DEAR SENATOR MCFARLAND: In reply to your telephone request with regard to the central Arizona project, a comparison with several other projects has been made of the effect of the subsidy to irrigation on the average power rate required in order to accomplish repayment of that part of the reimbursable investment which, it is estimated, must be repaid by power.

The following comparison includes several of our more recent and larger multipurpose projects in which power revenues contribute substantially to the aid of irrigation.

Project	Estimated average firm power rate to accomplish required repayment assigned to power, mills per kilowatt-hour	Portion of average rate required for irrigation subsidy, mills per kilowatt-hour	Ratio of subsidy component to the average firm rate, percent
Central Arizona	4.82	0.72	15
Central Valley	5.30	.68	13
Colorado-Big Thompson	5.10	.89	17
Columbia Basin	1.00	.36	36
Missouri Basin	5.50	2.47	45

It should be noted that the rates given in the first column are the average firm power rates estimated as those necessary to produce the revenues from the sale of firm power to accomplish the necessary pay-out. The individual power rates for different load factors, or interim rates later to be superseded by permanent rates, will differ somewhat from these average rates. The summation of all estimated revenues from the sale of firm power, divided by the number of kilowatt-hours, however, will result in the average rates above indicated.

I trust that this gives you the information desired. If I can be of further assistance in this matter, please advise.

Sincerely yours,

KENNETH MARKWELL,
Assistant Commissioner.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, May 4, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Senate Committee on Interior and Insular Affairs,
United States Senate.

DEAR SENATOR O'MAHONEY: I have been requested by Senators Hayden and McFarland of Arizona to reexamine and, to the extent possible, clarify the contents of my letter of May 5, 1948, to Mr. Michael Straus, Commissioner of the Bureau of Reclamation, in which we reviewed the proposed report of the Secretary of the Interior, dated December 19, 1947, concerning the central Arizona project.

Perhaps this can best be accomplished by directing your attention to the fact that the Department of Agriculture has not taken the unequivocal position that the development of irrigation water to supply the bulk of the lands described in the Department of the Interior report concerning the central Arizona project should not be undertaken.

Senators Hayden and McFarland have stated to me that my letter of May 5, 1948, has been construed by some as opposing the central Arizona project. I wish to make it clear that my letter was not written for this purpose. We did point out that we disagreed with the method used by the Bureau in estimation of benefits grossed rather than net (which is the same objection which we have made in our reports on other reclamation projects). My letter repeated my opposition to the methods generally used by the Bureau of Reclamation in its reports upon reclamation projects.

I want also to make it clear that I am not opposed to the development of reclamation in the West. On the contrary, I have frequently pointed out the necessity of reclamation development.

Assuming an increase in population at the projected rate with an increasing demand for food in this country, plus a healthy export trade, and also recognizing that there are some lands in this country which should be retired from active cultivation because of their misuse by our predecessors, it is increasingly clear that all of the soil resources and power resources of this country will have to be intelligently and properly developed in the interest of the national welfare.

Sincerely yours,

CHARLES F. BRANNAN,
Secretary.

STATEMENT OF CHARLES A. CARSON, CHIEF COUNSEL OF ARIZONA INTERSTATE STREAMS COMMISSION, IN REPLY TO TESTIMONY OF NORTHCUTT ELY AND JAMES H. HOWARD BEFORE THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS OF THE UNITED STATES SENATE ON MAY 2, 1949

The quotations given by Mr. Ely and attributed to various individual Members of the Senate on the debate on the floor, as well as the quotations from other individuals, are deemed by me to be entirely immaterial.

The language of the Colorado River compact, the Boulder Canyon Project Act, and the California self-limitation statute are clear and unambiguous and their meaning is plain. Therefore, I do not deem it necessary to answer in detail the conclusions of Mr. Ely, based upon such quotations, but I would like to point out that on the whole record, both legislative and the complete statements of the individuals whom he purports to quote, his contentions are not borne out, but on the contrary the full record fully supports the testimony given by Senator Hayden.

On page 1870 of the stenographic transcript, Mr. Ely purports to quote a statement, attributable to me, at a hearing before the Secretary of the Interior December 17, 1934, when Arizona was at that time attempting to secure a contract for 2,800,000 acre-feet of water, and he quotes as follows:

"The contract does not include and there will not be affected by it the use of water from the tributaries in Arizona, estimated at 2,500,000 to 3,000,000 acre-feet."

I have checked the transcript of that hearing and I find no such statement. I find, however, that Mr. Ely was apparently quoting from a statement prepared for the convenience and use of Arizona representatives at that hearing. That statement was not filed with the Secretary and I am at loss to understand how Mr. Ely secured a copy of it. Mr. Ely miscontrues the single sentence. The entire paragraph and the succeeding paragraph of that statement is herewith set out as follows:

"The contract does not include and there will not be affected by it the use of water from the tributaries in Arizona, estimated at 2,500,000 to 3,000,000 acre-feet. These waters are not within control of the Secretary of the Interior, for the reason that they are not to be stored at Boulder Canyon Reservoir. The act gives the Secretary power to contract only for the delivery of water to be stored at Boulder Canyon Reservoir. He has no jurisdiction or control over the waters of the tributaries in Arizona that are not to be stored in the Boulder Canyon Reservoir, nor does the fact that Arizona uses the waters of her tributaries, render it necessary in any way that the Secretary permit 2,800,000 acre-feet of

water intended for use in Arizona to be delivered for use in Mexico. No other State can use the 2,800,000 acre-feet of water. The act and the compact are not susceptible of the narrow construction sought to be placed upon them by California and Nevada.

"Arizona does not intend by this contract to prevent the future initiation or perfection of rights to the waters of her tributaries in Arizona if the water is there and available for use."

The committee will therefore see that Mr. Ely entirely misconstrues the single sentence he quoted. I submit also his conclusions are not borne out by the full record; and I further submit that the method of quoting single sentences and phrases twists and distorts the meaning of the document from which they are taken.

For instance, the Bible says "Judas went and hanged himself," * * * "Go thou and do likewise," but I do not believe that Mr. Ely would say that was the teaching of the Bible, that people should go and commit suicide.

On page 1886 of the stenographic transcript Mr. Howard states that I misquoted him. I submit that I did not quote him at all, but gave what appears to me to be the only logical conclusion as to what he meant in that connection. What I said appears on page 36 of my prepared statement which I will quote:

"It has been argued by the representatives of the southern California agencies in the hearings before this committee on S. 75 and more fully in the hearings before the Public Lands Committee on H. R. 934 and 935, which have been proceeding simultaneously, that Congress does not have the power or jurisdiction, for any purpose, to construe or interpret the Colorado River Compact; and determine the question whether or not, in its judgment, there is water legally available for the central Arizona project, for the purpose of the authorization bill. They have argued that consideration of that question by the Congress is precluded and barred and that the only tribunal having jurisdiction to determine the question of the availability of water for the project is the Supreme Court of the United States.

"However, while some of their witnesses have been pressing such arguments in the legislative committees, Mr. James H. Howard, general counsel for the metropolitan water district of southern California, presented a statement before Subcommittee No. 3 of the House Committee on the Judiciary in a hearing on House Joint Resolution 3 and similar resolutions, all of which are companion to Senate Joint Resolution 4, being considered by your committee, in which he conceded that Congress did have such power to determine the availability of water for a project for the legislative purpose of authorizing a project."

On page 307 of the stenographic transcript of the hearings before Subcommittee No. 3 of the House Judiciary Committee on April 6, 1949, Mr. Howard said:

"In order that I may not be misunderstood, let me say it is unquestionably within the power of the Congress as an administrative and legislative matter, to ascertain the existence of facts required as the basis of legislative action. Every time the Congress authorizes a reclamation project it necessarily considers the engineering feasibility, which includes the availability of a water supply. It is hard to imagine Congress authorizing a project calling for a large amount of water from a river system incapable of producing the required water.

"Such legislative determination, however, falls far short of being an adjudication or final determination of water rights. In the event that anyone believed that its rights on a river system had been invaded, by a project built in response to congressional authority, his remedy in court would be open to him." * * *

I submit that my statement correctly interprets what Mr. Howard said.

Mr. Howard on page 1927 of the stenographic transcript again states that I misquoted him. Again I submit I did not quote him at all in connection with the matter to which he refers. What I said was:

"Mr. Howard stated that in making contracts with the Secretary of the Interior the southern California agencies had relied upon * * *.

"* * * allegations in the bill and statements in the pleadings in *Arizona* v. *California* (283 U. S. 423), I thought that Mr. Howard was too careful a lawyer to rely upon such statements, and I checked dates. I find that he must be in error because the bill was not filed in that case until October 13, 1930. I find in the Hoover Dam contracts, by Wilbur and Ely, published in 1933, copies of a contract for electrical energy executed by the United States and the metropolitan water district of southern California on April 26, 1930, for the delivery of water by the United States to it. Both of said contracts were executed nearly 6 months before the Arizona bill of complaint was filed; so Mr. Howard must be mistaken."

(EDITOR'S NOTE.—As appears in the Hoover Dam contracts a contract for electrical energy and a contract for water were executed on April 24 and on April 26, 1930. Correction of above by Mr. Carson.)

I quote what Mr. Howard said beginning on page 746 of the reporter's stenographic transcript for April 2, 1949:

"Mr. HOWARD. In response to Senator McFarland's statement I will say that at the time Arizona attempted to have the Colorado River Compact and the Boulder Canyon Project Act declared unconstitutional the allegations of their bill and the brief in support of the bill took the clean-cut position which is exactly in accordance with the position we now take, that III (b) water was not apportioned water, from which it would follow that the California Limitation Act does not renounce claim to it.

"Mr. Ely will follow that up and show you the exact text of the various documents to support that statement.

"That occurred at about the same time, contemporaneously with the making of our water delivery contracts, so that at that time we had no reason to suppose that there was any difference of opinion on that point or any reason to suppose we would not participate in the water described in article III (b) of the compact.

"Also, the matter of consumptive use was treated at that time very much in the manner that we want to treat it now. There has been a complete shift in the Arizona position since that day.

"When we made our contracts we were relying upon the contemporary interpretation of the documents which can be fully substantiated by the record, and will be fully substantiated. * * *"

I submit the only case to which he could have been referring was the case to which I referred, that my interpretation is correct that he could not have been relying upon the allegation and pleading in the case to which he refers and the case to which he refers is *Arizona* v. *California* (283 U. S. 423). There is no evidence of any other documents or claimed interpretations attributable to Arizona other than those allegations in the briefs and pleadings in that case to which I have referred.

Again I desire to point out to the committee, as I have heretofore, that those allegations are entirely immaterial to any issue in that case and are not binding upon Arizona; and that the questions now raised by California were not in issue.

I submit that no statement made under such conditions is binding upon any sovereign State or upon the United States.

Suppose some attorney made an immaterial and irrelevant allegation that involved a question of sovereignty of the United States, would anyone contend that the United States was bound by such a statement until it had been authorized or approved by the Congress?

Statements in the two cases to which California refers are irrelevant and immaterial upon any issue raised in those cases. California had not at that time raised the questions which are presently presented at this hearing, they were in nobody's mind.

Indeed Mr. Ely at page 497 of the hearings before the Subcommittee No. 4 of the Judiciary Committee of the House of Representatives on House Joint Resolution 225 and companion measures in May 1948 admitted that they were not binding and stated as follows:

"Arizona has said that she is not bound by the expressions of her counsel. Of course, she is not; nor is she bound by the expressions they make today. They may be repudiated at some future time by any future counsel."

Again Mr. Howard quotes portions of various statements from various individuals. Statements heretofore made regarding Mr. Ely's similar quotations apply equally to those of Mr. Howard. In my opinion such quotations are irrelevant and Mr. Howard's conclusions are not sustained by the complete statements and the whole record from which he appears to quote.

Also, I do not believe it would serve any useful purpose to reply to Mr. Howard and Mr. Ely upon any such statements, as in my opinion, the Colorado River Compact, Boulder Canyon Project Act, and the California self-limitation statute are plain and clear in meaning and are in no sense ambiguous, so there is no possibility of going back to rely upon isolated phrases and statements made by any individuals.

The whole effort of the southern California agencies in regard to III (b) water and the measurement of beneficial consumptive use is directed to the proposition of claiming that a part of the 7,500,000 acre-feet of water to be de-

livered by the States of the upper division at Lee Ferry is surplus water and therefore California is entitled to use a part of such surplus water claimed to be part of the 7,500,000 acre-feet deliverable at Lee Ferry; otherwise they cannot possibly claim any right to the use of it in California under the language of the California self-limitation statute which limits their possible claim to 4,400,000 acre-feet of III (a) water plus not more than one-half of any surplus or water unapportioned by the compact.

I submit that the Supreme Court of the United States has ruled adversely to California's contentions both in respect to the water mentioned in article III (b) of the Colorado River Compact, the 1,000,000 acre-feet which the Supreme Court says is apportioned to the lower basin, and also against California upon any possible claim that any of the 7,500,000 acre-feet released at Lee Ferry to the lower basin may be considered as surplus. This ruling is set forth in 292 U. S. at pages 358–359, quoted at length on page 13 of my prepared statement.

In that paragraph the Supreme Court specifically held that III (b) water is apportioned water and the Supreme Court there specifically says:

"* * * The effect of article III (b) (at least in the event that the lower basin puts the 7,500,000 acre-feet of water to beneficial uses) is to preclude any claim by the upper basin that any part of the 7,500,000 acre-feet released at Lee Ferry to the lower basin may be considered as 'surplus' because of Arizona waters which are available to the lower basin alone. * * *"

Certainly then, the Supreme Court having denied to the upper basin the right to claim that any part of the 7,500,000 acre-feet deliverable at Lee Ferry can be considered as surplus would not permit California to make such a claim and thereby enable upper division States to do what the Supreme Court has told them they may not do.

Mr. Howard seeks to add to the phrase "diversions less returns to the river," appearing in the Boulder Canyon project and the California Self-Limitation Act, the words "measured at the site of the use," see page 301 of the hearings before the Subcommittee No. 3 of the Judiciary Committee on House Joint Resolution 3, given on April 6, 1949. I submit that the words "measured at the site of the use" are not in the Boulder Canyon Project Act and not in the California Self-Limitation Act, but the whole argument of California witnesses that consumptive beneficial use does not mean depletion is based upon that proposition; and I submit it is because they know that the phrase "diversions less return flow" means depletion, and can mean nothing else, therefore they believe it necessary to add to that phrase the words "measured at the site of use."

Mr. Ely states that Arizona desires one method of measuring beneficial consumptive use to apply to Arizona and another to California. He is mistaken. In our view, depletion would be measured at the international boundary insofar as the lower basin is concerned, and at Lee Ferry insofar as the upper basin is concerned. Arizona does not say that depletion must be measured at the site of use as to California.

I know of no responsible official, attorney, or engineer of Arizona, or other basin States, who take such a position.

Insofar as I am personally concerned, I believe that California also is entitled to have the depletion resulting from her consumptive use of water measured at the international boundary. I know of no State and I know of no attorney or engineer of the other States who would object to that.

I therefore submit that all the questions raised by California are clearly determined and settled by the language of the Supreme Court of the United States, except as to evaporation on lower basin mainstream reservoirs.

As to evaporation losses, I submit that storage in a reservoir whether it be an on-stream reservoir or off-stream reservoir is diverted from the flow of the stream; that the California Self-Limitation Act and the Boulder Canyon Project Act do not say that the 4,400,000 acre-feet of apportioned water to which California is limited is a minimum but do say that it is a maximum and they do not measure beneficial consumptive use (diversions less returns to the river) as applying to water diverted into California, but to water diverted for use in California, so that when water is stored in a reservoir for later diversion into California it is diverted for use in California.

I further submit that it is provided in the California contracts that their right to store water is subject to such regulations as to accumulation, retention, and release as the Secretary of the Interior may prescribe, and that the United States in their contracts reserves the right to make similar arrangements for use in other States without distinction in priority, and that the Secretary's determination shall be final. It is therefore plain that California must bear her propor-

tionate share of evaporation losses caused by the storage of water for her benefit.

Again I submit that the question of who should bear evaporation losses cannot give rise to any justiciable controversy in the foreseeable future and that it can never give rise to such a controversy unless and until the upper basin States put to full use the 7,500,000 acre-feet reserved for their use and unless and until all surplus water disappears from the river, and not even then, unless and until, there should occur a shortage of water in Lake Mead which would require a curtailment of deliveries for use below Lake Mead and in that event such deliveries for use below Lake Mead would be proportionate and ratable.

Respectfully submitted.

CHAS. A. CARSON,
Chief Counsel of Arizona Interstate Streams Commission.

WASHINGTON, D. C., *June 23, 1949.*

Hon. JOSEPH C. O'MAHONEY,
Chairman, Senate Committee on Interior and Insular Affairs,
United States Senate, Washington, D. C.

DEAR MR. CHAIRMAN: I have just seen, in the galley proof of the hearings on S. 75, the statement filed by Charles A. Carson, commenting upon my testimony.

It is unnecessary to reply to Mr. Carson's contentions, as they are refuted either by their internal inconsistencies, or by direct quotations from official documents and records in my testimony.

I do desire, however, to reply to one personal comment made by Mr. Carson. He refers to my quotation of his statement at a hearing before the Secretary of the Interior, December 17, 1934, in which Mr. Carson said: "The contract does not include and there will not be affected by it the use of water from the tributaries in Arizona, estimated at 2,500,000 to 3,000,000 acre-feet."

Mr. Carson says: "I have checked the transcript of that hearing, and I find no such statement. I find, however, that Mr. Ely was apparently quoting from a statement prepared for the convenience and use of Arizona representatives at that hearing. That statement was not filed with the Secretary, and I am at a loss to understand how Mr. Ely secured a copy of it.

I secured a copy by asking the Department of the Interior for it. A photostat was furnished me by that Department, where Arizona's brief is on file, contrary to Mr. Carson's assumption. The Department billed me $10.50 for the photostat and presumably would furnish Mr. Carson one on the same terms.

Respectfully,

NORTHCUTT ELY.

SUPPLEMENTAL STATEMENT OF SENATOR ERNEST W. MCFARLAND

For the purpose of grouping together in condensed form the various views hitherto expressed by myself and other witnesses who have opposed Senate Joint Resolution 4 and who have pointed out that there is no present justiciable issue or controversy between California and Arizona, or any other of the basin States, I submit the following somewhat summarized statement. There then will follow a brief commentary in the nature of rebuttal to the testimony of California witnesses, particularly those who testified toward the end of the hearing.

I

Undeniably, there is and has long been a great dispute between the States of Arizona and California, involving differences of opinion ranging from slight to violent. California seizes upon the fact of the dispute itself as proof that such dispute must be settled in the Supreme Court.

However, and this is the absolute core of the matter, the mere fact of dispute cannot and does not confer jurisdiction upon the Supreme Court. That Court may act when and only when a "justiciable controversy" is presented; but every controversy, no matter how great, is by no means justiciable.

The general principle has been enunciated in many cases, and I therefore quote the following excerpt from the decision in the case of *Texas* v. *Florida* (306 U. S. 398, at p. 405), where the Court spoke as follows:

"So that our constitutional authority to hear the case and grant relief turns on the question of whether the issue framed by the pleadings constitutes a justiciable 'case' or 'controversy' within the meaning of the constitutional provision, and whether the facts alleged and found afford an adequate basis for the relief

according to the accepted doctrines of the common-law or equity systems of jurisprudence, which are guides to decision of cases within the original jurisdiction of this Court."

The dispute between Arizona and California is not a justiciable controversy upon the present status of the case, and cannot become such until an injury, actual or threatened, comes into the picture.

What is a justiciable controversy?

That point has been many times determined by the Supreme Court of the United States in litigation between the various States. As a preliminary, it probably would be well to note, in passing, that the determination as to whether there is a justiciable controversy in an interstate suit is upon a basis entirely different from that prevailing in suits between private parties.

For example, in the case of *Alabama* v. *Arizona* (291 U. S. 286), the Court said:

"This Court may not be called upon to give advisory opinions or to pronounce declaratory judgment * * *. Its jurisdiction in respect of controversy between States will not be exerted in the absence of absolute necessity."

In the more recent case of *United States* v. *Appalachian Electric Power Co.* (311 U. S. 377), the Court said:

"To predetermine, even in the limited field of water power, the rights of different sovereignties, pregnant with future controversies, is beyond the judicial function."

The Court does not lightly regard the question of the existence of a justiciable controversy. For example, the Court in the case of *Louisiana* v. *Texas* (176 U. S. 1), said:

"But it is apparent that the jurisdiction is of so delicate and grave a character that it was not contemplated that it would be exercised save when the necessity was absolute and the matter in itself properly justiciable."

In brief summary, the Supreme Court has held that it will not grant relief against a State unless the complaining State shows an existing or presently threatened injury of serious magnitude. The Court will not grant relief against something merely feared, something which may happen or is likely to occur at some future time. The correlated rule is that the judicial power does not extend to the determination of abstract questions. The existence of a justiciable controversy depends upon a showing that the complaining State has suffered a loss or injury through the action of another State, which loss or injury is of a nature to furnish a claim for judicial redress; or, the complaining State must assert a right which is susceptible of judicial enforcement according to the accepted principles of jurisprudence. The mere fact that a State is a party plaintiff is not sufficient. Although an injunction will issue to prevent an existing or presently threatened injury, relief will not be granted as against something merely feared as likely to occur at some indefinite time in the future.

The Court has repeatedly held that it will not issue declaratory decrees; and it is clear that inchoate rights which depend upon possible future developments furnish no basis for a decree in an interstate suit.

The final effect of the rules may be boiled down to this: You must have an existing injury of serious magnitude, or an immediately threatened injury of the same type, before you have a justiciable controversy. Neither exists in this instance. Neither California nor Arizona is using the amount of water to which they are respectively entitled. It therefore is clear that there is no present injury.

It is equally clear that there is no threatened injury. So far as I know, there is no project under construction or authorized in any part of the Colorado River Basin which in any way would threaten to reduce or diminish the flow of the river so as to make less water available to California. The only project which has thus far been tangibly put forward is the Central Arizona Project. Bills seeking its authorization are now before the Congress; but unless and until the project is authorized, it cannot be said that such project constitutes a threat to the State of California.

A threat not coupled with an actual, or apparent, or a probable ability to effectuate such threat is in law no threat at all. California's witnesses have cited a number of items which they claim jointly constitute a threat of injury; but dress the facts how they will, they cannot conceal the final and determinative fact that Arizona has absolutely no physical means whatsoever wherewith to divert water to an extent in any way impinging upon California's rights. The passage of an authorization bill, looking forward to the construction of physical structures to divert water, probably is no actual threat; but certainly

the passage of such an act would be the earliest point at which a threat might be created.

It is well settled, of course, by reason of the language of the Constitution itself, that the Supreme Court has original jurisdiction in controversies between the several States. But granting that the Court possesses jurisdiction of the parties, no action is maintainable unless there is a justiciable controversy.

Other considerations point up another basic fallacy of the assertions that a justiciable controversy exists between the State of California and other States of the Colorado River Basin, particularly Arizona. The proponents do not say that the Court may equitably apportion the waters of the Colorado River; nor do they say that the issues involve specific property or rights therein; nor do they say that there is an actual or even imminent threat of irreparable injury to property. They do say that the purpose is to submit various documents to the Court, and to seek an interpretation thereof, so that the engineers may at a later date proceed with the actual division and use of the waters.

Manifestly, the proponents are seeking an advisory opinion, asking for the interpretation of various written instruments.

Lest the inquiry arise as to whether the passage in 1934 of the Declaratory Judgment Act may have in some way diminished the requirement of a justiciable controversy as a condition precedent to the maintenance of suit, I invite the committee's attention to the case of *Coffman* v. *Breeze Corporations* (323 U. S. 316), which was decided in October of 1944. The case involved facts dissimilar to those now in question, but the Supreme Court unequivocally voiced the following rule:

"The declaratory judgment procedure is available in the Federal courts only in cases involving an actual case or controversy * * *, and may not be made the medium for securing an advisory opinion in a controversy which has not arisen * * *."

In the case of *New York* v. *Illinois and Sanitary District of Chicago* (274 U. S. 488), the State of New York sought to enjoin the defendants from diverting immense quantities of water from Lake Michigan, among other things upon the theory that such diversion would interfere with or prevent the use of the waters of the Niagara and St. Lawrence Rivers by the plaintiff States and her citizens for the development of power. There was no showing that there was any present use of the waters for such purpose which was being or would be disturbed, nor that there was a definite project for so using them which was being or would be affected. The Court there said:

"The suit is one for an injunction, a form of relief which must rest on the actual or presently threatened interference with the rights of another. Plainly no basis for such relief is disclosed in what is said about water-power development. At best the paragraph does no more than present abstract questions respecting the right of the plaintiff State and her citizens to use the waters for such purposes in the indefinite future. We are not at liberty to consider abstract questions (*New Jersey* v. *Sargent*, 269 U. S. 328)."

The applicability of this language to the position presently taken by California does not require elaboration.

In the course of the decision in the case of *Ashwander et al.* v. *Tennessee Valley Authority et al.* (297 U. S. 288), decided in February 1936, a case having no resemblance to the present issue as to factual aspects, the Court said, at page 324:

"The judicial power does not extend to the determination of abstract questions (*Muskrat* v. *United States*, 219 U. S. 346, 361; *Liberty Warehouse Co.* v. *Grannis*, 273 U. S. 70, 74; *Willing* v. *Chicago Auditorium Assn.*, 277 U. S. 274, 289; *Nashville, C. & St. L. Ry. Co.* v. *Wallace*, 288 U. S. 249, 262, 264). It was for this reason that the Court dismissed the bill of the State of New Jersey which sought to obtain a judicial declaration that in certain features the Federal Water Power Act exceeded the authority of the Congress and encroached upon that of the State (*New Jersey* v. *Sargent*, 269 U. S. 328). For the same reason, the State of New York, in her suit against the State of Illinois, failed in her effort to obtain a decision of abstract questions as to the possible effect of the diversion of water from Lake Michigan upon hypothetical water-power developments in the indefinite future (*New York* v. *Illinois*, 274 U. S. 488). At the last term the Court held, in dismissing the bill of the United States against the State of West Virginia, that general allegations that the State challenged the claim of the United States that the rivers in question were navigable, and asserted a right superior to that of the United States to license their use for power production, raised an issue 'too vague and ill-defined to admit of judicial determination' (*United*

States v. *West Virginia*, 295 U. S. 463, 474). Claims based merely upon 'assumed potential invasions' of rights are not enough to warrant judicial intervention (*Arizona* v. *California*, 283 U. S. 423, 462).

"The act of June 14, 1934, providing for declaratory judgments does not attempt to change the essential requisites for the exercise of judicial power. By its terms, it applies to 'cases of actual controversy,' a phrase which must be taken to connote a controversy of a justiciable nature, thus excluding an advisory decree upon a hypothetical state of facts. (See *Nashville, C. & St. L. Ry. Co.* v. *Wallace*, supra)."

II

Complete rebuttal and refutation of the testimony upon behalf of California appear in the evidence submitted by the Bureau of Reclamation, the proponents of S. 75, and the opponents of Senate Joint Resolution 4, including evidence given not only at the present hearings but that which was incorporated from the earlier hearings during the Eightieth Congress on Senate bill 1175 and Senate Joint Resolution 145.

I feel that the foregoing statement necessarily must serve for present purposes, as the task of separately singling out various elements of California's evidence and then respectively offsetting such elements by citation of the contradictory evidence in refutation would be unnecessarily repetitive and time-consuming.

The testimony of Mr. Northcutt Ely is a case in point. For example, Mr. Ely selected certain items from context and presented them in support of his argument concerning the understanding and purpose of Congress at the time of the passage of the Boulder Canyon Project Act. For the sake of brevity I will not here reiterate but will merely invite attention to my testimony appearing at pages 315 through 319 of the printed hearings on Senate Joint Resolution 145, which testimony refutes Mr. Ely. It is quite clear that a review of the record of statements made on the floor, taken as a whole and in their proper order and perspective, plainly establishes that the understanding and purpose of Congress when it passed the Boulder Canyon Project Act were exactly the same as Arizona contends. However, it is unnecessary to go behind or beyond the language of the act itself, as its meaning is clear and unambiguous and plainly shows that Arizona is entitled to the water she now claims.

FEDERAL POWER COMMISSION,
Washington, May 27, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Senate Interior and Insular Affairs Committee,
United States Senate, Washington, D. C.

DEAR SENATOR O'MAHONEY: In a letter dated May 14, 1949, Senator Ernest W. McFarland asked that I write you giving the Commission's comments concerning certain questions regarding the proposed Bridge Canyon power and irrigation project described in bill S. 75, introduced into the Senate of the United States on January 5, 1949, by Senator McFarland. The particular matters on which comments of the Commission are desired concern a letter to the Commissioner of Reclamation dated May 21, 1948, reporting on the then proposed project at Bridge Canyon and in central Arizona and its relation to changes made in the proposed project in the certain respects which Senator McFarland points out in his letter. It is to these points in particular that the Commission's comments are directed. A copy of Senator McFarland's letter is attached for your convenient reference.

The project originally conceived, and upon which the Commission reported, would have taken water from Lake Havasu at Parker Dam for the irrigation of lands in central Arizona. As part of the project a dam would have been built in the Colorado River above the existing Hoover Dam at a site known as Bridge Canyon. Under this project there appeared to be no physical connection between the Bridge Canyon Reservoir and the central Arizona irrigation project. However, the project proposed in bill S. 75 includes the use of the forebay at Bridge Canyon as a water supply and a waterway connected thereto with central Arizona, utilizing gravity flow through a long tunnel and canal system. In answer to Senator McFarland's question on this point there would be a direct physical connection between the project described in S. 75 and the lands to be irrigated in central Arizona.

The matter of power supply and its availability to meet the needs for pumping water for the irrigation project is a further point upon which Senator McFarland desires you be advised by the Commission. All of the existing power supply in

the Colorado River Valley, the Commission understands, has been disposed of and a demand for additional power from the Colorado River now exists. In order to secure any large supply of power for pumping purposes, additional power sources must be made available. The Bridge Canyon project, which would develop a large amount of power, could readily be used for this purpose. It is pointed out that a transmission grid connecting the projects in the Colorado Valley will probably be utilized in marketing the Bridge Canyon power. However, the increment of power required in such a system will have to come from sources not now developed and, as stated above, the Bridge Canyon site would provide a suitable source.

It is proposed in the project to utilize returns from the sale of power to assist in meeting some of the expense in the irrigation project. In the report previously referred to the Commissioner of Reclamation indicated that the cost of such power delivered to load centers in Arizona and southern California, including the cost of power and such additional costs as are necessary to assist the irrigation program would result in a rate of 4.82 mills per kilowatt-hour. This estimated rate of 4.82 mills per kilowatt-hour may be compared with the cost in 1947 of energy from the best steam-electric plants in the area. For example, the cost of energy from the Harbor plant, Los Angeles Department of Water and Power, was 5.5 mills per kilowatt-hour; the Silver Gate plant of the San Diego Gas & Electric Co. showed costs for energy of 5.25 mills per kilowatt-hour; and the Long Beach plant of the Southern California Edison Co. had energy costs of 6.1 mills per kilowatt-hour. The cost of energy from steam plants in Arizona was 12.2 mills per kilowatt-hour for the Tucson plant of the Tucson Gas, Electric Light & Power Co. and 10.0 mills per kilowatt-hour (approximately) for the Phoenix plant of the Central Arizona Light & Power Co.

Sincerely yours,

NELSON LEE SMITH, *Chairman.*

UNITED STATES SENATE,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
May 14, 1949.

MR. NELSON LEE SMITH,
Chairman, Federal Power Commission, Washington, D. C.

DEAR SIR: On February 4, 1949, Mr. Frank Pace, Jr., Director of the Bureau of the Budget, wrote to Secretary Krug concerning the Secretary's report on the central Arizona project. In this letter Mr. Pace refers to the letter you wrote on May 21, 1948, to the Commissioner of Reclamation in connection with that project, and he states, in part:

"The Federal Power Commission points out that there is no essential physical relationship between the Bridge Canyon power project and the central Arizona diversion project, but that the two are linked together in the report because of the need for subsidies from electric-power income to help finance the irrigation improvement. It also indicates that the burden of the irrigation costs are considerable and that the proposed charges for electric power consequently approach a level where such power cannot be classed as 'low cost' in this region."

I am sure that in view of the developments since the writing of your letter of May 21, and particularly on account of the introduction during the Eighty-first Congress of S. 75, you will agree that you should give further consideration and make prompt early statement with respect to the factors briefly outlined as follows:

1. There are very definite relationships other than financial which require the inclusion of the Bridge Canyon Dam and the Bridge Canyon power project in the authorization bill, which reasons are set forth in S. 75, and which are not included in the request for your comment on the project. Briefly, Bridge Canyon is the only nearby source for development of power to effectuate the project on its first phase, which contemplates pumping operations. In the project's later phase Bridge Canyon Dam is required to create a forebay for delivery of water to the tunnel which will carry by gravity the water theretofore pumped.

2. When your letter was written, contracts for the acquisition of Davis Dam power had not been made. Since that date, all of this power has been disposed of by contract, and all such power fell far short of meeting the applications and demand therefor. Present and future scarcity of power supply in this area urgently requires the development of Bridge Canyon Dam and power plant at the earliest possible time.

3. The cost of power which can be produced at Bridge Canyon power plant as one feature of the central Arizona project is, in relation to costs of other

recently developed and potential sources of power in the region, low-cost power and is probably the lowest-cost potential power that can now be developed in the future in that area.

I would greatly appreciate your writing a letter to the chairman of the Senate Interior and Insular Affairs Committee bringing your comments up to date on the matters set forth above. As time is an urgent factor, prompt action upon your part will be most welcome.

With kindest personal regards, I remain,

Sincerely yours,

ERNEST W. MCFARLAND.

STATE OF CALIFORNIA,
GOVERNOR'S OFFICE,
Sacramento, April 16, 1949.

HON. JOSEPH C. O'MAHONEY,
Chairman, Senate Committee on Interior and Insular Affairs,
Senate Office Building, Washington, D. C.

MY DEAR SENATOR: This letter is addressed to you in support of the passage of Senate Joint Resolution 4, with reference to the adjudication of the water rights of the States of the lower basin of the Colorado River. I had hoped to be able to appear personally before your committee on this matter, but my obligations in California do not permit me to do so. It would be appreciated if you would receive this communication and make it a part of the record of your hearings.

It is unfortunate that a controversy exists over the rights to the use of the waters of the lower basin of the Colorado River. It is unfortunate also that another year has passed without anything constructive having been accomplished toward the solution of the existing problems. In May 1948, Senator Knowland, at my request, appeared before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, and presented my views urging the adoption of Senate Joint Resolution 145 to authorize commencement of an action by the United States to determine the rights of the lower-basin States to Colorado River water. The resolution failed to be adopted.

The controversy is essentially a dispute over the meaning of certain statutes and documents, including particularly those known as the Colorado River compact, the Boulder Canyon Project Act, the California Limitation Act, and certain water-delivery contracts made by the Secretary of the Interior. Conferences held on this subject throughout the years have not brought about a solution, and as the present and future needs become more critical the situation will probably become more acute.

On March 3, 1947, I made the written suggestion to the Governor of Arizona that we endeavor to resolve our differences by one of three methods. These methods are, in order of preference, (1) by written agreement between the States; (2) by arbitration; or (3) by suit in the Supreme Court of the United States. No agreement resulted from this proposal of mine, but I am of the firm belief that such action is still highly desirable and in the best interests of both Arizona and California. Since there seems to be no possibility of terminating the controversy by agreement or arbitration, the means of adjudication set forth by Senate Joint Resolution 4 is the only alternative.

The future economic development of the lower-basin States is dependent upon a solution of the existing controversy. The Secretary of the Interior has recognized the necessity of a determination of the controversy in order to permit further development of the water resources of the Colorado River by the Federal Government.

Since the major issues of the controversy are matters of law and not of fact, it is probable that within a comparatively short time the Court could hear legal arguments, without the necessity of taking extended evidence regarding facts, and adjudicate the rights of the affected States promptly. I believe the case could be presented to the Court on an agreed statement of facts. Each year that the settlement of the controversy is delayed means additional years of delay in the development of the areas affected by the use of Colorado River water.

In the event the Congress authorizes the suit by acceptance and passage of Senate Joint Resolution 4, I assure you that California's part in the proceeding will be carried on with all possible promptness.

I urge your favorable consideration of the resolution.

Sincerely,

EARL WARREN, *Governor.*

NATIONAL PARKS ASSOCIATION,
Washington 6, D. C., March 23, 1949.

Senator JOSEPH O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate, Washington, D. C.

DEAR SENATOR O'MAHONEY: The National Parks Association is a nonprofit, educational organization, with a Nation-wide paid membership of over 3,000. The association is primarily concerned with the preservation of natural conditions in the national parks and national monuments, and with other activities affecting the national park system; but it is also closely associated with efforts to secure proper protection for other kinds of reservations that are designed for the enjoyment of all the people.

The National Parks Association has studied S. 75 and the various reports that describe the Bridge Canyon Dam and associated projects in order to determine the relations of this project to the natural values protected within the Grand Canyon National Monument and the Grand Canyon National Park. This project will directly affect both of these reservations. The act of February 26, 1919, establishing the Grand Canyon National Park, authorized the Secretary of the Interior to permit utilization of areas therein which may be necessary for the development and maintenance of a reclamation project, whenever consistent with the primary purposes of this park; the proclamation of December 22, 1932, establishing the Grand Canyon National Monument, included no such provision.

As a matter of principle, the National Parks Association believes that all of the national parks and monuments should be inviolate and free from any engineering projects, for their highest use, for which they were established for the benefit of all of the people, is represented by their existing natural values and not by their commercial or artificial potentialities. The association, therefore, believes that the disadvantages of this project, in relation to the national interest, outweigh the expected benefits; and that authorization of its construction may open the way to the construction of similar projects affecting national parks and monuments elsewhere, with resultant destruction of the protection afforded the national park system.

Mr. Frederick Low Olmsted, in his report of October 20, 1942, discusses in detail the effects of the Bridge Canyon Dam upon the Grand Canyon itself. He points out certain ways in which this dam, if constructed with the natural values of the canyon in mind, could produce conditions benefiting the recreational use of the lower parts of the canyon. All of his conclusions are based upon the premise that such a dam would not exceed a height of 1,772 feet above sea level; he describes many serious adverse effects that would result were the dam built to a higher elevation. If S. 75 should receive any favorable consideration by this committee, it is strongly urged that the bill be amended (p. 2, lines 10 and 11) to authorize a dam not exceeding 1,772 feet in elevation. Such an amendment would insure more adequate protection for the natural features of the national park and national monument than does the present wording.

It is also to be noted that the wording of the provisions of S.75 on pages 3 and 4 is so general as to be subject to the possible interpretation that it is intended also, without specifically saying so, to authorize construction of the proposed Kanab tunnel. This tunnel project represents a threat that would irremediably destroy the greatest assets the Grand Canyon possesses. The following comment is noted from the interim report of the Secretary of the Interior entitled "The Colorado River," July 1947, page 243:

"The project involves a 42.5-mile diversion tunnel under the Kaibeb Plateau to a power plant site at Kanab Creek.

"Probably the most serious effect upon scenic and related values from the building the suggested tunnel to Kanab Creek would be the curtailment of the flow of the Colorado River through Grand Canyon National Park, reducing it to a minimum arbitrary allotment for purely scenic effect. Certainly such a project should not be considered until there is a need for the power thus generated which cannot be met by other means. Then the decision should be made as stated by Mr. Olmsted as in the case of the Bridge Canyon Reservoir, 'not primarily upon technical details—but upon broad considerations of public purpose—upon how much the people care about preserving the natural conditions and scenery in the portion of Grand Canyon selected for such preservation in 1908 and whether they are able and willing to pay the price of such preservation.'"

It is respectfully suggested that the wording of pages 3 and 4 of S. 75 be changed to make explicit exactly what additional works are contemplated by this

bill, and that a definite clause be included excepting from authorization any subsidiary projects within or relating to Grand Canyon National Park or that will substantially change the flow of the Colorado River through that national park.

The Secretary of the Interior's report also discusses other projects proposed for construction on the upper Colorado River and its tributaries, pointing out their importance in controlling siltation of the lower stream (San Juan Basin, pp. 140 and 146; Little Colorado River, p. 142, and others). It is the opinion of the National Parks Association that such projects located above the Grand Canyon should receive consideration before construction of the Bridge Canyon Dam is authorized, as they would more effectively control siltation of the main channel, and do so without damaging the important national values affected by the proposed Bridge Canyon Dam.

A copy of a resolution passed by the board of trustees of the National Parks Association, in annual meeting assembled, May 20, 1948, concerning this and similar projects is appended herewith.

Yours sincerely,

FRED M. PACKARD, *Field Secretary.*

ENGINEERING THREATS

Dam building constitutes major threats to four national park areas, as follows:

(1) Glacier View Dam, which would flood an area of nearly 20,000 acres on the west side of Glacier National Park and destroy a major portion of the winter range of deer, moose, and elk;

(2) Mining City Dam, which would inundate large parts of the caverns in Mammoth Cave National Park;

(3) Proposed dams in and immediately adjacent to Kings Canyon National Park, which would change the character of several valleys which are now centers of recreational use;

(4) Bridge Canyon Dam, below Grand Canyon National Park, which would flood that part of the canyon in the Grand Canyon National Monument and part of the Grand Canyon National Park proper. A further and greater threat to the Grand Canyon is a proposed diversion of the waters of the Colorado River from a point above the park, thus removing the great river from the canyon it created.

To all of these projects the National Parks Association expresses its firm and uncompromising opposition. National parks are set aside by Congress to be preserved in their natural condition. The laws of the United States, including the Pan American Convention for Nature Preservation and Wildlife Protection in the Western Hemisphere provide that our national parks shall not be exploited for commercial purposes. Yet these proposed dams and other works, although themselves chiefly outside national park boundaries, would destroy important natural features which the parks were created to protect.

The board of trustees of the National Parks Association also, in this connection, commends the Secretary of the Interior for his expressed opposition to some of these projects, and looks confidently to him to defend the national park system against all dangers of similar nature.

THE STATE OF NEVADA,
Carson City, March 18, 1949.

Hon. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
Washington 25, D. C.

DEAR SENATOR O'MAHONEY: I wish hereby to reaffirm my position and that of my State associates with respect to the necessity for adjudication of claims to waters of the Colorado River as provided for in Senate Joint Resolution 4.

I am informed that this matter is to be heard in committee on March 21. It has been my intention to have Nevada represented at the hearing by both our attorney general and State engineer, but, unfortunately, the present session of our legislature, as well as other conflicting appointments require these men to remain in Nevada at that time.

As was stated by Senators McCarran and Malone, of Nevada, as well as by the two men above-mentioned, at a hearing before the subcommittee of the Judiciary Committee of the House last year in support of House Joint Resolution 226,

Eightieth Congress, I am convinced that the controversy over the division of waters of the Colorado River between Arizona, California, and Nevada cannot be satisfactorily cleared up except by litigation. We have, over a period of 20 years, attempted to end the disagreement and controversy by other methods, but completely without results.

In view of the present unsettled and undetermined allocation of water and the absence of an interstate compact between the said three States (which was authorized by Congress but never enacted), I believe that approval of any new reclamation and irrigation projects calling for the consumptive use of a large amount of water from the Colorado River should not be considered by Congress until said water rights are fully clarified. This applies in particular to the Arizona project which apparently will require substantially more water than the remainder of Arizona's total share.

Most sincerely yours,

VAIL PITTMAN, *Governor.*

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D. C., May 12, 1949.

Senator JOSEPH C. O'MAHONEY,
Chairman, Senate Committee on Interior and Insular Affairs, Senate Office Building, Washington, D. C.

MY DEAR MR. CHAIRMAN: In accordance with the understanding reached by the Senate Committee on Interior and Insular Affairs, Senator Downey submitted a list of 24 questions to me for reply.

Attached is a copy of the questions and replies to all except question No. 23 which is as follows:

"What is the estimated cost of all reclamation projects authorized to date, the corresponding total expenditures to date, the cost allocated to irrigation, and the area to be irrigated, separately for each project and the total?"

The answer to this question will be furnished to you as soon as the data can be compiled.[1]

Sincerely yours,

V. E. LARSON,
Assistant Regional Planning Engineer,
Bureau of Reclamation, Phoenix, Ariz.

REPLIES TO INTERROGATORIES SUBMITTED BY SENATOR SHERIDAN DOWNEY TO V. E. LARSON

1. Question.—What studies, if any has the Bureau made of the possibilities of meeting water shortage by additional conservation and utilization of the local water supplies of the Gila River and its tributaries in central Arizona, by—

(*a*) Conservation of floodwaters in periods of surplus flow, such as the period 1905–20, by surface and underground storage.

(*b*) Maximum utilization of underground reservoir.

(*c*) Salvage of waters now consumed by water-loving vegetation, and what are the findings and conclusions reached, if any.

Answer.—(*a*) Investigations and studies have been made by the Bureau of Reclamation, United States Engineers Office, and the Department of Agriculture in determining potentialities of additional conservation and utilization of floodwaters of the Gila River and its tributaries. As a result of these investigations certain potentialities were recommended as feasible developments. These recommended developments are included as a part of the central Arizona project. Further conservation of surface water would require large storage reservoirs for the purpose of providing long-time hold-over storage. These reservoirs could be filled only after all present and recommended reservoirs had been filled. A large part of such stored water would be lost in evaporation. For example, the existing Horseshoe Dam provides a reservoir capacity of 68,000 acre-feet. By enlarging the dam for a reservoir capacity of 298,000 acre-feet, or an increase of 230,000 acre-feet, it would be possible to conserve 42,000 acre-feet annually. Additional water conserved at the McDowell Dam would be lost in evaporation.

(*b*) Utilization of the underground reservoir is contemplated under the potential central Arizona project. It is estimated that the average annual safe pumping

[1] Question 23 was subsequently answered and is carried in its regular order below.

from the ground-water basins is 694,600 acre-feet under present conditions. Additional recharge to the ground-water basins brought about by the central Arizona project would increase this safe annual yield to 1,094,600 acre-feet annually. During periods of low run-off from the Gila River and its tributaries pumping must exceed the average if a full water supply is made available to the irrigated lands. Also, during a dry period the recharge to the ground-water basin is below the average. Therefore, the reduced recharge and increased pumping will result in a withdrawal of water from the ground-water basin during periods of low run-off that must be replenished during periods of high run-off. It is believed that under the central Arizona project such operation will fully utilize the ground-water reservoir within feasible limits.

(c) Salvage of waters now consumed by water-loving vegetation is a problem that has been considered by the Corps of Engineers, Department of Agriculture, Geological Survey, Bureau of Reclamation, State and local agencies, Irrigation Districts, and individuals. Investigations are being continued by all of the parties listed above with the objective of developing a satisfactory method of eliminating some of the phreatophytic growth to improve the flood hazard conditions and salvage water. Any water that will probably be salvaged would represent but a small part of the supplemental requirement.

It should be noted, however, that in the water supply computations for the central Arizona project, credit has been taken for water conserved by the Charleston Dam, the Safford Valley improvements, and Hooker Dam. Such conservation comes about essentially by reducing the amount of water available to phreatophytic growth.

Studies by the Bureau of Reclamation indicate that the trend in cropping is resulting in a gradual increase in the duty of water. Present water supply studies are based on an average duty of water at the farm of 4 acre-feet per acre. The trend indicates that this requirement will increase. It has been assumed that water conserved by further conservation of the local water supply, in addition to the conservation measures included in the central Arizona project report, will be required in the future as it can be made available.

2. Question.—You state that practically all the surface run-off in the area is now regulated and utilized for irrigation. Is it not a fact that under present development and operation practices, large amounts of run-off in periods of surplus flow such as 1905–20 would be wasted out of the area?

Answer.—During periods of run-off such as 1905–20, water would be wasted out of the area. The average annual natural or virgin inflow to the Phoenix and Coolidge areas for the period 1897 to 1944 was 2,261,000 acre-feet. For the period 1905–20 it was 3,376,000 acre-feet and 1,919,000 acre-feet for the period 1921–44. Reservoir capacity of 17,840,000 acre-feet would be required to store all of the flow above normal during the 16-year period 1905–20 inclusive. Since 1920 the run-off has been below normal and any attempt to utilize the excess flows that occurred during the 1905–20 period would have required utilizing water contained in the hold-over storage for the past 29 years. A large part of such stored water would be lost in reservoir evaporation.

3. Question.—Have you made a study and determination of the consumptive use requirements of presently irrigated lands in central Arizona as related to water supply available from local sources, predicated upon maximum effective utilization of both surface and underground reservoirs and with due regard to storage of waters in the underground reservoir from surplus surface irrigation water applications and from natural run-off and subsequent utilization of such waters by pumping from wells; and what are the findings and conclusions of such study?

Answer.—The Bureau of Reclamation studies are based upon (1) a determination of the number of acres of land that could be served a full water supply under present conditions of utilizing surface water and underground reservoirs, the summary of which is shown on table B–5 of the report, and (2) the amount of supplemental water required to furnish a full supply to 640,000 acres of the 672,000 that has been under cultivation. The results of this study are summarized on table B–23 of the report on the central Arizona project. On this basis, the amount of fallow land would be about 5 percent, which is about the same as the Salt River project and Imperial irrigation district.

4. Question.—How does the run-off during the period 1940 to 1944 compare with the run-off during the period 1905 to 1920? Give comparative figures for each period.

Answer. The average annual natural or virgin inflow to the Phoenix and Coolidge areas for the period 1940 to 1944 is estimated at 2,216,000 acre-feet, as compared to the long-time average of 2,261,000 acre-feet for the period 1897 to 1944. The run-off for the period 1905 to 1920 is 3,376,000 acre-feet.

5. Question. In what localities is the ground water becoming toxic to plant growth? Please furnish data on well locations and quality of water in parts per million, with reference to this statement.

Answer. Ground water is now becoming toxic to plant growth in the Roosevelt irrigation district and Buckeye Water Conservation and Drainage District. Well locations, dates water was sampled, and quality of water are shown in the attached tables for 12 irrigation wells located in these districts.

6. Question. What records are available as to quality of ground water in existing wells throughout the project area? Please furnish all available records of quality of ground water by individual wells including location, quality in parts per million and date of sample, covering entire period of record to show any progressive changes in quality.

Answer.—Volumes of records are available as to the quality of ground water from existing wells throughout the project area. These records are available in the offices of the Geological Survey of Phoenix and Tucson, Bureau of Reclamation at Phoenix, and irrigation districts throughout the project area. To assemble and reproduce all available records for the 1,700 wells within the project area would require considerable time and expense. Some of the records have been reproduced in response to question No. 5.

7. Question. You state that the maximum acreage ever irrigated in the proposed central Arizona project area is about 672,000 acres:

(*a*) Was 672,000 acres ever irrigated in any one year?

(*b*) What is the maximum area irrigated in the project area in any one year to and including 1944 and when,

(1) for the project area as a whole.

(2) for the Maricopa and Pinal units separately.

(3) for each irrigation district, agency or enterprise in the area.

Answer. (*a*) No.

(*b*) Our available records for all irrigation districts, agencies and enterprises are complete for the period 1940 to 1944 inclusive. Dating back from 1940 we have only the year of maximum acreage for each unit or individual organization. On the basis of information available the answers are as follows:

(1) The maximum acreage ever irrigated in any one year within the proposed project boundary was 587,480 acres in 1944. The boundary of the potential project was limited to an area containing 672,000 acres of land that had been under cultivation and entitled to supplemental water. Of the 672,000 acres, 95 percent, or 640,000 acres could be served a full water supply each year. An allowance of 5 percent for fallow land was used because this is the average percentage experienced in the Salt River project and in the Imperial irrigation district.

(2) Maricopa unit, 406,458 acres, 1044; Pinal unit, 139,970 acres, 1943.

(3) Historical maximum acreages irrigated by units and individual organizations.

	Year	Acres cultivated
Maricopa unit:		
Arcadia area	1929	1,150
Arlington Canal Co	1942	4,480
Buckeye Water Conservation and Drainage District	1927	19,200
Chandler Heights irrigation district	1930	1,280
Gillespie area	1925	20,000
Goodyear Farms and Adaman Municipal Water Co	1937	13,450
Indian lands	1937	4,640
Maricopa Co. Municipal Water Conservation District No. 1	1942	27,880
Marinette Farm	1929	8,300
Peninsula-Horowits and Champion and St. Johns irrigation districts	1937	3,750
Private pumps:		
East of RWCD	1944	2,520
North of Arizona Canal	1939	10,170
South of Salt River project	1929	12,140
West of the Agua Fria	1929	15,000
Queen Creek area	1929	16,000
Roosevelt irrigation district	1930	35,200
Roosevelt Water Conservation District	1937	37,500
Salt River project and miscellaneous areas	1937	229,610
Total Maximum Unit	.....	462,490

	Year	Acres cultivated
Pinal unit:		
Magma area	1930	3,660
San Carlos project	1937	85,400
Stanfield and Maricopa districts:		
Electrical district No. 2	1930	68,840
Electrical district No. 4		
Total Pinal unit		157,900
Upper Gila unit:		
Cliff-Gila area, N. Mex	1930	5,000
Duncan-Virden Valley	1930	8,060
Red Rock Valley, N. Mex	1930	1,500
Safford Valley	1930	32,510
Total upper Gila unit		47,070
San Pedro Unit: St. David and Pomerene	1920	4,500
Total all units		671,960

8. Question. You state that the Colorado River compact "apportioned waters of the Colorado River." Do you not know that the compact apportions the beneficial consumptive use of the waters of the Colorado River system and that your statement is inaccurate and, therefore, possibly misleading?

Answer. This and the next question, I take it, refer to the following quotation from page 8 of the mimeographed statement:

"The Colorado River compact apportioned waters of the Colorado River between the upper and lower basins, designating Lee Ferry, on the Colorado River, 1 mile below the mouth of the Paria River, as the point of diversion. The apportionment of Colorado River waters by the Colorado River compact is from the virgin or undepleted flow of the stream, that is, from the stream as [it] would be in the absence of any development."

Like all the other passages in my statement which bear upon the legal availability of water for the central Arizona project, this statement must be read as, in effect, setting forth my understanding of Arizona's position and as involving, to use the words of the Commissioner in his letter of January 26, 1948, to the Secretary on this project, "the assumption that claims of the State of Arizona * * * are valid." This, indeed, is made clear at page 10 of my statement where I pointed out that—

"* * * the determination of Colorado River water available for diversion to the central Arizona project herein presented is based upon interpretations by responsible officials of the State of Arizona. This presentation is not intended to be prejudicial to the claims of the States challenging Arizona's interpretations. The Bureau of Reclamation recognizes these differences of opinion, but, as has been stated in our report, the Bureau cannot authoritatively resolve these differences."

If the expression of the notion that the Colorado River compact apportioned waters is in any way inaccurate or misleading, I trust that you and the other members of the committee will be on guard against it wherever it may occur, whether in statements of the Arizona witnesses, in my statement, or in section 4 (a) of the Boulder Canyon Project Act.

9. Question. What is the basis or authority for your statement that the apportionment of Colorado River waters by the Colorado River compact is from the "virgin" or "undepleted flow" in the Colorado River compact, and, if so, where?

Answer. See answer to question 8.

10. Question. Under the Bureau's proposed repayment program, what part of the capital cost allocated to irrigation, in terms of dollars and of percent of the total, would be repaid by—

(a) Irrigation revenues?

(b) Commercial power revenues?

Answer. Under the Bureau's proposed repayment program, the capital cost allocated to irrigation includes a proportionate part of the dams, power plants, and transmission facilities required to produce and deliver electrical energy to

the pumping plants as required in pumping irrigation water. It also includes all of the irrigation features and a proportionate part of additional joint features. In answering the above question it is assumed that revenues from the sale of irrigation water would be used to repay all costs for operation and maintenance and replacement reserve and that the balance would be applied on the capital investment.

It is further assumed that the revenues from irrigation water would amount to $4.75 per acre-foot delivered at the farmer's headgate. The power rate has been assumed as 4.65 mills. Both power and irrigation water users are assumed to repay for 70 years with the full interest component from power being credited to repayment of irrigation construction costs. Municipal water users, paying at the rate of 15 cents per 1,000 gallons for a period of 40 years, would also provide a small subsidy to be applied to the irrigation costs.

The capital cost allocated to irrigation would be repaid as follows:

		Percent
(*a*) Irrigation revenues	$10,143,000 or	2.5
(*b*) Net power revenues other than interest	38,244,000 or	9.6
(*c*) Interest on commercial power investment	348,799,000 or	87.3
(*d*) Municipal water revenues	2,238,000 or	.6
Total	399,424,000	100.0

11. Question. What part of the operation, maintenance, and replacement expenses allocated to irrigation in terms of dollars and of percent of the total, would be repaid by—

(*a*) Irrigation revenues.

(*b*) Commercial power revenues.

Answer. As outlined in question No. 10, all operation and maintenance costs and reserve for replacement allocated to irrigation would be repaid from irrigation revenues. These costs for a 70-year period are estimated to be $210,210,000. They would be repaid as follows:

(*a*) From irrigation revenues: $210,210,000 or 100 percent.

(*b*) From power revenues: None.

12. Question. (*a*) Is the proposed exchange of Colorado River water for Salt River water definitely assured by agreement with the Salt River Valley water users concerned?

(*b*) If the proposed exchange could not be effected, what amounts of capital and annual costs would be added to the project?

Answer. (*a*) At the present time there is no formal agreement with the Salt River Valley Water Users Association for the exchange of water as proposed in the central Arizona project report. However, the Salt River Valley Users Association has not informed the Bureau of any objection to the proposed exchange. On page 13 of the regional director's recommendations, agreement for the exchange of water is included as a prerequisite to the construction of Granite Reef Aqueduct.

(*b*) Pumping water from Granite Reef Dam into the Salt-Gila aqueduct as an alternative to diverting water from the reservoir at Sturart Mountain Dam would result in an increased cost of $1.18 per acre-foot of water to be delivered by the Salt-Gila aqueduct.

13. (*a*) Question. In view of the fact that Buttes Dam will make available substantial additional new water for use on lands downstream, would not such new water far more than compensate for any infringement on downstream water users that might result from the Charleston Dam development and Tucson aqueduct diversion, and thus make unnecessary any imported water for this particular purpose?

Answer. The legality of such a plan of development has been questioned by water users on the Gila River because of the provisions of the Gila River decree and storage right applications.

14. Question. (*a*) Why is it necessary or economically advisable to provide distribution facilities to furnish a surface irrigation supply to lands that are now irrigated by pmping from wells?

(*b*) Could not the additional supply, to the extent needed, be furnished by replenishing the ground water and continuation of pumping°

(*c*) Is it proposed to discontinue fur'her ground water pumping in areas now served by pumping from wells and sr' stitute surface irrigation therefor?

Answer. (*a*) and (*b*) Pumping must be reduced to the safe yield of the ground-water basins. The necessary reduction in pumped water must be compensated by surface water if an adequate supply is to be kept available to the land. Also in some areas surface water is required for mixing with pumped water to dilute the salt concentrations in the pumped water. The supplemental supply of water required on the project lands could not be made available without a distribution system.

(*c*) It is proposed to reduce the average annual pumping to an amount equal to the safe yield of the ground-water basin and supply the supplemental needs with delivery of surface water. During periods of low run-off the annual pumping would exceed the safe yield and would be less than the safe yield during periods of high run-off. This plan will utilize both surface and ground-water potentialities.

15. (*a*) Question. Is there any precedent under Federal reclamation development to include the cost of distribution and drainage facilities as a part of project cost to be repaid from project power revenues, as proposed for the central Arizona project in the amount of about $64,000,000?

Answer. The term "distribution facilities" is used in a great many different ways. It is used, for instance, in the Columbia Basin allocations report (H. Doc. 172, 79th Cong., p. 6) in a much broader sense than it is used in the central Arizona project report. Consequently, it is impossible to say, without a far more detailed break-down of the costs of other projects than is available to me, whether there is or is not precedent in reclamation practice for having power revenues bear some or all of the burden of the cost of such facilities.

(*b*) Question. Should not such costs be considered as an obligation to be repaid by the water users in accordance with the usual reclamation policy and procedure, and if not, why?

Answer. Whether, in the case of the central Arizona project, the cost of distribution and drainage facilities (however they may be defined) should be considered an obligation to be repaid by the water users is, of course, one among the many questions that the Congress must decide in the course of passing on S. 75. It is my view that, policy-wise, there is no magic distinction between distribution facilities and other irrigation works that requires the former to be paid by the water users but permits the latter to be paid for in whole or in part from net power revenues.

16. Question. Under the Bureau's proposed plan of coordinate operation—

(*a*) In what amount would the annual firm energy output of Hoover Dam power plant be increased by the power produced at the proposed Bridge Canyon Dam?

(*b*) In what amount would the annual firm output of the proposed Bridge Canyon power plant be increased by Hoover Dam power plant output?

Answer. The estimated potential firm energy production of the power plants on the Colorado River as described in the central Arizona project report is based on the minimum 10-year flow of the river. The studies were based on full reservoirs at the beginning and full reservoirs at the end of the 10-year low flow period which would permit the same power production in the future even though a consecutive 10-year low-flow period occurred.

The construction of Bridge Canyon, Coconino, and Bluff Dams would permit a reduction in the flood-control reserve in the reservoir formed by Hoover Dam. A reduction in the flood-control reserve would result in operating the power plant at Hoover Dam at a higher head, thereby making it possible to produce more kilowatt-hours of electrical energy per acre-foot of water released.

By operating the power plants at Hoover Dam, without the benefit of Bridge Canyon and the related dams, during a critical period with upstream depletions occurring as under initial conditions, the potential firm energy output would be 4,250,000,000 kilowatt-hours annually during the low run-off period. By taking advantage of the benefits afforded by Bridge Canyon and the related dams, the potential firm energy output of the power plants at Hoover Dam would be 4,500,000,000 kilowatt-hours annually or an increase of 250,000,000 kilowatt-hours annually.

By utilizing the Bridge Canyon and Bluff Reservoirs, the power plant at Bridge Canyon would produce 3,325,000,000 kilowatt-hours of firm energy annually without coordination with any other power plants. Under coordinated operation with power plants at Hoover, Davis, and Parker Dams the output at Bridge Canyon would be 4,675,000,000 kilowatt-hours.

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17. Question. Under the Bureau's proposed plan of coordinate operation of power plants on the lower Colorado River, would not such plan if carried out seriously and disadvantageously invade rights of Hoover Dam power contractors and would not such plan necessitate a material revision of the present Hoover Dam power contracts?

Answer. It is believed that the Hoover Dam power contractors would greatly benefit through the Bureau's proposed plan of coordinating the operation of power plants on the lower Colorado River. As a result of the potential Bridge Canyon development and coordinated operation of the lower Colorado River power plants, the firm energy production at Hoover Dam power plant would be increased by 250,000,000 kilowatt-hours annually during a critical period under initial conditions of stream-flow depletion. Under the present contract the power users would be entitled to purchase this firm energy at the secondary rate. Effective coordinated operation of Hoover, Davis, Parker, and Bridge Canyon power plants would require an agreement with the present contractors for energy produced at Hoover power plant.

18. Question. Even assuming that the proposed integration involving substantial changes in Hoover Dam power contracts could be effected, do you believe that, under practical operating conditions, the degree of perfection revealed in your operating studies could be attained or that the amount of firm energy estimated could actually be produced?

Answer. It is believed that the estimated firm-energy production is conservative and could probably be exceeded under actual operating conditions. The estimated output is based on the minimum 10-year low run-off period which is 76 percent of the long-time mean. In the operation studies, the reservoirs were filled at the end of the 10-year low run-off period. As a further factor of safety, 30 percent of the active storage capacity of Lake Mead was not utilized during the critical period.

19. Question. Under the financial analysis summarized in your statement, what is the total amount in dollars of the interest component included in commercial power revenues and applied to the repayment of reimbursable capital costs during the repayment period?

Answer. Based upon a 70-year repayment period and a 3 percent interest rate, the interest component would amount to $348,799,000 and would all be applied to the repayment of rembersible capital costs of irrigation features during the repayment period.

20. Question. Do you consider existing reclamation law permits the interest on the cost allocated to commercial power and included in commercial power rates to be used for repayment of capital costs, and, if so, on what authority?

Answer. Yes. A copy of the opinion of the Solicitor of the Department of the Interior dated September 29, 1944, dealing with this question is attached for your information.

21. Question. Based upon the Bureau's estimate of consumptive use for irrigation of 3.2 acre-feet per acre in the Maricopa and Pinal units and 2.74 acre-feet per acre in the upper Gila and San Pedro units of the proposed central Arizona project, what would be the total consumptive use requirements in acre-feet in each of these units and combined, for (*a*) average area irrigated in period 1940–44, and (*b*) area proposed to be furnished a water supply, including so-called idle lands?

Answer. The answers to questions (*a*) and (*b*) are shown in the following table. On the basis of average irrigated acreage for the period 1940–44, the total water requirement would be about 2,571,000 acre-feet annually. Based upon the irrigated acreage for the potential project as outlined in the report, the total water requirement would be about 2,916,000 acre-feet. By dividing the total water requirement for the area by the actual irrigated acreage, the resulting requirement would give a unit rate of 4.6 acre-feet per acre. Under this same comparison for the Imperial irrigation district, based upon the water diverted to the project area, the unit rate averages 6.9 acre-feet per acre for the period 1943 to 1946, inclusive.

Item	Unit served	Irrigation consumptive use on cultivated acreage	Average irrigated acreage 1940-44		Average irrigated acreage under the potential project	
			Acres	Water requirements	Acres	Water requirements
1	Maricopa	3.2	394,970	1,264,000	441,000	1,411,000
2	Pinal	3.2	123,730	396,000	150,000	480,000
3	Upper Gila	2.74	45,640	125,000	46,800	128,000
4	San Pedro	2.74	1,830	5,000	1,880	5,000
5	Tucson			12,000		12,000
	Subtotal		566,170	1,802,000	639,680	2,036,000
6	Miscellaneous uses	3.2	[1] 77,800	249,000	[1] 88,650	284,000
		2.74	[1] 7,120	20,000	[1] 7,300	20,000
7	Phreatophytes			[2] 200,000		[2] 200,000
8	Release for salt balance			300,000		376,000
	Total			2,571,000		2,916,000

[1] The consumptive-use rate shown in the above table is the quantity of water, in acre-feet per cropped acre per year, absorbed by the crop and transpired or used directly in the building of plant tissue, together with that evaporated from the crop-producing land, less the effective percipitation. Items 1 to 4, inclusive, consider only cropped acreage. To these items must be included the consumptive use on uncropped area within the project. These include water consumed by evaporation and plant growth along the canals, laterals, and drainage systems; uses by rights-of-way and fallow land; uses by industrial plants in the project area; livestock and domestic uses on the farms, and uses by towns and cities in the project area. Under the definition of consumptive use as used in our studies, the above outlined uses of water are expressed as equivalent cropped area multiplied by the consumptive-use rate. These uses are estimated at 15 percent of the cropped acreage.

[2] The Groundwater Division of the Geological Survey estimates the use of water by phreatophytes, in the project area between Ashurst-Hayden Dam, Granite Reef Dam, and Gila Bend, at between 200,000 and 350,000 acre-feet annually. For the purpose of this study, the minimum figure has been adopted.

22. Question. Comparing your answers of the previous question as to total consumptive-use requirements in acre-feet with the ultimate surface-water supply that would be made available as proposed in the Bureau's report on the central Arizona project, set forth in column 9 of table B-23 at 2,758,600 acre-feet, together with an additional ground-water supply of 250,000 acre-feet which you testified would be available from natural percolation, (*a*) what would be the amount of water supply in excess of such requirements, in each unit and combined, and (*b*) what disposition would be made of such amounts of water supply proposed to be made available in excess of consumptive-use requirements?

Answer. In the report on the central Arizona project, column 9 of table B-23 shows 2,758,600 acre-feet as the average annual surface water available for diversion. Of this amount, 100,000 acre-feet is estimated as the return flow and rediverted. Therefore, the available supply of surface water available for consumptive use is 2,658,600 acre-feet. During the hearings, I roughly estimated that the yield from the ground-water basin resulting from natural percolation may amount to possibly 250,000 acre-feet annually. This combined with the surface water would give a total of 2,908,600 acre-feet. This available supply is substantially the same as shown under water requirements for the project as outlined in the table under question No. 21.

23. Question. What is the estimated cost of all reclamation projects authorized to date, the corresponding total expenditures to date, the cost allocated to irrigation and the area to be irrigated, separately for each project and the total?

Answer:

Bureau of Reclamation—Project completed, under construction, or authorized (programs and finance program coordination, May 26, 1949)

C=completed	Project and State	Total estimated cost	Costs to date (3-31-49)	Cost allocated to irrigation	Area to be irrigated (acres)
	W. C. Austin, Oklahoma	$13,205,798	$11,946,250	$10,995,798	50,000
	All-American Canal, Calif.	76,484,248	48,940,252	71,984,248	503,300
C	Baker, Ore.	281,592	281,592	281,592	[1] 7,300
C	Balmorhea, Tex.	435,630	435,630	435,630	[1] 10,400
	Belle Fourche, S. Dak.	4,658,940	4,636,330	4,658,940	72,000
C	Bitter Root, Mont.	947,641	947,641	947,641	[1] 16,500
	Boise-Anderson Ranch, Idaho	32,234,000	25,720,293	18,492,247	[1] 300,000
	Boise-Fayette, Idaho	17,173,000	13,572,750	17,173,000	52,760
	Boise-Drainage, Idaho	160,000	29,772	160,000	
C	Boise (all other), Idaho	18,289,759	18,289,759	18,091,230	171,545
	Boulder Canyon, Ariz-Nev.	173,903,900	149,700,811		
	Buffalo Rapids, Mont.	5,369,250	3,731,149	5,369,250	22,926
	Buford-Trenton, N. Dak.	1,370,216	736,174	1,370,216	7,900
C	Burnt River, Oreg.	601,025	601,025	601,025	[1] 15,300
	Carlsbad, N. Mex.	4,064,650	3,999,780	4,064,650	25,100
	Central Valley, Calif.	440,069,000	248,830,023	221,551,600	[1] 930,000
	Central Valley distribution system, Calif.	72,500,000	268,570	72,500,000	
	Colorado-Big Thompson, Colo.	144,581,000	69,505,394	79,356,521	[1] 615,000
	Colorado River front work and levee system, Arizona-California	18,920,000	3,783,700		
	Colorado River, Tex.	23,983,700	23,963,417		
	Columbia Basin, Wash.	784,836,000	274,418,090	425,878,608	1,029,100
	Davis Dam, Ariz.	111,438,000	50,655,968		
	Deschutes, Oreg.	12,800,000	11,235,890	12,800,000	[1] 96,000
	Deschutes-Arnold irrigation district, Oregon	210,000	138,672	210,000	
	Deschutes-Ochoco Dam, Oreg.	1,535,000	53,254	1,535,000	
	Eden, Wyo.	4,667,000	419,937	4,667,000	[1] 20,000
	Fort Peck, Mont.	15,500,000	3,231,329		
C	Frenchtown, Mont.	279,099	279,099	279,099	4,900
C	Fruitgrowers, Colo.	200,741	200,741	200,741	[1] 2,700
	Gila, Ariz.	53,306,750	15,069,302	53,306,750	115,100
	Grand Valley, Colo.	6,330,248	5,662,273	6,330,248	52,300
C	Humboldt, Nev.	1,316,408	1,316,408	1,316,408	[1] 38,900
	Hungry Horse, Mont.	108,800,000	13,671,607		
C	Huntley, Mont.	1,559,590	1,559,590	1,559,590	32,500
C	Hyrum, Utah	941,885	941,885	941,885	[1] 6,300
	Intake, Mont.	119,453	94,213	119,453	842
	Kendrick, Wyo.	24,138,000	19,809,175	14,470,973	20,000
	Kern River, Calif.	125,000	6,000	125,000	
	Kings River, Calif.	285,000	206,029	285,000	
	Klamath, Oreg.-Calif.	13,954,000	11,093,498	13,954,000	[1] 208,200
	Lewiston Orchards, Idaho	2,301,294	1,128,727	2,301,294	3,800
C	Lower Yellowstone, Mont.-N. Dak.	3,685,433	3,685,433	3,685,433	57,200
	Mancos, Colo.	3,870,000	3,710,201	3,870,000	[1] 8,200
	Middle Rio Grande, N. Mex.	30,179,000		20,880,000	84,900
C	Milk River-Dodson, Mont.	125,292	125,292	125,292	1,000
	Milk River, Mont.	9,574,121	9,320,307	9,574,121	127,900
	Minidoka, Idaho	27,891,893	23,877,304	22,694,698	[1] 1,126,200
	Mirage Flats, Nebr.	3,081,080	2,995,208	3,081,080	12,000
	Missoula Valley, Mont.	287,416	264,811	287,416	2,100
	Missouri River Basin (various)	2,703,060,738	76,894,746	2,074,329,000	[1] 6,334,100
C	Moon Lake, Utah	1,600,361	1,600,361	1,600,361	[1] 72,600
C	Newlands, Nev.	7,947,283	7,947,283	7,947,283	69,100
	Newton, Utah	736,000	660,015	736,000	[1] 2,225
C	North Platte, Nebr-Wyo.	20,584,174	20,584,174	18,309,402	375,500
	Ogden River, Utah	4,833,059	4,431,601	4,833,059	[1] 21,000
C	Okanogan, Wash.	1,456,866	1,456,866	1,456,866	5,300
C	Orland, Calif.	2,556,296	2,556,296	2,556,296	19,800
	Owyhee, Oreg-Idaho	18,824,077	18,747,759	18,824,077	103,000
	Palisades, Idaho	57,398,500	1,782,291	30,232,200	650,000
	Paonia, Colo.	3,030,000	476,680	2,920,000	[1] 14,800
	Parker Dam Power, Ariz.	23,529,019	23,186,778		
	Pine River, Colo.	3,441,201	3,383,068	1,641,201	[1] 35,900
	Preston Bench, Idaho	453,000	187,454	453,000	[1] 4,000
	Provo River, Utah	29,348,000	16,588,280	17,784,071	[1] 56,200
	Rapid Valley, S. Dak.	1,010,880	920,874	1,010,880	[1] 6,000
	Rathdrum Prairie-Hayden Lake, Idaho	117,600	42,572	117,600	1,100
C	Rathdrum Prairie-Post Falls, Idaho	363,951	363,951	363,951	[1] 3,100
	Rio Grande, N. Mex-Tex.	25,698,044	23,227,564	13,934,904	173,326
	Riverton, Wyo.	19,760,801	12,507,843	19,099,524	96,000
C	Salt River, Ariz.	22,607,408	22,607,408	18,852,655	[1] 380,000
	San Luis Valley, Colo.	45,146,000	940,400	45,146,000	[1] 556,100
C	Sanpete, Utah	374,540	374,540	374,540	[1] 12,700
	Santa Barbara County, Calif.	34,189,000	225,408	20,752,723	[1] 29,700
	Scofield, Utah	946,000	929,026	946,000	[1] 15,600
	Shoshone, Wyo.	23,401,180	18,957,707	18,004,191	[1] 149,148
	Solano County, Calif.	45,577,000		38,599,000	187,500

See footnote at end of table.

Bureau of Reclamation—Projects completed, under construction, or authorized (programs and finance program coordination, May 26, 1949)—Continued

C=completed	Project and State	Total estimated cost	Costs to date (3-31-49)	Cost allocated to irrigation	Area to be irrigated (acres)
C	Strawberry Valley, Utah	$3,519,935	$3,519,935	$3,519,935	47,100
	Sun River, Mont	10,333,707	10,077,595	10,333,707	97,000
C	Truckee River storage, Nev	1,103,255	1,103,255	1,103,255	[1] 28,800
	Tucumcari, N. Mex	16,730,000	14,216,147	16,730,000	44,700
C	Umatilla, Oreg	5,240,292	5,240,292	5,240,292	[1] 33,600
C	Uncompahgre, Colo	10,467,068	10,467,068	10,467,068	[1] 98,000
C	Vale, Oreg	4,920,189	4,920,189	4,920,189	32,000
	Valley gravity canal and storage, Texas	129,828,000	1,385,979	127,268,000	[1] 700,000
C	Weber River, Utah (Salt Lake Basin)	2,725,885	2,725,885	2,725,885	[1] 91,700
	Yakima-Kennewick, Wash	10,736,000		10,736,000	[1] 21,000
	Yakima-Roza, Wash	22,662,000	19,279,187	22,662,000	72,000
	Yakima (all other), Wash	24,177,440	24,177,440	24,177,440	[1] 390,000
C	Yuma, Ariz	11,191,051	11,191,051	11,191,051	68,900
	Total	5,624,196,852	1,455,035,523	3,744,412,283	[1] 16,948,772

[1] Includes supplemental irrigation.

24. Question. What are the maximum static pumping lifts and plant capacities for irrigation water supply on existing and authorized reclamation projects and on any potential reclamation projects reported upon or definitely planned and proposed?

Answer. The above information was submitted for the record in response to a request by Senator Downey. It was inserted on page 1771 of the transcript.

Interim report—Supporting data—Central Arizona project—Results of analysis of water samples

WELL 9W., 1¼N.—BUCKEYE NO. 5

[Source: SRVWUA]

Sample location	Date of sample	T. D. S., parts per million	Parts per million							
			Cations			Anions				
			Ca	Mg	Na	CO_3	HCO_3	SC_4	Cl	NO_3
	1930	1,000	90	30	------	------	312	240	308	------
	Jan. 23, 1936	1,026	120	26	176	------	220	200	284	------
	March 1938	1,750	------	------	------	------	------	------	------	------
	Sept. 20, 1938	1,715	158	49	346	------	332	280	550	------
	June 1939	2,318	------	------	------	------	------	------	------	------
	August 1939	2,378	------	------	------	------	------	------	------	------
	August 1941	2,091	173	53	452	------	273	560	580	------
	July 1942	2,337	210	60	491	------	268	630	678	------
	November 1942	2,674	150	83	670	------	117	730	912	------
	July 1943	2,622	210	79	556	------	320	658	752	47
	Oct. 7, 1944	2,819	120	158	601	------	342	780	818	------
	Oct. 11, 1944	2,742	150	135	569	------	342	720	826	------
B2114	------	2,756	225	90	574	------	305	760	802	------
B1664	1944	2,602	240	98	492	------	266	760	476	------
	March 1945	2,701	240	75	559	------	315	740	772	------
	June 1946	2,738	195	68	648	------	210	720	860	37
	Apr. 18, 1946	2,978	240	90	632	------	354	810	852	------
	Apr. 25, 1946	2,640	203	86	575	------	242	700	834	------

Interim report—Supporting data—Central Arizona project—Results of analysis of water samples—Continued

BUCKEYE NO. 7

Sample location	Date of sample	T. D. S., parts per million	Parts per million							
			Cations			Anions				
			Ca	Mg	Na	CO_3	HCO_3	SC_4	Cl	NO_3
	1936	1,631								
	September 1938	1,967	143	34	476		300	420	594	
	November 1938	2,754	165	53	693		417	620	806	
	April 1939	2,534	195	15	644		322	540	810	
	June 1939	2,751								
	August 1939	2,683								
	July 1942	2,621	195	68	613		293	540	912	
	November 1942	3,268	255	83	792		312	400	1,426	
	July 1943	2,831	250	100	573		261	687	930	30
B1665	1944	2,687	220	98	500		259	700	860	
B2116		2,980	270	120	572		264	780	974	
	Mar. 21, 1945	3,105	315	68	648		254	840	980	
	Apr. 18, 1946	3,160	345	98	593		244	840	1,040	
	Apr. 25, 1946	3,440	293	105	761		163	860	1,258	
	June 1946	3,437	345	113	660		281	920	1,092	

BUCKEYE NO. 8

	July 1938	2,266								
	Sept. 20, 1938	2,536	143	60	640		251	620	822	
	April 1939	2,661	225	30	651		227	680	848	
	June 1939	2,544								
	August 1939	2,946								
	July 1942	3,077	240	90	862		351	710	1,004	
	November 1942	2,938	270	90	620		246	640	1,070	
B1666	1943	3,152	240	128	651		273	860	1,000	
	July 1943	3,172	268	106	655		285	764	1,020	74
B2117	1944	2,666	270	120	635		273	870	998	
	Oct. 7, 1944	3,139	195	158	649		271	860	1,006	
	Mar. 21, 1945	3,189	300	90	657		268	880	994	
	Apr. 18, 1946	3,286	285	98	697		266	910	1,030	
	Apr. 26, 1946	3,143	255	101	649		204	900	1,034	
	June 1946	3,410	270	120	723		234	960	1,072	31

BUCKEYE NO. 10

	July 1938	2,119								
	Sept. 20, 1938	2,545	218	56	573		290	580	828	
	November 1938	2,712	203	53	651		303	660	842	
	April 1939	2,492	210	60	557		259	580	824	
	June 1939	2,664								
	August 1939	2,847								
	July 1942	3,142	270	90	688		254	740	1,100	
	November 1942	3,454	285	90	791		242	800	1,246	
	July 1943	3,728	300	122	805		215	888	1,280	118
B1668	1944	3,767	390	128	725		244	960	1,320	
B2119		4,041	360	135	839		215	1,060	1,432	
	Oct. 7, 1944	4,172	405	158	814		207	1,100	1,488	
	Mar. 21, 1945	5,039	405	143	1,622		183	1,160	1,514	
	Apr. 18, 1946	4,904	450	158	1,037		181	1,300	1,778	
	Apr. 25, 1946	4,816	450	180	974		156	1,280	1,776	
	June 1946	5,044	435	173	1,079		178	1,300	1,838	41

[Source: Roosevelt Irrigation District]

WELL—15W., 1N.

	Sept. 5, 1929	827	86	42	125		171	123	275	5
	December 1930	1,220	90	86	222		156	320	424	
	July 1934	1,988	195	90	377		154	300	872	
	Aug. 8, 1935	2,393	225	118	442		146	447	1,004	11
	Summer 1938	2,772	233	79	631		154	560	1,084	31
	December 1940	2,791	225	105	608	2	100	660	1,080	11
	September 1943	4,262	345	135	939		163	1,180	1,500	

Interim report—Supporting data—Central Arizona project—Results of analysis of water samples—Continued

WELL—16W., 1N.

Sample location	Date of sample	T. D. S., parts per million	Parts per million							
			Cations			Anions				
			Ca	Mg	Na	CO_3	HCO_3	SC_4	Cl	NO_3
	Sept. 5, 1929	1,445	127	59	264	------	165	337	403	50
	December 1930	1,575	348	79	348	------	193	450	500	------
	July 1934	1,736	370	64	370	------	159	500	516	------
	Summer 1938	2,780	210	71	663	------	149	640	1,016	31
	December 1940	4,570	420	173	937	2	144	1,120	1,756	18
	July 1943	5,183	645	225	814	------	159	1,500	1,840	------
WELL—16½W., 1N.										
	Summer 1938	1,725	120	56	393	0	161	380	588	27
	December 1940	3,460	278	109	790	10	117	860	1,278	18
	September 1943	4,941	465	210	962	0	178	1,240	1,886	------
WELL—16 W., 1½ N.										
	Summer 1938	2,832	218	120	609	0	163	550	1,150	22
	December 1940	3,950	390	188	709	0	181	1,000	1,468	14
	September 1943	6,550	570	255	1,351	0	224	1,760	2,390	------
WELL—18 W., ¾ N.										
	December 1930	1,322	68	19	363	------	159	520	328	35
	July 1934	2,235	180	49	501	------	161	800	544	------
	Aug. 8, 1935	1,406	129	66	243	------	134	401	406	27
	Summer 1938	2,349	150	64	555	------	173	670	666	71
	December 1940	3,128	173	83	782	10	151	1,040	866	23
	September 1943	3,063	195	105	703	------	190	960	910	------
WELL—19½ W., ½ N.										
	Sept. 5, 1929	1,228	63	22	305	------	207	372	236	3
	December 1930	1,774	113	68	400	------	200	750	336	70
	July 1934	2,822	120	71	719	------	178	1,200	534	------
	Aug. 8, 1935	2,390	105	41	644	------	171	792	584	53
	September 1943	3,754	465	180	931	------	146	1,320	712	------
	March 1945	6,231	495	195	1,385	------	156	2,000	2,000	------
WELL—20½W., 0 N										
	Sept. 5, 1929	1,292	80	19	310	------	207	449	222	5
	December 1930	2,005	90	19	575	------	190	800	306	30
	July 1934	1,670	105	22	432	------	161	500	450	------
	Aug. 8, 1935	1,745	129	18	445	------	134	458	534	27
	Summer 1938	2,442	188	19	632	------	137	660	762	44
	December 1940	2,736	315	41	565	------	134	780	876	25
WELL—21½W., ¼ S										
	Sept. 5, 1929	1,686	102	18	439	------	207	457	433	30
	December 1930	2,094	83	8	642	------	209	800	422	------
	Aug. 8, 1935	2,889	218	30	769	------	122	531	1,166	53
	Summer 1938	2,847	188	26	785	------	124	650	1,034	40
	December 1940	3,692	473	53	83	------	98	1,160	1,780	45
	September 1943	5,279	645	90	1,031	------	115	1,840	1,558	------

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington 25, D. C., June 6, 1949.

Hon. JOSEPH C. O'MAHONEY,
United States Senate.

MY DEAR SENATOR O'MAHONEY: Enclosed is a memorandum prepared by the Geological Survey in response to your request of May 6, 1949, concerning the underground water supply of Arizona. The memorandum indicates the nature, extent, and general scope of the Survey's investigations of the ground-water supply and lists the published reports that resulted from the investigations.

I shall be glad to furnish any additional information that you may require.

Sincerely yours,

MASTIN G. WHITE,
Acting Assistant Secretary of the Interior.

THE GROUND-WATER SUPPLY OF CENTRAL ARIZONA

STATUS OF INVESTIGATIONS AND AVAILABLE DATA

The need for the investigation of ground-water resources of the central Arizona area was appreciated as long ago as 1903, as evidence by the reconnaissance investigation of the availability of ground water for irrigation use in the Salt and Gila River Valleys made by W. T. Lee.[1] [2] O. E. Meinzer[3] made a similar reconnaissance investigation in the Paradise Valley portion of the area in 1915. During the period of World War I, C. P. Ross[4] and Kirk Bryan[5] mapped the routes to desert watering places in central and southwestern Arizona to help the prospectors and others trying to develop the natural resources.

Investigations of the ground-water resources by the Geological Survey in cooperation with the State of Arizona were started in the fall of 1939. The Corps of Engineers, United States Army, also cooperated and furnished part of the funds used for several years. This work consisted of reconnaissance investigations of the ground water in the Gila and Salt River Basins, with special reference to the effects that flood-control structures might have on the ground water. Babcock and Cashing[6] measured the losses both from floods and from clear, low-water flows in Queen Creek, and determined the resulting recharge to the ground-water body. Based on these measurements, the Army engineers designed the gate opening in their proposed flood-control dam to allow a maximum discharge not to exceed the amount of water that could be recharged through the creek bed downstream from the dam. The investigation indicated that, if properly designed, the flood-control dam would not only eliminate flood damage but would double the replenishment of the ground water in the Queen Creek area. Turner[7] and others made a somewhat detailed but not comprehensive investigation of the ground-water resources of the Santa Cruz River Basin. Their report, published in 1943, included estimates of the annual yield of the various subdivisions of the basin.

The Verde River Valley, above its junction with the Salt River, was next investigated in similar manner. This work was carried on in cooperation with the city of Phoenix and the State of Arizona. The recharge from the Verde River, under various conditions of silting, and the yield to city-supply pumps were determined by McDonald[8] [9] [10] and others; the results were published in 1945 and 1946.

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[1] Lee, W. T., The underground water of Gila Valley, Ariz., U. S. Geol. Surv. W.-S. Paper 104, 1904.

[2] ——, Underground waters of Salt River Valley, Ariz., U. S. Geol. Surv. W.-S. Paper 136, 1905.

[3] Meinzer, O. E., and Ellis, A. J., Ground Water in Paradise Valley, Ariz., U. S. Geol. Surv. W.-S. Paper 375 (b), 1915.

[4] Ross, C. P., Routes to desert watering places in the lower Gila region, Arizona, U. S. Geol. Surv., W.-S. Paper 490 (c), 1922.

[5] Bryan, Kirk, Routes to desert watering places in the Papago country, Arizona, U. S. Geol. Surv. W.-S. Paper 490 (d), 1922.

[6] Babcock, H. M., and Cushing, E. M., Recharge to ground water from floods in a typical desert wash, Pinal County, Ariz., Am. Geophy., Union Trans., 1942, pp. 49–56.

[7] Turner, S. F., and others, ground-water resources of the Santa Cruz Basin, Ariz., mimeographed, 1943. Most important reports with special reference to the central Arizona area.

[8] McDonald, H. R., and Padgett, H. D., Geology and ground-water resources of the Verde River Valley near Fort McDowell, Ariz., mimeographed, 1945.

[9] McDonald H. R., and Bluhm, F. I., Further investigations of the ground-water resources of the Verde River Valley, near Fort McDowell, Ariz., mimeographed, 1946.

[10] ——, Wolcott, H. N., and Bluhm, F. I., Geophysical investigation of possible aquifers in the vicinity of Williams and Moore Ranches, Verde River Valley, Ariz., mimeographed, 1947.

In 1945 the Bureau of Reclamation requested that the Survey make an immediate estimate of the safe annual yield of the ground-water reservoirs in the central Arizona area. Data on hand were not sufficient, nor were time and funds available to make a reliable determination. Nonetheless, using all available information, Turner,[11] McDonald, and Cushman prepared a report (1945) and therein stated the limitations of the estimate given, and listed not only the items that were not included in the estimate but detailed the data and work necessary to make a reliable determination of the annual safe yield.

In 1945 the State legislature requested that the survey furnish brief reconnaissance reports on each of the major ground-water basins in the State as a basis for the formulation of a ground-water conservation law. These reports were for the purpose of determining the approximate boundaries of the basins, describing the ground-water resources and problems of each, and outlining the additional work necessary to obtain the safe yield of the several basins. Reports of this type, prepared by Turner,[12] McDonald,[13], [14] Babcock,[15] and others, were released in 1947 and 1948.

The Governor called the legislature into special session early in 1948 and furnished summaries of the reports to the members. S. E. Turner, United States Geological Survey district engineer, in charge of the ground-water investigations in Arizona, cooperated with the legislative committees in furnishing information on the ground-water resources and water-supply problems of the State pertinent to the formulation of sound legislation. At the end of the third special session—called for that sole purpose—a law was enacted. This law states that after a detailed study has been made of a ground-water basin or subdivision thereof, and the boundaries, irrigated area, well locations and discharges, declines in ground-water levels, and other pertinent data are determined, public hearings shall be held by the State land commissioner. If the ground-water supply is determined to be critical, the area shall be placed under State control and no further development allowed. The law recommended that the facts regarding the possible overdevelopment be determined by the Geological Survey. Detailed investigations of this type have been completed in both the Eloy subdivision of the Santa Cruz Basin and the Deer Valley subdivision of the Salt River Basin. The Eloy area already has been placed under control. A report on the Deer Valley area by Bluhm and Wolcott[16] is now in review for publication. Detailed field work is under way in the Queen Creek subdivision of the Salt River Valley and the Florence-Coolidge-Casa Grande subdivision of the Gila River Basin.

The ground waters of the State are intimately related to the surface waters, which, in some areas, seep into the ground to recharge the aquifers, and in other areas are fed by seepage or spring flow from the ground water. Information on the surface waters (chiefly stage and flow records) has been obtained and published by the Geological Survey in its regular series of Water-supply Papers beginning in 1899; 50 such reports are listed in Water-Supply Paper 1059 (1948). Monthly summaries of all available records of flow in the tributaries to the Colorado River below Lees Ferry, Ariz., up to September 1938, are published in Water-Supply Paper 1049 (1947). In addition, water levels in key observation wells and the amount of ground water pumped have been determined annually since 1940. This information likewise has been published in the Geological Survey's series of annual water-level papers. Five such reports have been published and four more are prepared, awaiting publication. These, together with information on other publications dealing with the geology and ground water of Arizona, are listed in Water-Supply Paper 992 (1947).

To date, considerable investigation has been conducted and a substantial amount of information is available regarding the central Arizona area. The boundaries of the principal ground-water basins have been mapped by reconnais-

[11] Turner, S. F., McDonald, H. R., and Cushman, R. L., Safe yield of the ground-water reservoirs in the drainage basins of the Gila and Salt Rivers, near Phoenix, Ariz., mimeographed 1945. Most important reports with special reference to the central Arizona area.

[12] Turner, S. F., and others, Further investigations of the Ground-water resources of the Santa Cruz Basin, Ariz., mimeographed, 1947. Most important reports with special reference to the central Arizona area.

[13] ——, and others, Geology and ground-water resources of Paradise Valley, Maricopa County, Ariz., mimeographed, 1947.

[14] ——, Wolcott, H. N., and Hem, J. D., Geology and ground-water resources of the Salt River Valley area, mimeographed, 1947. Most important reports with special reference to the central Arizona area.

[15] Babcock, H. M., Kendall, K. K., and Hem, J. D., Geology and ground-water resources of the Gila Bend Basin, Maricopa County, Ariz., mimeographed, 1948.

[16] Bluhm, F. I., and Wolcott, H. N., Ground-water resources of Deer Valley, Maricopa County, Ariz., ms. in review prior to publication, 1949.

sance methods, with detailed mapping only in local areas; data on the location, depth, discharge, and other pertinent facts regarding each irrigation well have been obtained; water samples from typical wells have been analyzed; some data, far from adequate, have been gathered on ground-water recharge; and areas of useless vegetation along river bottoms, together with the amount of water wasted by this nonbeneficial growth, have been very roughtly estimated. The hydrologic data gathered heretofore have been adequate for the needs at the time the investigations were made but are far from adequate to provide answers for the solution of the problems raised by the water shortage now existing in central Arizona.

DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
Washington 25, D. C., June 9, 1949.

Hon. SHERIDAN DOWNEY,
United States Senate.

MY DEAR SENATOR DOWNEY: In further reply to your letter of May 2 requesting that the Geological Survey furnish you a statement containing recommendations and estimates of costs for a comprehensive hydrologic investigation and report covering the central Arizona area, comprising the Salt, Verde, and Gila Rivers and their tributaries:

The enclosed statement describes briefly the water problems of the area, discusses the information available and information needed, and gives a detailed description of the work necessary, together with the time needed and estimated cost of a comprehensive water investigation. The statement was prepared after discussion with the Arizona officials who cooperate with the Survey in water investigations.

This Survey will be pleased to furnish any additional information you may need.

Sincerely yours,

W. E. WRATHER, *Director.*

HYDROLOGIC INVESTIGATION OF CENTRAL ARIZONA AREA

INTRODUCTION

The general drought conditions that have prevailed during the last several years in Arizona have focused attention on the water problems of the central Arizona area. The following memorandum contains a brief history of the development of the problems, discusses the information available and the information needed, and suggests an outline of comprehensive and intensive water investigation needed for the maximum utilization of the available water supplies in the area.

WATER PROBLEMS

Farming has become one of the most important factors in the economy of Arizona. The area of greatest farm development lies in Maricopa and Pinal Counties, in central Arizona, where precipitation is inadequate and all crops require irrigation. These two counties now have 75 percent of the total cultivated acreage in the State.

The first lands cultivated in this area were adjacent to the Salt, Gila, San Pedro, and Santa Cruz Rivers. In the late 1870's diversion dams were built on these rivers to supply surface water for irrigation. This supply, however, was undependable because there was no provision for flood-water storage to use during periods of low flow. In spite of the periodic shortages of water, the cultivated acreage was increased until the demand for water in dry years greatly exceeded the normal stream flow. This led to the organization of irrigation districts and the construction of storage dams on the major streams; for a time there was sufficient surface water to meet the demand.

As ground-water supplies were developed to supplement the surface-water supply and the cultivated areas were expanded further, large acreages depending entirely on pumped ground water were developed outside of the organized irrigation districts. By 1945 the total annual amount of irrigation water used in Arizona was about 4,000,000 acre-feet, of which more than 50 percent was pumped from ground-water reservoirs, and by 1948 water pumpage from underground sources accounted for about 75 percent of the total use. About 80 percent

of the present ground-water pumpage in the entire State occurs in Maricopa and Pinal Counties.

Pumping is drawing upon the ground-water supply of central Arizona in an amount exceeding the natural recharge. This is indicated by the continued decline of ground-water levels amounting to an average of 8 feet in the pumped area during 1948. In certain local areas, such as the Deer Valley area, which depends entirely on pumped water, the average decline of water levels was as great as 21 feet during 1948, and a maximum decline of over 100 feet since 1941. At the present rate of depletion, it is merely a matter of time before pumping costs become prohibitive or the wells go dry. In order to maintain a perennial water supply there must be no long-term overdraft on the ground-water reservoirs. Temporarily, however, in times of drought, the amount pumped could exceed the annual safe yield, provided the overdraft is made up in wet years.

Information Available

The Geological Survey has made several reconnissance investigations in the central Arizona area, but there has been no opportunity to make an intensive and comprehensive water investigation. However, during the course of those reconnissance investigations, a substantial amount of surface and ground-water information has been made available. The boundaries of the principal ground-water basins generally have been mapped by reconnaissance methods, but in only a few areas was detailed mapping done; data on the location, depth, discharge, and other pertinent facts regarding irrigation wells have been obtained; water samples from typical wells have been chemically analyzed; some data, far from adequate, have been gathered on ground-water recharge; and some areas of useless vegetation along river bottoms, together with the amounts of water wasted by this nonbeneficial growth, have been roughly determined. The hydrologic data gathered heretofore have been adequate for the need at the time the investigations were made but are far from adequate to provide answers for the solution of the problem raised by the water shortage now existing in central Arizona. The titles of the published reports are given in an attached list.

Information Needed

The chief objective of an intensive and comprehensive water-resources investigation would be the accurate determination of the safe annual yield of the water-bearing formations (aquifers) of the area. This determination, however, is no simple matter, for the safe yield is subject to change, depending upon a number of variable factors. It would be necessary to examine each and all of these variables, weigh them objectively and quantitatively, and determine therefrom how to derive the maximum utility of the aquifers.

The salt-content variable is an example of these factors that bear upon safe annual yield in central Arizona. Under existing conditions it is essential that a large amount of water be allowed to flow unused out of the aquifers in order to maintain the salinity of the ground water below concentrations harmful to irrigated plants. Cutting off this wasted outflow would cause a rise in the salinity of the water that would ultimately ruin the aquifer for irrigation purposes. But, if the salt content of the water flowing into the area of use were reduced prior to entering the area (and it now appears that this may be entirely feasible and practicable in some instances), the safe yield might be greatly increased.

So, too, might such practices as recharging the aquifer by waterspreading of flood flows, removal of nonbeneficial vegetation from along stream courses, and proper spacing of supply wells (based upon quantitive ground-water studies) increase the safe yield. There are other factors, such as periodic variations in the amount of water available for natural recharge to the aquifers based on changes in stream run-off, but these will serve as examples.

A comprehensive investigation of all the pertinent hydrologic factors involved in the problems of the central Arizona water-development project would require at least 3 years of intensive, detailed study followed by a smaller but continuing program of observation. The initial 3-year program would establish, define, and delimit all the constants and would indicate the variables which would be the concern of the continuing program. It is estimated that the costs of the 3-year initial investigation, together with publication of a comprehensive report, would amount to approximately $627,000, and the continuing program would cost $54,000 annually. The work program and cost break-down follow:

Work Program

The work involved in a comprehensive and intensive investigation of the water resources of the central Arizona area would include studies under the following major headings:

(1) Surface-water flow and ground-water underflow into the area.
(2) Precipitation.
(3) Evaporation and transpiration.
(4) Surface-water flow and ground-water underflow out of the area.
(5) Storage changes in ground water and surface water bodies.
(6) Quality of water of the ground water and surface water.

Means of accomplishing the work outlined above are discussed in detailed sections below.

OBSERVATION WELLS AND PUMPAGE MEASUREMENT

As a part of the State cooperative program, the United States Geological Survey is now engaged in a study of water levels, pumpage, and related hydrologic data over most of the State. In certain localized areas, such as Eloy, Deer Valley, Queen Creek, and the Florence-Coolidge-Casa Grande area (see pl. 1), short-term intensive studies have been and are being made. Of these, all except the Eloy area are within the boundaries of the central Arizona area, and the Eloy area borders on it. This work should continue but must be greatly expanded to fulfill the requirements of a comprehensive and intensive investigation.

LEVELING TO OBSERVATION WELLS AND PREPARATION OF WATER-TABLE MAPS

Basic to any adequate ground-water study is the preparation of water-table maps. Such maps show not only the height and configuration of the water table for a given time, but also indicate directions of ground-water flow and thus delineate areas of inflow to and outflow from the aquifers. They also serve to indicate—when two or more such maps for different times are compared—changes in storage, such as the amount of unwatering an aquifer suffers during a dry period when heavy pumping is done.

In order to convert water levels to a common datum plane for the preparation of water-table maps, it is necessary that the altitude of measuring points at all observation wells be established. Considerable leveling has already been done as a part of the State cooperative project but a large amount of additional leveling is needed. This leveling and preparation of detailed maps should be a part of the Federal project.

STUDIES OF EVAPO-TRANSPIRATION LOSSES CAUSED BY NONBENEFICIAL VEGETATION

The largest single loss of water in the entire area is that caused by the growth of nonbeneficial vegetation along the stream courses. The areas where these losses are extremely heavy are indicated on the map (pl. 1). Rough estimates, based on data gathered during the course of the State cooperative project, indicate that the total amount of this evapo-transpiration is probably in the order of 300,000 to 400,000 acre-feet per year, although it may be as low as 200,000 or as high as 500,000.

Work needed to establish the amount of this loss of vitally needed water would require detailed maps of the area indicating vegetation types, area covered, and relative density of growth. Such mapping is best done on recent aerial photographs, some of which are on hand; the coverage is not complete, however, and therefore provision would have to be made for some additional aerial photography.

The amount of water used in central Arizona by various types of valley-bottom vegetation is not known, but may be determined by (1) establishment of a station where controlled experiments in common phreatophytes, such as salt cedar, mesquite, Baccharis, and salt bush, together with soil-tank studies, are made; (2) water-level studies in the field by use of transpiration wells; and (3) slope-seepage method, with studies made at numerous selected localities.

The United States Geologisal Survey has already made a study near Safford, Ariz., of the water requirements of phreatophytes. The results of this study have been used widely as a basis for computing evapo-transpiration losses in many other arid or semiarid localities by using weighted factors to account for differences in climate. However, no one knows whether or not the factors used are correct. Data obtained on the Safford project would be used in the present proposed study; but, inasmuch as the central Arizona area has a much

lower altitude and a hotter and drier climate, it is probable that evapo-transpiration rates would differ appreciably. In any case, the data obtained will be of prime value in the preparation of curves for use in transferring evapotranspiration losses from one geographic area to another. The work in central Arizona would supply at least one more point on such transferral curves.

Phreatophyte research should also include possible methods of eradicating nonbeneficial plants or replacing them with useful ones.

STUDIES OF CROP WATER USE

Crops use tremendous quantities of water, some more than others. As a parallel of the studies on nonuseful plants, and to obtain another vital factor in the total water-supply problem, studies should be made of the proportion of the water applied to the land used by various crops produced in the central Arizona area. These studies would be attacked by selecting areas where all the water from one well is utilized for one particular kind of crop. Careful measurements would then be made of the water pumped and power used during the season together with soil moisture studies in the irrigated field. Also, crop water use may be checked by selecting suitable fields irrigated by surface water. Inflow, outflow, and ground-water storage changes during the study would be the principal factors observed. Considerable mapping of crops would be required, part of which can be done from data obtainable from the United States Department of Agriculture, and the remaining information could probably be obtained through the State cooperative project.

SALT BALANCE BY INFLOW-OUTFLOW STUDIES

The amount of outflow required to flush out salty water and thereby maintain the salinity within the central Arizona area at a safe level has never been adequately determined. A considerable start has been made on this problem, and a large amount of data is in the files awaiting competent study and analysis.

The chief task in solving this salt-balance problem is the study and interpretation of existing data, but there would need to be some additional field work done. Under the plan herein proposed, the scope of the study would not be confined merely to the area within the boundaries of the central Arizona area but would of necessity include investigations of salt-water sources in the upper drainage basins of the three contributing rivers (Salt, Gila, and Verde), and downstream studies in the Gila Valley below Gillespie Dam. Such studies would not only determine the salt input and output of the central Arizona area but would investigate the practicability of keeping out a significant part of the salt water and of aiding in the maintaining of lower salinity in ground water of the pumped areas. For the purpose of quality of water investigations connected with this and other phases of the central Arizona project, a field laboratory would be established. In connection with the inflow-outflow studies, a minimum of 10 field sampling stations for inflowing water and 1 for outflowing water would be established and maintained.

QUANTITATIVE GROUND-WATER STUDIES

There has been a large amount of unwatering of the aquifers in the central Arizona area, and it is essential to learn how much water was delivered in the process. This may be accomplished by comparison of original and present waters levels, and by determining the hydrologic characteristics of the materials involved—specific yield, specific retention, and coefficients of permeability, transmissibility, and storage.

Techniques involved would be standard United States Geological Survey field and laboratory procedures, consisting of test-well drilling, sampling, running of pumping tests, permeameter tests, tank tests on earth materials at the experiment station (to be established) and any or all other methods that appear to be practicable.

STUDIES OF UNMEASURED SURFACE FLOW INTO THE CENTRAL ARIZONA AREA

There is at present considerable unmeasured surface-water flow into the area, especially the flash floods from the washes that ordinarily are dry. Such floods contribute unknown but significant quantities of water. Under the present proposed program, these flows would be gaged. Such additional work would require the establishment and maintenance of five new gaging stations, repairs

and renovations to several existing ones, and preparations, including some minor construction, for occasional measurements on six washes. The number of discharge measurements would be greatly increased over those now made.

UNDERFLOW INTO THE CENTRAL ARIZONA AREA

Although it is believed that ground-water underflow into the central Arizona area is not a large factor, it must be determined. The most critical point is at the Ashurst-Hayden Dam on the Gila River; other sections, for example, are New River at the gaging station, and Centennial Wash. At each of these sites, some or all of the following general work would be required:

1. Drill an exploratory test well to granite (bedrock) and install drive-point observation wells.
2. Make laboratory tests on samples from the test well.
3. Run pumping tests on the test well to establish needed hydrologic constants such as the coefficients of transmissibility, permeability, and storage.
4. Make an electrical-resistivity survey of the cross section of valley fill.

UNDERFLOW OUT OF THE CENTRAL ARIZONA AREA

All underflow leaving the central Arizona area passes near Gillespie Dam and the volume of this outflow may be much larger than it is generally believed to be. The dam rests on lava interbedded with Recent and Pleistocene fill which may be fairly extensive. The program of investigation at and below Gillespie Dam would be similar to that for the stations mentioned above.

RECHARGE AND INFILTRATION TESTS

Considerable work relating to recharge of ground-water aquifers by infiltration of stream waters has already been done by the various irrigation districts, but the results need checking and analysis; also, the new scattered data should be brought into a central file for permanent keeping. Some additional field work needs to be done. Data on infiltration of rainfall also need to be carefully gathered and interpreted. Previous work in the desert areas has shown that there is practically no direct recharge to the water table from rainfall; however, there may be considerable infiltration on irrigated lands and along or adjacent to stream courses. Also ,the amount of infiltration resulting from irrigation needs to be studied. Data on infiltration would be obtained by the operation of small, temporary gaging stations on canals and by seepage studies at critical points during selected periods.

EVAPORATION STUDIES

The United States Weather Bureau maintains stations at Phoenix and Mesa, where evaporation data are gathered. For the purposes of this water-supply problem more data would be required, and it is proposed to install two permanent stations, one near Buckeye (where the experiment station would be located) and the other at Coolidge; in addition, there would be several movable evaporation stations.

RAINFALL STUDIES

There are a considerable number of rain gages near Phoenix and Mesa, as shown on plate 1*; however, there are large areas where precipitation is wholly unmeasured. Ten to fifteen additional gages, installed in cooperation with the United States Weather Bureau or as part of this project, would probably adequately satisfy this need.

STUDIES OF DEPTH, THICKNESS, AND EXTENT OF AQUIFERS

At present the aquifers of the central Arizona area are not adequately known or mapped. As a means of overcoming this lack, a careful study of the basin should be undertaken and the geologic factors correlated with the hydrologic factors. This would require test-well drilling, field and laboratory study of the materials and data collected, and electric logging and electrical-resistivity surveys. Pumping tests (for gathering hydrologic data) would be run; most of these tests could be made on existing wells but some would be made on new wells. Out of this geologic study would come knowledge of the geologic history of the basin—when and how it was formed. This would be of great importance in arriving at an over-all understanding of the occurrence and movement of ground water in the area.

*Pl. 1 not reproducible. Colored map and legend on file with committee.

STUDY OF SOURCES OF SALT WATER

Published maps of the quality of ground water in the United States Geological Survey basin reports on the Santa Cruz River and Salt River near Phoenix show local areas of mineralized ground water. These areas have not been adequately studied. It is proposed to determine, if possible, the sources of these bodies of salt water by means of both field and laboratory techniques.

In addition to these local salt-water areas, study must be made of sources of saline waters in the headwater basins of the Verde, Salt, and Gila Rivers. This will be discussed below in sections dealing with the over-all investigation of these upper-basin areas.

WELL-SPACING STUDIES

Proper spacing of wells can do much to alleviate trouble caused by haphazard drilling. On the one hand, wells spaced too widely apart may allow ground water to escape unused past the well system—a practice in which the central Arizona area cannot afford to engage, for every drop of water must be utilized—and, on the other hand, wells too closely spaced cause excessive draw-down with subsequent increased costs of pumping and reduced efficiency of the wells.

Proper spacing depends upon a knowledge of the dimensions and hydrologic characteristics of the aquifer, and the needs of the users. Pumping tests, properly interpreted, will be basic to a determination of the answer to this problem.

INVESTIGATIONS IN THE UPPER BASINS

Plans are given below for water-resources investigations of the upper drainage areas of the Gila, Salt, and Verde Rivers, all of which have salt springs contributing to flow into the central Arizona area. If any significant part of this salt water could be prevented from entry into the central Arizona area a saving in water would result, for it would not then be necessary to allow as much waste outflow as now takes place in order to keep excess salt flushed out. This means that more water would be available for use in the central Arizona area.

Under present conditions precipitation is being measured at some places on each of the three upper river basins and run-off is being gaged on the rivers; however, ground-water levels are not being studied. This is a serious lack and should be corrected immediately. This would require a minimum of 18 pairs of observation wells and rain or snow gages that would be installed in the headwaters of each of the three rivers. Some of these wells could be paired with existing snow and rain gages, but in some cases it would be cheaper and better to install new precipitation stations near existing wells. In other cases it would be better to install new wells at strategic locations. Some of these wells can probably be read by employees of the National Forest Service and of the Bureau of Indian Affairs; other wells would be read by hired local observers. Cost estimates have been prepared on the basis that about 6 wells in each basin would have to be drilled; about six would be driven sand-point wells, and six would be existing wells. Also, it is estimated that about half the wells could be measured by Government employees at no extra cost other than furnishing steel tapes; the other wells would be read by paid observers. This water-level problem in the upper basins would not yield immediately helpful data but would eventually be of incalculable value in the long-range forecasting of water supply available for central Arizona.

UPPER GILA RIVER AREA

Salt-water studies

In the upper Gila River area there are two known areas of salt-water inflow:

1. Clifton Hot Spring, on the San Francisco River, near Clifton.
2. Seepage, on the Gila River, between Fort Thomas and Geronimo. There may be other seepage areas, and if so these should be located and evaluated. Clifton Hot Spring flows an estimated 1½ to 2½ second-feet and contributes approximately 60 tons of salt a day, or about 22,000 tons of salt per year.

Present information indicates that this salt water might be intercepted by a well drilled into the fault along which the spring rises, and the water pumped to evaporation areas on the nearby waste piles of the Morenci Copper Mill. One or more test wells would be drilled and a pumping test made at this location.

The salt-water inflow between Fort Thomas and Geronimo enters the Gila River chiefly as warm spring water rising along faults through the lake beds

in that area. Some additional salty water probably enters as return flow from irrigation in the middle portion of the Safford Valley. As with the Clifton salt water, so with the Fort Thomas-Geronimo—it is possible that it may be intercepted and evaporated. Sale of salt recovered from these operations might be of sufficient value to offset much of the cost of operating the interceptor works, for present wholesale value of salt at the factory is about $18 a ton. At this rate, recovery of a maximum of 60 tons a day would return $1,080 a day.

Rainfall-ground-water run-off relationship study

Eighteen pairs of rain and snow gages and observation wells will amply cover the needs of this area. As earlier mentioned, the wells will be spaced according to the local conditions.

Transit losses, Coolidge Dam—Ashurst-Hayden Dam

Flow records of the Gila River in the reach between Coolidge and Ashurst-Hayden Dams indicate large water losses. This is surprising, for the reach is through a high mountainous country where increased flow should normally be expected. General geologic knowledge of this area indicates that in this reach the river crosses both cavernous limestones and brecciated volcanics but it is not now known whether this unexpected water loss is caused by the geologic nature of the stream channel or is due to other causes, such as phreatophyte action. Therefore, detailed investigation of this area should be made. The first work would be the making of seepage runs on the stream to determine where the losses occur. Next, detailed geologic studies would be made to determine whether or not geologic factors are responsible for the losses. Phreatophytes and their local effect on the water would next be investigated. These studies would lead to the evaluation of possible remedial measures that might substantially reduce or even entirely eliminate the losses.

Phreatophyte study

The role of phreatophytes in the loss of water everywhere along the upper reaches of the Gila should be investigated. The phreatophyte growth should be mapped and an attempt be made to differentiate losses ascribed to phreatophytes from losses attributable to geologic factors.

UPPER SALT RIVER AREA

Salt-water studies

Reconnaissance studies by the Salt River Valley Water Users Association on the upper Salt River basin indicate that about 10 to 12 second-feet of warm saline inflow contributes about 60 or 70 percent of the salts that reach the central Arizona area in the Salt River. This salt probably comes from two sources: (1) so-called salt banks along the river below the Chrysotile gage; and (2) Carrizo Creek.

The exact source and amount of the salt-water inflow would be located by seepage runs correlated with chemical tests, made during periods of low stream flow. Detailed geologic studies would be made to locate the sources of saline water and to investigate the nature and extent of the so-called salt banks.

Rainfall-ground-water run-off studies

These studies would be quite similar to those described in the section on introduction to the upper basins (p. 15), but the studies here would be aided by the long periods of record on rainfall-run-off relationship obtained by the United States Forest Service at the Sierra Ancha experiment station above Roosevelt Reservoir.

Development of additional sources of water

Additional water supplies probably can be developed from ground-water sources in the upper Salt River area. This stream heads in the Mogollon Rim country, which is the highest plateau area in the State and receives a large amount of rain and snow. The surface of the plateau generally is composed of lava flows which are so broken and permeable that they absorb most of the rain and melted snow; surface streams, except those fed by springs, are rare. The lava overlies consolidated sedimentary beds of sandstone, limestone, and clay.

The Mogollon area has suffered extensive faulting, especially near the Rim, and the general dip of the sedimentary beds, together with the ground-water gradient, is to the northwest; thus most of the ground water moves in that direction is eventually discharged from relatively large springs in the valleys of the

Little Colorado and its tributaries. However, a part of the recharge on the highest parts of the Rim country is discharged through springs to the south and west of the Rim in the headwater areas of the Salt and Verde Rivers.

Reconnaissance studies will locate all spring sources of any consequence. Chemical analyses of the water of each spring and a brief geologic study of each source would indicate which areas deserve more detailed geologic and hydrologic study. Such studies would probe the possibility that considerable additional water might be developed by lowering the spring outlets, drilling deep wells, or digging long interceptor tunnels back under the Rim. Many of the springs are controlled by faults which may serve as conduits to bring water back to the south and west from under the Rim country.

Any development that would move the ground-water divide northeast of its present location would increase the amount of water flowing into the Salt River Basin and would be of considerable value. An acre-foot of water in the central Arizona area is worth several times as much as in the valley of the Little Colorado River.

Phreatophyte study

There are some phreatophyte areas on the Salt River above the central Arizona project. Probably the largest of these is located just above Granite Reef Dam. This area should be studied and mapped in order that the amount of water used may be computed.

UPPER VERDE RIVER AREA

Salt-water studies

On the upper Verde River there are two areas where hot and somewhat saline spring water is discharged into the river. These two sources should be investigated and the amount of salt they contribute measured.

Rainfall-ground-water run-off studies

The discussion on observation wells for long-range forecasting on the upper Verde would be similar to that on the Salt and on the Gila, with the exception that in this area the principal source of low flow on the upper Verde is from large springs in limestone. The effect of these is discussed below.

Study of developing additional water supplies

The problem of development of additional water on the upper Verde should be considered along with the problem of development of areas where water may be "borrowed" from large ground-water reservoirs when needed. This area contains five large springs that originate in cavernous limestone. These springs from south to north are: Natural Bridge, Fossil Creek, Montezuma's Well, Page Spring, and an unnamed spring on Spring Creek. Flow of these springs ranges from a low of 5 to a high of 25 second-feet. These springs derive their water from recharge back under the Mogollon Rim.

Because of the low hydraulic gradient that exists in most cavernous limestones, lowering the outlet of one of these springs several feet might move the ground-water divide several miles to the northeast under the Rim, and thus result in an increase of the permanent flow into the Verde River. It is also possible that deep wells drilled in favorable localities down into these cavernous limestones would also divert extra water from under the Rim country. Depending upon whether or not extra water is imported into central Arizona, this upstream water might be taken either on a permanent or a "borrowed" basis. That is, water could be borrowed from these limestone reservoirs during periods of drought, but during periods when there is plenty of water available from the Salt River system, the limestone reservoirs would not be drawn upon and would be naturally recharged. Methods of attack on the problem of obtaining additional water supply in the upper Verde basin would be approximately the same as those discussed above for the upper Salt River basin.

Phreatophyte study

There is a large phreatophyte area on the lower part of the Verde River between Bartlett Dam and the junction with the Salt River. The United States Geological Survey report of the study on the Verde River, made in cooperation with the city of Phoenix, estimated the amount of evapo-transpiration in this area as high as 12,000 to 20,000 acre-feet per year. This was a rough estimate and the area should be studied and mapped in detail.

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PERSONNEL REQUIREMENTS

Personnel required to do the necessary work during the initial 3-year period of intensive and comprehensive investigation recommended above are estimated to be as follows: 10 hydraulic engineers, 5 ground-water geologists, 4 chemists, 1 draftsman, 3 clerk-stenographers, and 3 laborers. The project would be directed by the present district engineer of the United States Geological Survey's Ground Water Branch. It is anticipated that during this 3-year period the present State cooperative project would continue about as it has in the past; it would be the duty of the district engineer to correlate the two programs.

After the comprehensive and intensive investigation is completed, the necessary continuing observational and investigative work would be prosecuted on a greatly reduced scale but would still be complementary and supplementary to the State cooperative program, which would then become the core of hydrologic investigations in Arizona. Personnel required for the continuing program are: Four hydraulic engineers, one ground-water geologist, one chemist, one clerk-stenographer, and one laborer.

COST OF INVESTIGATION

Total costs for the initial 3 years' work are estimated to be $602,000, of which $246,000 would be spent the first year and $178,000 during each of the succeeding years; it would require an additional $25,000 to prepare the publication after the end of this initial period. Continuing observational and investigative work encompassing stream gaging, ground-water gains and losses, and changes in the quality of water, together with preparation and publication of periodic progress reports, are estimated to cost $54,000 per year. This would presuppose continuation of the State cooperative funds about as now, for the additional continuing work envisioned is over and above the requirements of the existing investigations.

PERTINENT PUBLICATIONS OF THE GEOLOGICAL SURVEY

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(2) Lee, W. T., Underground waters of Salt River Valley, Arizona, United States Geological Water-Supply Paper 136, 1905.

(3) Meinzer, O. E., and Ellis, A. J., Ground water in Paradise Valley, Arizona, United States Geological Survey Water-Supply Paper 375 (b), 1915.

(4) Ross, C. P., Routes to desert watering places in the lower Gila region, Arizona, United States Geological Survey Water-Supply Paper 490 (c), 1922.

(5) Bryan, Kirk, Routes to desert watering places in the Papago country, Arizona, United States Geological Survey Water-Supply Paper 490 (d), 1922.

(6) Babcock, H. M., and Cushing, E. M., Recharge to ground water from floods in a typical desert wash, Pinal County, Arizona, American Geophysical Union Transactions, 1942, pages 49–56.

(7) Turner, S. F., and others, Ground-water resources of the Santa Cruz Basin, Arizona, mimeographed, 1943.[1]

(8) McDonald, H. R., and Padgett, H. D., Geology and ground-water resources of the Verde River Valley near Fort McDowell, Arizona, mimeographed, 1945.

(9) Turner, S. F., McDonald, H. R., and Cushman, R. L., Safe yield of the ground-water reservoirs in the drainage basins of the Gila and Salt Rivers, near Phoenix, Arizona, mimeographed, 1945.[1]

(10) McDonald, H. R., and Bluhm, F. I., Further investigations of the ground-water resources of the Verde River Valley, near Fort McDowell, Arizona, mimeographed, 1946.

(11) McDonald, H. R. Wolcott, H. N., and Bluhm, F. I., Geophysical investigation of possible aquifers in the vicinity of Williams and Moore Ranches, Verde River Valley, Arizona, mimeographed, 1947.

(12) McDonald, H. R., and others, Geology and ground-water resources of Paradise Valley, Maricopa County, Arizona, mimeographed, 1947.

(13) McDonald, H. R. Wolcott, H. N., and Hem, J. D., Geology and ground-water resources of the Salt River Valley area, Maricopa and Pinal Counties, Arizona, mimeographed, 1947.[1]

(14) Turner, S. F., and others, Further investigations of the ground-water resources of the Santa Cruz Basin, Arizona, mimeographed, 1947.[1]

[1] Most important reports with special reference to the central Arizona area.

(15) Babcock, H. M., Kendall, K. K., and Hem, J. D., Geology and ground-water resources of the Gila Bend Basin, Maricopa County, Arizona, mimeographed, 1948.
(16) Bluhm, F. I., and Wolcott, H. N., Ground-water resources of Deer Valley, Maricopa County, Arizona, manuscript in review prior to publication, 1949.

OPINION NO. M33473, OF THE SOLICITOR, DEPARTMENT OF THE INTERIOR

POWER RATE SCHEDULES FOR COLUMBIA BASIN (GRAND COULEE) PROJECT

September 29, 1944

COLUMBIA BASIN (GRAND COULEE) PROJECT—AUTHORIZATION—POWER DEVELOPMENT—ALLOCATIONS OF COST—RATE SCHEDULES

Allocations of cost of the Columbia Basin (Grand Coulee) project and the establishment of the rate schedule for the sale of power therefrom are governed by the provisions of section 9 of the Reclamation Project Act of 1939 (53 Stat. 1193), notwithstanding the broad power vested in the President "to make and enter into any and all necessary contracts" in connection with the project, by section 2 of the act of August 30, 1935 (49 Stat. 1039), since section 1 of the Columbia Basin Project Act, approved March 10, 1943 (Public Law 8, 78th Cong.), "authorized and reauthorized" the project as one "subject to the Reclamation Project Act of 1939."

COLUMBIA BASIN (GRAND COULEE) PROJECT—RATE SCHEDULES—MINIMUM REQUIREMENTS

The minimum legal requirements for the fixing of rate schedules for the sale of power may be met by the establishment of rate schedules which will return (1) the share of operation and maintenance expenses chargeable to power development, (2) interest at not less than 3 percent on the power construction costs, and (3) as "other fixed charges," an amount equal to any excess over total net power revenues which would otherwise exist in the construction costs allocated to power to be returned from power revenues.

COLUMBIA BASIN (GRAND COULEE) PROJECT—INTEREST REQUIREMENTS

Interest during construction need not be included as a part of the project cost and the interest component in the rate schedule need not be calculated from the time of actual expenditure in construction.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SOLICITOR,
Washington 25, D. C., September 29, 1944.

The honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: At the request of the Commissioner of the Bureau of Reclamation, in which the Acting Director of the Division of Power has concurred, you have referred to me for opinion certain questions concerning the legal requirements of the rate structure to be established for the sale of electric energy generated at the Columbia Basin (Grand Coulee) project and marketed by the Bonneville Power Administration pursuant to Executive Order No. 8526, dated August 26, 1940.[1] The following are the questions:

"I. (a) For the purposes of the cost allocations report on the Columbia Basin project, must the estimates of revenues to be allocated to the Columbia Basin (Grand Coulee) project for electric power generated at the project power plants and delivered to the Bonneville Power Administration to be marketed by Bonneville be sufficient to return to the United States interest at 3 percent per annum on some portion of the reimbursable costs of the project, in addition to returning that portion of the reimbursable costs properly chargeable to power and the other portions of the reimbursable costs that are to be met by power revenues, including that part of the irrigation cost not to be repaid by the project water users?

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[1] 5 F. R. 3390.

"I. (b) If the answer to question I (a) is 'No,' would estimates of revenues so to be allocated be legally adequate that were premised on the return of the reimbursable costs, as stated in question I (a) but with the interest component of revenues being used to assist in the retirement of that portion of the reimbursable costs which are not properly allocated to power but which are to be returned from power revenues?

"II. Does the law require, for the purposes of rate making as distinguished from application of revenues, that interest be calculated on the investment from the time of making the investment by actual expenditure in construction, or may it be calculated from a later date?"

It is my opinion that question I (a) must be answered in the negative and that the answer to question I (b) accordingly must be in the affirmative. As for question II, it is my opinion that the Secretary is not required to calculate interest on the investment from the time of actual expenditure in construction and that it therefore may be calculated from such subsequent point of time as may be most appropriate.

The Columbia Basin project, under the name "Grand Coulee Dam," was initiated as a Public Works Administration project and subsequently was ratified and adopted by section 2 of the Rivers and Harbors Act of August 30, 1935 (49 Stat. 1039; 33 U. S. C., sec. 540, note), which provided in part:

"That for the purpose of controlling floods, improving navigation, regulating the flow of the streams of the United States, providing for storage and for the delivery of the stored waters thereof, for the reclamation of public lands * * * and other beneficial uses, and for the generation of electric energy as a means of financially aiding and assisting such undertakings, the projects known as 'Parker Dam' on the Colorado River and 'Grand Coulee Dam' on the Columbia River, are hereby authorized and adopted, and all contracts and agreements which have been executed in connection therewith are hereby validated and ratified, and the President, acting through such agents as he may designate, is hereby authorized to construct, operate, and maintain dams, structures, canals, and incidental works necessary to such projects, and in connection therewith to make and enter into any and all necessary contracts including contracts amendatory of or supplemental to those hereby validated and ratified * * *." [Emphasis supplied.]

The Reclamation Project Act of 1939 (act of August 4, 1939, 53 Stat. 1187), certain provisions of which will be significant in the consideration of the questions herein presented for opinion, is the next enactment to be noted.[2]

Subsection 9 (a) of that act provides for the allocation of the estimated cost of any new project, new division, or supplemental works, to enumerated uses, including irrigation and power.[3] The second sentence of subsection 9 (c) provides:

"* * * Any sale of electric power or lease of power privileges, made by the Secretary in connection with the operation of any project or division of a project, shall be for such periods, not to exceed forty years, and at such rates as in his judgment will produce power revenues at least sufficient to cover an appropriate share of the annual operation and maintenance cost, interest on an appropriate share of the construction investment at not less than 3 per centum per annum, and such other fixed charges as the Secretary deems proper: * * *."

The question of the extent of the applicability of the 1939 act to the project first

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[2] The purpose of the act is set forth in sec. 1 (43 U. S. C., sec. 485): "That for the purpose of providing for United States reclamation projects a feasible and comprehensive plan for an economical and equitable treatment of repayment problems and for variable payments of construction charges which can be met regularly and fully from year to year during periods of decline in agricultural income and unsatisfactory conditions of agriculture as well as during periods of prosperity and good prices for agricultural products, and which will protect adequately the financial interest of the United States in said projects, obligations to pay construction charges may be revised or undertaken pursuant to the provisions of this Act."

[3] The following is the material portion of the text of this subsection: "No expenditures for the construction of any new project, new division of a project, or new supplemental works on a project shall be made, nor shall estimates be submitted therefor, by the Secretary until after he has made an investigation thereof and has submitted to the President and to the Congress his report and findings on (1) the engineering feasibility of the proposed construction; (2) the estimated cost of the proposed construction; (3) the part of the estimated cost which can properly be allocated to irrigation and probably be repaid by the water users; (4) the part of the estimated cost which can properly be allocated to power and probably be returned to the United States in net power revenues; (5) the part of the estimated cost which can properly be allocated to municipal water supply or other miscellaneous purposes and probably be returned to the United States."

is presented by section 1 of the Columbia Basin Project Act, approved March 10, 1943 (Public Law 8, 78th Cong.), which provides:

"In addition to the primary purposes for which the Grand Coulee Dam project (hereafter to be known as the Columbia Basin project and herein called the 'project') was authorized under the provisions of the Act of August 30, 1935 (49 Stat. 1028), the project is hereby authorized and reauthorized as a project *subject to the Reclamation Project Act of 1939; and the provisions of each of those two Acts* together with the provisions of this Act *shall govern the repayment of expenditures* and the construction, operation, and maintenance of the works constructed as a part of the project." [Emphasis supplied.]

In the meantime an amendment to the 1939 Interior Department Appropriation Act[4] had contained an important provision governing the application of power revenues in connection with irrigation projects. This provision, known as the Hayden-O'Mahoney amendment, provides that—

"All moneys received by the United States in connection with any irrigation projects, including the incidental power features thereof, constructed by the Secretary of the Interior through the Bureau of Reclamation, and financed in whole or in part with moneys heretofore or hereafter appropriated or allocated therefor by the Federal Government, shall be covered into the reclamation fund, except in cases where provision has been made by law or contract for the use of such revenues for the benefit of users of water from such project: *Provided*, That after the net revenues derived from the sale of power developed in connection with any of said projects shall have repaid those construction costs of such project allocated to power to be repaid by power revenues therefrom and shall no longer be required to meet the contractual obligations of the United States, then said net revenues derived from the sale of power developed in connection with such project shall, after the close of each fiscal year, be transferred to and covered into the General Treasury as 'miscellaneous receipts': *Provided further*, That nothing in this section shall be construed to amend the Boulder Canyon Project Act (45 Stat. 1057), as amended, or to apply to irrigation projects of the Office of Indian Affairs."

It is my opinion that the Columbia Basin project is subject to the provisions of the Reclamation Project Act of 1939, section 9 of which is controlling with respect to the sale of power from the project and the elements to be included within the rate schedule. The Hayden-O'Mahoney amendment of the Interior Department Appropriation Act of 1939 which deals expressly with the application of power revenues, is entirely consistent with the act of 1939 and aids in its construction.

Before proceeding to the consideration of question I, it is desirable to examine the divergent views which have been advanced with respect to it and to note certain assumptions which have been made in its submission. The following is quoted from a memorandum by which the question was submitted:

"* * * One view of the law is that the allocations report must be predicated on estimates of revenues sufficient to return to the United States that portion of the reimbursable costs properly chargeable to power and the other portions of the reimbursable costs that are to be met by power revenues and, in addition, interest at 3 percent per annum on what is described in section 9 (c) of the Reclamation Project Act of 1939 as 'an appropriate share of the construction investment.' It is part and parcel of this view that this term 'appropriate share' comprises that part of the estimated project costs that are properly chargeable to power.

"The other principal view is that, even though power rates are to be fixed on a basis that includes as a part of the rate base interest on that portion of the costs properly chargeable to power, it is only necessary, insofar as showing full reimbursability of the project is concerned, to show a return within an agreed period of amortization of the full amount of the project costs which are allocated to be returned from power revenues. Under this view the interest component of power revenues would be applied to assist in the retirement of the reimbursable costs that were not properly chargeable to power but which are to be retired by the application of power revenues.

"For the purpose of the Solicitor's consideration of the legal problems, these assumptions should be made: (1) That all project costs, except those allocated to flood control and navigation, are required to be returned to the United States within an agreed amortization period; and (2) that power revenues will be ex-

[4] Act of May 9, 1938, 52 Stat. 291, 322, 43 U. S. C. sec. 392 (a).

pected to return to the United States that part of the costs properly chargeable to power, plus that portion of the costs properly chargeable to irrigation but which are beyond the ability of the water users to repay within the statutory repayment period."

It is understood that both views, quoted supra, of the application of section 9 assume that the cost allocations report will reflect (1) the part of the estimated cost which can be properly allocated to irrigation and be repaid by the water users; (2) the part of the estimated cost which can properly be allocated to power and probably be returned to the United States in net power revenues, and (3) that part of the estimated cost properly chargeable to irrigation but which, because of the inability of the water users to repay, also is to be repaid from net power revenues (the irrigation subsidy). The first view is that the minimum rate schedule prescribed by the second sentence of subsection 9 (c) must be such as will produce revenues sufficient to meet (2) and (3), plus at least 3 percent of (2).[5] The second view concedes the necessity of always collecting (2) with at least 3 percent thereon. It is contended, however, that the minimum rate schedule need otherwise only be such as will return revenues, including interest, which will be sufficient to meet (2) and (3).[6] Under the first view the proceeds of the interest charge would be realized above the amounts necessary to meet reimbursable cost, while under the second view they would be applied to that purpose[7] to the extent of the irrigation subsidy. Reduced to its simplest terms therefore the issue is as follows: The Bureau of Reclamation contends that the Congress, by this provision of subsection 9 (c) intended that the United States not only realize, but retain, a "profit" of 3 percent from its power investment. The Division of Power contends that Congress did not so intend, and that the sum collected by virtue of the 3 percent interest on investment required to be included in any power rate schedules prepared under subsection 9 (c) may be applied to the amortization of those costs chargeable to irrigation but beyond the ability of the water users to repay (irrigation subsidy).

It is my opinion that neither the contention of the Bureau of Reclamation nor that of the Division of Power is entirely correct. I believe that a proper interpretation of section 9 of the Reclamation Act of 1939 and the Hayden-O'Mahoney amendment to the Department's Appropriation Act of 1939 require that the minimum rate schedule be such as to produce revenues sufficient only to meet in addition to the return for operation and maintenance cost, an amount equal to 3 percent of the power construction costs with the proviso that if total revenues thus produced are insufficient to repay all costs allocated to power to be repaid by power revenues, "other fixed charges" must be included in the rate schedule to produce revenues sufficient to repay such costs. The Bonneville Power Administration has indicated that it shares this view, and its views otherwise are in accord with those of the Division of Power.

If we look only to the language of section 9 of the Reclamation Project Act of 1939, the intention of the Congress seems clear. Subsection 9 (a) and 9 (c), although related, serve two different purposes. Subsection 9 (a) embodies the test for feasibility. All projects to be undertaken as authorized under the act must meet this test. Subsection 9 (c) contains the criteria for rates to be charged by the Secretary for the sale of power. All rates prescribed by him must conform to these criteria.

It is to be observed that the criteria prescribed in subsection 9 (c) include a discretionary factor. The rates must produce power revenues "at least sufficient to cover an appropriate share of the annual operation and maintenance cost, interest on an appropriate share of the construction investment at not less than

[5] Both views assume that "an appropriate share of the construction investment," on which the interest is to be computed within the meaning of subsec. 9 (c), is the amount properly chargeable to power for power construction costs, an assumption which is supported by the legislative history. Both the Senate report (No. 758, 76th Cong., 1st sess.) and the conference report (84 Congressional Record 10219), in explanation of an amendment of the bill reducing the interest rate, clearly indicate an understanding that interest should be computed "on the share of the construction cost attributed to power construction."

[6] Both views, of course, assume that the power revenues must be sufficient to return operation and maintenance cost also, factors which for simplicity are not injected at this point of the discussion.

[7] As an example of the practical application of the second view it may be assumed that the interest component, whether the 3 percent minimum or a permissible higher one, would return revenues sufficient to cover (2), thus permitting a complete reimbursement from power revenues of those parts of the cost so allocated. Or, if a 3-percent interest component should in fact be insufficient for that purpose the difference could be realized by including in addition so much of the subsidy to irrigation as might be necessary under "other fixed charges." This view therefore involves not only a negative answer to question I (a) but, necessarily, an affirmative one to question I (b).

3 percent per annum, and such other fixed charges as the Secretary deems proper." The Secretary's discretion, however, is limited by the relationship between subsection 9 (a) and subsection 9 (c). Subsection 9 (a) was intended to insure the reimbursability of projects. "Other fixed charges," as used in subsction 9 (c), must, therefore, be such as to produce total revenues from power which will equal any costs not written off as allocable to navigation and flood control or not reimbursable from other sources. If these costs are less than the revenues which would be collected by reason of the minimum 3 percent interest factor, the Secretary need not, unless he deems them proper, include any other "fixed charges." If such costs exceed an amount equal to the revenues which would be collected by reason of the minimum 3-percent interest factor, the Secretary is required to include "other fixed charges" to the extent necessary to equal the sum representing such excess. This, however, is the extent of the limitations upon the Secretary's discretion, and if he acts within these limitations, he has followed the criteria prescribed in subsection 9 (c) and the requirements of law have been satisfied. It appears, therefore, that there is nothing in the act of 1939 to prevent the Secretary from fixing rates sufficient to meet "an appropriate share of the annual operation and maintenance cost," interest on "an appropriate share of the construction investment" at 3 percent per annum and "other fixed charges" sufficient to retire all construction costs to be returned from net power revenues.

If we look to the Hayden-O'Mahoney amendment to the Department's Appropriation Act for 1939, we find confirmation of this construction of the Reclamation Project Act of 1939.

The Hayden-O'Mahoney amendment deals expressely with the disposition of power revenues. It contains the specific provision that all revenues derived from the sale of power "*shall be covered into* the reclamation fund." [Emphasis supplied.] No reservation of any amount for the payment of special accounts, such as interest in the form of a "profit" to the United States, is made. It is provided that *only after net revenues* derived from the sale of power developed in connection with any such projects *shall have repaid* those *construction costs* of such project "*allocated*" *to power to be repaid by power revenues* (power construction costs plus subsidy) therefrom shall any part of said net revenues derived from the sale of power developed in connection with such projects go to the United States. Then, by specific instruction, it directs their disposition by providing that they "*shall, after the close of each fiscal year, be transferred to and covered into the General Treasury as 'miscellaneous receipts.'*" [Emphasis supplied.] No clearer reflection of congressional intention with respect to the application to be made of revenues derived from irrigation power undertakings could be found. There appears to be no conflict, therefore, between the Hayden-O'Mahoney amendment and section 9 of the act of 1939, and I find nothing in either act which would require the Bureau of Reclamation to change what appears to be its past practice with respect to the application of power revenues. That practice appears to have been to retain in the reclamation fund, as a part of net power revenues, collections representing the interest element, where, it is reasonable to presume, they have been available for application against reimbursable costs not otherwise paid. This practice was in accord with a number of statutes dealing with specific projects which called for the application of all revenues from power to the credit of the projects.[8]

It appears to be a matter of common knowledge that in many irrigation project undertakings the amount representing the irrigation subsidy is in excess of the amount which it is anticipated will be realized by a 3 percent interest return on the power investment. That there is authority to include in rate schedules as one of "such other fixed charges as the Secretary deems proper" an element representing some part of the subsidy, in order to avoid a deficit, is not questioned. There is objection, however, to a construction of the provisions of subsection 9 (c) which would *require* that there should be included an element reflecting repayment of the *full* amount of the subsidy, in addition to the interest element, the revenues resulting from which are applied against the repayment of the subsidy.

It is argued that the contention of the Bureau of Reclamation is fortified by past practices whereby rate schedules have been such as to produce revenues from the sale of power sufficient to meet all construction costs to be returned from power revenues in addition to an amount equal to 3 percent of the power construction costs. It is necessary only to point out that insofar as such a prac-

[8] See, e. g., act of April 6, 1906 (34 Stat. 116, 117), as amended; act of March 4, 1929 (45 Stat. 1562, 1592); act of May 14, 1930 (46 Stat. 279, 308); act of August 9, 1937 (50 Stat. 564, 592).

tice has existed, it is of no assistance in the construction of the legal *requirements* of rate schedules. Such a practice is entirely consistent with the view that the Secretary may "if he deems proper" include such factors as "other fixed charges." The practice throws no light, as an administrative construction, on the question whether the Secretary is *required* to include such factors as "other fixed charges." It indicates that he *may*, not that he *must*.

I have been cited two instances which are alleged to indicate an understanding on the part of certain members of the House committee which considered the bill that rates for the sale of power must be such as to return all costs allocated to power to be repaid from power revenues and in addition a 3 percent interest charge on the power investment. One such instance was an exchange between Congressman Mundt and Commissioner Page as follows:

"Mr. MUNDT. Who gets the profits of the allocation? You say that the profits go to the Government. Do you mean to the United States Treasury?

"Mr. PAGE. Yes, sir.

"Mr. MUNDT. Not to the Bureau of Reclamation.

"Mr. PAGE. It goes in the reclamation fund and is available for reappropriation by Congress.

"Mr. MUNDT. And can be spent without separate appropriation?

"Mr. PAGE. No, sir, only after specific appropriation.

"Mr. HORTON. That part allocated for power pays for itself.

"Mr. PAGE. Yes, sir; the revenue goes into the reclamation fund until the allocation is repaid; then they go to the Treasury.

"Mr. MUNDT. Does the Secretary of the Interior, is he compelled to sell this power to the highest bidder?

"Mr. PAGE. No, sir; rates are established to return the obligation, with interest, and the power is not auctioned" (hearings, House Committee on Irrigation and Reclamation, 76th Cong., 1st sess., p. 144).

The other incident occurred in a debate on the floor of the House during consideration of the conferee's report. The following exchange occurred between Congressman Rich and Congressman White:

"Mr. RICH. [After quoting managers statement as to Senate amendment.] What reduction was made in the rate of interest?

"Mr. WHITE of Idaho. One-half of 1 percent, and the Government still makes a big profit, because it borrows money at a lower rate than the rate fixed in this bill. The Government is making a profit on the interest, and we have extended those benefits to these reclamation projects" (84 Congressional Record, p. 10220).

I think it is clear that neither of these incidents throws any particular light on the narrow question in issue.

Even greater stress is laid by the Bureau of Reclamation on the implications of the Acting Secretary's letter of June 9, 1939,[9] in which the following statement concerning section 9 of the act appears:

"The provisions of this section are substantially in accordance with recent special acts of Congress relating to multiple-purpose projects constructed by the Bureau of Reclamation and would give effect to sound public policy" (H. Rept. No. 995, 76th Cong., 1st sess., p. 5).

This paragraph in itself is of little significance. It is necessary to examine the "recent special acts of Congress relating to multiple-purpose projects" to which it refers and to explore what might have been intended by the phrase "give effect to sound public policy."

The "special acts" referred to include the Boulder Canyon Project Act.[10] An examination of this act indicates that it varies in material respects from section 9 of the Reclamation Act of 1939. In fact, the act varies so materially that little is to be gained by comparison. For example, it requires the return of the total cost of the project including the allocation to flood control with interest at 4 percent per annum. Under the act of 1939, it is not contended that interest be returned on the irrigation subsidy and subsection 9 (a) provides for writing off costs allocable to flood control and navigation. Under section 9, therefore, not only is it unnecessary to collect interest on flood control and navigation costs, but it is even unnecessary that the costs themselves be returned. It is thus obvious that the Boulder Canyon Project Act is of no assistance in interpreting the meaning of section 9 of the act of 1939. Of the other multiple-purpose project acts in

[9] See H. R. 995, 76th Cong., 1st sess., pp. 5, 6.
[10] Act of December 21, 1928, ch. 42, 45 Stat. 1057.

operation or under construction at the time the 1939 act was under consideration,[11] none, with the exception only of that relating to Black Canyon,[12] contained any provisions whatever as to rates for the sale of power or the requirements for repayment from power revenues.

Whatever significance is to be derived from the Acting Secretary's letter thus must be found in his statement that section 9 of the act of 1939 would put into effect "sound public policy." It is argued by the Bureau of Reclamation that this "sound public policy" is to be found in the Bureau's practice in establishing rate schedules under the special acts referred to. This practice seems to have been one which included an interest charge over and above charges sufficient to amortize the entire cost of the project. Admittedly, however, such schedules were established as a matter of policy and not as a matter of legal requirement. The implication of the Acting Secretary's letter would thus appear to go no farther than to suggest that under section 9 of the act of 1939, a similar policy could be followed. There is no necessary implication that such a procedure should be followed as a matter of law.

In these circumstances, I am confronted with a situation in which the language of the legislation in question is perfectly clear but the legislative history of doubtful intent. Ordinarily, legislative history is invoked when it can throw light on statutory language which is susceptible of more than one meaning. Such is not the case here. To deviate from the interpretation I have placed on section 9 of the act of 1939 would require reading something into the act which is not there. In order to accomplish this, I am asked to resort to legislative history which is itself capable of several meanings. It would be a curious reversal of ordinary canons of statutory interpretation to follow such a course.

Considerable point is made by the Bureau of Reclamation of the practices of the Bureau in establishing rate schedules and of representations made to Congress since the passage of the 1939 act. It is contended that representations thus made and appropriations made by the Congress in consequence thereof are entitled to great weight in determining the requirements of that act.

But most of the colloquies between Bureau representatives and members of Appropriation Committees are ambiguous, subject to a meaning which is consistent with the contentions of the Division of Power as well as with those of the Bureau of Reclamation. In a discussion between Commissioner Page and Congressman Carter in connection with H. R. 8745, Seventy-sixth Congress, third session, which was the first appropriation act following the enactment of the 1939 act, Commissioner Page observed that "under the 1939 act it is contemplated that money allocated to power should pay interest, and the water end of it would be interest-free" (House hearings, p. 382). When Commissioner Page testified before the Senate Subcommittee on Appropriations in connection with the same bill, he assured Senator Taft that "power always carries interest. The rates are set to repay investment with interest" (Supp. hearings, Senate Subcommittee on Appropriations, p. 27).

In connection with H. R. 4590, which became the act of June 28, 1941, the second annual appropriation act after the enactment of the 1939 act, Commissioner Page told Congressman Fitzpatrick that power prices were "based on taking care of the operation of the plant, amortization of the investment within the period which the law permits, and the payment of 3 percent on the cost of construction." In answer to a question by Congressman Sheppard, the Commissioner said:

"* * * We establish a rate at a figure which we think will yield, with the output which we have, the operating cost, the amortization, and the interest; and that is the rate at which we sell the power, and that varies in each case

[11] The following acts involve situations of that kind: The acts of June 5, 1924 (43 Stat. 416) and March 4, 1929 (45 Stat. 1590), relating to the Black Canyon power plant and the Deadwood Reservoir, Boise project; the acts of March 4, 1929 (45 Stat. 1592) and April 9, 1938 (52 Stat. 210), relating to the Shoshone power plant; the act of May 14, 1930 (46 Stat. 279, 308), relating to the Yakima-Prosser power plant; the several appropriation acts relating to the Kendrick project, beginning with the act of June 22, 1936 (49 Stat. 1757, 1784), (these must be considered along with the finding of feasibility of August 30, 1935 which was premised on the use of power revenues to retire a part of the cost that might properly be chargeable to irrigation); and the act of August 9, 1937 (50 Stat. 564, 593, and 595), relating to the Rio Grande project and to the Colorado-Big Thompson project. Reference should be made also to the acts of August 30, 1935 (49 Stat. 1028, 1039) and August 26, 1937 (50 Stat. 850) which related to Grand Coulee Dam, Parker Dam, and the Central Valley projects, which were multiple-purpose projects under construction when the 1939 Project Act was being considered, but for which at that time no provision had been made for the allocation of costs, nor for the terms on which power would be sold.

[12] Act of March 4, 1929, ch. 705 (45 Stat. 1562).

with the investment involved, because of amortization and interest" (hearings, House Subcommittee on Appropriations, 77th Cong., 1st sess., p. 613).
Later in the same hearings, Commissioner Page told Congressman Leavy that "No interest is charged on the cost of construction for irrigation. That charged to power is repaid with interest" (hearings, p. 634).

In connection with H. R. 6845, which became the act of July 2, 1942, the third appropriation act after passage of the 1939 act, Commissioner Page in response to a question by Congressman Leavy stated:

"Expenditures for irrigation are reimbursable under the law. That must be repaid in 40 years without interest. Costs allocated to power in multiple-purpose projects are repaid with interest at 3 percent * * *" (hearings, House Subcommittee on Appropriations, 77th Cong., 2d sess., p. 306).

When H. R. 6845 was under debate on the floor of the House, Mr. Leavy in discussing the proposed appropriation for the Central Valley project asserted:

"It will cost somewhere between $225,000,000 and $275,000,000.

"Every dollar of this is to be paid back to the Federal Treasury over a period of 40 years, the reclamation feature without interest and the power feature with interest" (88 Congressional Record, p. 5721).

In connection with H. R. 2719, which became the act of July 12, 1943, the fourth annual appropriation following enactment of the 1939 act, Commissioner Page, in response to a question by Congressman Norrell, made the following explanation before the House Subcommittee on Appropriations:

"Most of the projects now being constructed were authorized prior to the enactment of the 1939 act; however, the practice of the Bureau previous to the enactment of the 1939 act was analogous to the procedure set up in the 1939 act. This practice in substance consisted of allocating to each use that portion of the project that was used exclusively for that particular purpose and the common works were likewise allocated as could best be determined on the basis of use. After these allocations had been made, consideration was given to the ability of the water users to repay the costs properly charged to them as well as the benefits they could be expected to receive from the construction. The result of such an allocation in most cases has been that a certain part only of the project cost properly allocated to irrigation be repaid by charges made to the water users. The rest of the allocation to irrigation uses and, of course, all of the allocation to power, will be returned by power revenues."

It will be observed that in these conversations loose language is frequently employed both by the Commissioner and by members of the committee. I am impressed, however, with the thought that such expressions as "power features," "irrigation features," "power costs," "costs allocated to power in multiple-purpose projects" are employed to identify the construction allocations of the power and irrigation features, as the case may be. For example, in Commissioner Page's testimony, last quoted, he says:

"* * * The result of such an allocation in most cases has been that a certain part only of the project cost properly allocated to irrigation be repaid by charges made to the water users. The rest of the allocation to irrigation uses and, of course, all of the allocation to power, will be returned by power revenues."

This immediately suggests that both the Commissioners and his hearers distinguished between the power investment and the irrigation investment. It is reasonable to assume, therefore, that when the committee members were assured that "costs allocated to power" were collected with interest, and when they themselves made such statements as "the reclamation features [are repaid] without interest and the power feature with interest," it was understood that in addition to interest thereon, only power costs would be reflected in the rates. I am persuaded that insofar as the legislative history of the four appropriation acts since enactment of the 1939 act refer to the requirements for rate schedules, I could go no further than to conclude that these requirements, in addition to operation and maintenance cost, include only the amortization of the power investment plus 3 percent interest thereon, unless "other fixed charges" are necessary to insure complete repayment of reimbursable costs. In other words, if it were permissible to consider this material, it would support the contention of the division of power as such, if not more than that of the Bureau of Reclamation.

To all of these statements, however, I am not disposed to attach significance. Statements subsequently addressed to Congress may not be invoked to alter what otherwise would be the plain meaning of a statute. Since I find no ambiguity in the terms of section 9 of the act of 1939, I am unwilling to look to later

declarations either by administrative officials or by members of appropriation subcommittees to make them ambiguous.

It has been suggested that the mere use of the word "interest" in subsection 9 (c) of the act of 1939 indicates a congressional intention that rate schedules be established which will return sufficient revenues to meet the requirements set forth in subsection 9 (a) of that act and in addition a "profit" of 3 percent on the power investment. "Interest," it is argued, implies a "profit" on investment. It implies the collection of a sum in addition to the amount on which the interest is charged. To use this sum for the purpose of reimbursement of the capital on which it is charged is to defeat the very purpose of its requirement. If the validity of this reasoning be conceded, I think it is answered by a consideration of the character of projects like Grand Coluee. The Reclamation Act of 1939 contemplated vast multiple-purpose projects, projects which would serve the ends of irrigation, power generation, navigation, and flood control. The provision in subsection 9 (a) for allocation of costs to different functions suggests that the Congress regarded such projects, for purposes of fiscal planning and accounting, as interrelated but nevertheless separate enterprises. The costs for navigation and flood-control purposes are to be borne in one way, costs for power construction in another, and costs for reclaiming and irrigating agricultural land in still a third manner. It seems to me not unusual to use the word "interest" as a return to be realized on one enterprise even though a part of the revenues from that enterprise are required to reimburse the reclamation fund for a capital investment in another enterprise. Since the returns from power investments are more generous than the returns from investments for irrigation purposes, it is only natural to suppose that the Congress anticipated the former to yield a return which could be applied to subsidize the latter.

I am not prepared, however, to concede the validity of the proposition that to use revenues collected by reason of an interest factor for the purpose of reimbursement of capital on which it is charged is to defeat the purpose of its requirement. It is a question-begging proposition. The fallacy lies in the assumption as to the purpose of the interest requirement. It does no violence to common sense to assume that the 3-percent interest requirement in subsection 9 (c) was intended to insure minimum rates for power in cases where a 40-year amortization plan would otherwise make possible rates which would return revenues less than an amount equal to 3 percent on the power construction costs. It is to be remembered that the Congress has been sensitive to the competitive position of Government power projects, and it is not unreasonable to assume an intenttion only to insure power rates which, under no circumstances, could be less than those which would return, in addition to operation and maintenance costs, an amount equal to 3 percent on the construction investment. In other words, the Congress may well have been concerned at this point with a minimum rate schedule rather than an enterprise which would insure a net profit to the Government. The device of requiring an interest component in the rate schedule was one method of attaining this objective.

It accordingly is my conclusion that the minimum legal requirement of subsection 9 (c) of the act of 1939 may be met by the establishment of rate schedules which will return:

(1) The share of operation and maintenance expenses chargeable to power development;

(2) Interest at not less than 3 percent on the power-construction costs; and

(3) As "other fixed charges," an amount equal to any excess over total net power revenues which would otherwise exist in the construction costs allocated to power to be returned from power revenues.

The Secretary may, if he deems them proper, include still other "fixed charges." His discretion under this provision is sufficiently broad to enable him to include charges which will produce revenues sufficient to equal all construction costs allocated to power to be returned from power revenues, including costs allocated to irrigation which are beyond the ability of the water users to repay, in addition to the returns representing interest at not less than 3 percent annually on the power-construction investment. He is not, however, so required by law.

Question II is whether the interest element in the rate schedule, which is to be computed on the part of the construction cost properly chargeable to power, must be calculated on that interest base from the time the investment was made. It raises a preliminary question, however, whether interest during the period of construction should be regarded as a part of the construction cost of the project. If it should be so regarded, it would seem clear that the interest element in the rate schedule should not be calculated from the time of making the investment,

since the part chargeable for the period of construction already would be reflected in the rate schedule. If it should not be so regarded, there would remain the question whether the Secretary, in fixing rates which would produce revenues "at least sufficient to cover * * * interest on an appropriate share of the construction investment at not less than 3 percent per annum * * *" is, nevertheless, required to compute the interest from the time of the investment.

While interest during construction has been treated in some situations as a part of the cost of the project,[12] two considerations tend to negative the propriety of its inclusion here: First, subsection 9 (a) of the Reclamation Project Act of 1939, which provides for cost-allocations reports, speaks in terms only of "the estimated cost of the proposed construction" and "the part of the estimated cost which can properly be allocated" to irrigation, power, and other purposes. This language, in the absence of more specific provisions, seems to be addressed only to capital investment. Second, if interest during construction should be included as a part of the project cost, it would seem that it reasonably should apply alike to the parts of the construction cost allocable to power and to irrigation, whereas interest historically has not been included in the financing of irrigation.[14] I, therefore, conclude that interest during construction need not be included as a part of the cost of the project. The question as originally submitted therefore remains to be answered.

A casual examination of the provision for interest in the rate schedule would raise the suggestion of a requirement that it be calculated from the date of investment.[15] Administrative practice prior to the enactment of the 1939 act was not uniform.[16] Two considerations, however, lead me to the conclusion that interest need not be calculated from the date of investment: First, the rate requirements of subsection 9 (c) are "in connection with the *operation* of any project" [italics supplied].[17] Second, it does not appear that the element of interest during construction has been reflected in any manner in any rate determinations made under subsection 9 (c), and the financial studies reflected in the feasibility reports made in three projects pursuant to subsection 9 (a) are based on calculations of annual revenues and annual charges.[18] In two of these three instances appropriations of funds have been made by the Congress for project construction.[19] Appropriations made with knowledge of administrative construction and practices are entitled to weight.[20]

It, therefore, is my opinion that the Secretary is not legally required, for the purposes of rate making, to calculate interest on the investment from the time of actual expenditure in construction and that it may be calculated from such subsequent point of time as would be factually most consistent with the legal reasons which have led to this conclusion. Such point of time presumably would be that at which the generation of energy begins to produce revenues.

The answers to the questions propounded are thus as follows:

I (a). No.

I (b). Yes.

II. No. Interest may be calculated from an "appropriate" later date.

Respectfully,

FOWLER HARPER, *Solicitor.*

Approved: September 19, 1944.

HAROLD L. ICKES,
Secretary of the Interior.

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[12] See, e. g., *In the Matter of Clarion River Power Co.* (1 F. P. C. Rept. 269, 314 (1935)).

[13] See S. Doc. 36, 76th Cong., 1st sess., p. 30.

[14] See hearings, H. R. 4852, House Subcommittee on Appropriations, 76th Cong., 1st sess., p. 334. See also ibid., p. 437, hearings, H. R. 6984, House Committee on Irrigation and Reclamation, 76th Cong., 1st sess., p. 144; 81st Cong. Rec. 10220.

[15] See, on the one hand, the financial studies for the Colorado-Big Thompson project (S. Doc. 80, 75th Cong., 1st sess., pp. 31, 32, and 33) and the hearings on an appropriation item for the Rio Grande project (hearings, House Subcommittee on Appropriations, 75th Cong., 1st sess., p. 316), both of which reflect a policy of charging interest during the period of construction. On the other hand, see hearings, House Subcommittee on Appropriations, 70th Cong., 2d sess., p. 452, in connection with the Black Canyon power plant, and hearings, House Subcommittee on Appropriations, 76th Cong., 1st sess., p. 286, in connection with the Kendrick project.

[16] In addition, it may be observed that subsec. 9 (c) speaks in terms of annual "operation and maintenance cost," which raises a suggestion that the other factors in the rate base, including interest, may be similarly computed.

[17] Boise project (Anderson Ranch Reservoir), (H. Doc. 916, 76th Cong., 3d sess.); King's River project (H. Doc. 631, 76th Cong., 3d sess.); Bullshead Dam project (H. Doc. 186, 77th Cong., 1st sess.).

[18] See, e. g., act of June 28, 1941 (55 Stat. 303, 336), which appropriated funds for the Bullshead project "for the purpose and substantially in accordance with the report thereon heretofore submitted under sec. 9 of the Reclamation Project Act of 1939."

[19] *Wells* v. *Nickles* (104 U. S. 444, 447 (1881)); *Brooks* v. *Dewar* (313 U. S. 354, 360, 361 (1941)).

STATEMENT BY SIDNEY KARTUS AT HEARING ON S. 75 AND SENATE JOINT RESOLUTION 4 BEFORE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, WASHINGTON, D. C., SCHEDULED TO RESUME APRIL 26, 1949

My name is Sidney Kartus, of Phoenix, Ariz. I oppose Senate Joint Resolution 4 and I am calling to the attention of the Senate Committee on Interior and Insular Affairs that the questions expected to be solved by the committee in this bill are not the governing questions in this matter.

Vested and inchoate water rights in each State which have been ignored by the Colorado River compact and the upper basin States Colorado River compact which this bill and its companion bills seek to interpret will be afforded in the courts the full protection to which they are entitled under the law. This would be so even though all the Colorado River Basin States were in agreement on the compact and its terms. In view of these facts, why should this committee be expected to report favorably a bill authorizing a suit which would settle nothing and which would undoubtedly be the forerunner of innumerable suits which thousands of water-right holders could institute in the courts of the land?

It must be conceded by the committee that neither State legislatures, Governors, nor Congress itself can sign away the water rights of the citizens of any State. It must also be conceded by the committee that there is nothing to prevent the State legislatures which ratified the Colorado River compact from rescinding it at subsequent sessions, thereby rendering meaningless any decree which might be handed down by the Supreme Court were this bill to be approved. Therefore it is quite obvious that water law governing such matters over many generations is the only recourse that will protect rights and make possible the most beneficial and proper use of the waters of the land for the benefit of all of its people. The compact is the direct antithesis of this objective. Arizona's rights will be finally determined under water law, as will those of California and others concerned in the Colorado River matter.

I am submitting this statement as a party in direct interest as filee on some 40 dam and canal sites in the Colorado River system for and on behalf of the State of Arizona and the water users under said projects, including the Bridge and Glen Canyon Dams, as successor to Fred T. Colter, who originally made these filings September 20, 1923, before the Arizona State water commissioner, and before the Federal Power Commission, beginning in 1925, to develop 5,000,000 acres and like amount of electrical horsepower in Arizona. These prior and superior rights antedate both the Colorado River compact and the upper basin Colorado River compact, which seek without authority to allocate Arizona not even an appreciable fraction of the waters to which it is entitled under these filings. I am submitting this also, with proper authority, as president of the Arizona Highline Reclamation Association, and as president of the Glen-Bridge-Verde-Highline reclamation district (preorganizaton), and a member of the Arizona House of Representatives.

I favor S. 75 provided that it is amended to eliminate from it the Colorado River compact and to assure gravity diversion. Arizona has vastly more water outside the compact than within it. Under these filings there is no question as to Arizona's rights to an adequate amount of water to divert into central Arizona from the Colorado River. By eliminating the compact these questions are automatically eliminated.

STATEMENT SUBMITTED BY FELIX S. COHEN, WASHINGTON, D. C.

JUNE 2, 1949.

MILLS ASTIN,
Chief Clerk, Senate Committee on Interior and Insular Affairs,
United States Senate, Washington, D. C.

DEAR MR. ASTIN: In accordance with the understanding reached at our conference on May 31, I am transmitting a brief statement for inclusion in the record of committee hearings on S. 75. Your courtesy in this matter is very much appreciated.

Sincerely,

FELIX S. COHEN.

STATEMENT OF HUALAPAI INDIANS OF ARIZONA ON BRIDGE CANYON BILL (S. 75), SUBMITTED TO THE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS BY BARNETT E. MARKS OF THE FIRM OF MARKS & MARKS OF PHOENIX, ARIZ., THEIR GENERAL COUNSEL, AND FELIX S. COHEN, WASHINGTON, D. C., THEIR ASSOCIATE COUNSEL

This statement is submitted on behalf of more than 500 citizens of Arizona whose lands will be flooded and taken away from them if the Bridge Canyon bill (S. 75) becomes a law. These citizens of Arizona, Indians of the Hualapai Tribe, are owners of the lands which are to be used for a reservoir site, a construction camp, and other purposes incidental to the Bridge Canyon Dam construction. Since June 5, 1943, the Hualapai Tribe of Arizona has been recognized and constituted as a municipal corporation. Equitable title to the lands in question is vested in this municipal corporation for the benefit of its members, who utilize these lands for their individual cattle herds and for their homes, garden plots, stores sites, and other economic purposes.

The simple fact which many discussions of the Bridge Canyon project have failed to note is that the key lands in this project do not belong to the Bureau of Reclamation or to the Bureau of Indian Affairs or to the United States. These lands belong to American citizens whose rights are not less sacred than the rights of other American citizens merely because they happen to be Indians.

The Hualapai Indians have no desire to stand in the way of any measure which is based on justice and national needs. But they insist that justice be done at the outset with respect to any lands that may be taken from them, and that their economic needs, as well as the economic needs of their white neighbors in Arizona, should be fully considered.

In brief, the Hualapai Indians want a chance to sit down across the table with the representatives of the Department of the Interior who will be charged with planning and building the Bridge Canyon Dam, and to work out mutually agreeable terms of conveyance and compensation, so that they may freely convey to the United States such land as is needed for the project and receive in return fair compensation for whatever they are asked to surrender.

The Hualapai Indians make their living primarily from the cattle business. These people, who were at the bottom of the economic ladder a few years ago, have built up some of the finest cattle herds in Arizona, by dint of hard work and with the help of one of the best Indian superintendents in the whole country, an Indian himself, Superintendent Tom Dodge. The Bridge Canyon bill would take over a considerable part of the Indians' cattle range and use this land for a construction townsite, for reservoir purposes, for roads and all sorts of uses that are incompatible with the cattle business. These people do not want to be pushed down to the bottom of the economic ladder again. They want fair treatment. They don't want to see their rights disregarded. They are willing to submit to the needs of national progress. They are willing to see a dam flood out what is to some of them the most precious spot in the world. The proposed Bridge Canyon Dam will flood out what was, according to their traditions, the original Garden of Eden where the first man was created. The project will put a camp and thousands of construction workers in the middle of their ranches and tiny settlements on the south side of the Colorado River. They do not oppose any of these developments but they do want a chance to negotiate on the terms of conveyance before the land is taken from them and not afterwards.

They know that when a poor Indian negotiates with the most powerful government in the world, the odds are all against the Indian. If the land is once taken, the Indian may have to wait a century or more to be paid for it. The only chance the Indian has to get a fair deal is now, before his lands are taken, when an Indian protest against this whole operation will be heard by millions of disinterested Americans who have no ax to grind and will oppose any land grab directed against our first Americans.

There should be enough good will on all sides to work out a fair deal. But, so far, neither the Department of the Interior nor any of the organizations sponsoring this bill (except the Congress of Industrial Organizations) has offered to include any real protection to Indian rights in this legislation.

These Indian landowners want fair compensation when their land is taken, not 5 or 10 or 25 years later. They want a chance to sit around a table with the Secretary of the Interior or the Bureau of Reclamation and agree on the value of whatever lands or water rights they are asked to surrender. If no agreement can be reached, they want the Bureau of Reclamation to put down cash on the line, as it does when it takes a white man's land, and they want the Bureau to

pay them whatever a court decides is the fair value of the land. That is all they ask. This request, as embodied in appropriate legislative form, and a brief supporting tribal council resolution are attached to this statement. If their modest request is granted, these people will join with their fellow citizens of Arizona in supporting a project which means much to all the people of Arizona, white and Indian.

On the other hand, if the rights of these people are not recognized legislatively, these people will do their best to secure protection of their rights in the courts. Unfortunately, that will take time. It took 18 years to get a final decision on the ownership of these Hualapai lands the last time this question was litigated. The Supreme Court of the United States then decided that these lands belong to these Hualapai Indians, that their title is not subject to defeasance by bureaucratic decisions, and that a purported grant of this land by the Interior Department to the Santa Fe Railroad without the consent of the Indians and without a court adjudication was null and void.[1] We are satisfied that a grant of this land to the Bureau of Reclamation without the consent of the Indians and without any court adjudication would be equally null and void.

It is no answer to say, as the Interior Department report of March 17, 1949, to this committee says, that the Secretary of the Interior should have the right to determine the compensation to be paid to these Indians for the land that he wishes to take from them.

In the first place, no man ought to be a judge of the value of the land he wants to take from humble private citizens—not even the Secretary of the Interior. That, under our system of government, ought to be decided either by agreement or by court decree.

In the second place, the Interior Department's proposed language indicates that the Indian lands are to be taken now, and that compensation is to be made at some indefinite time in the future. Generally, this means a delay of years or decades in actual payment.

In the third place, the Interior Department's language would not really compensate the Indians at all—it would only compensate the Indian Bureau, which is a very different proposition. It provides that allottees may be paid in cash—which sounds fine, except for the fact that none of these lands have ever been allotted. Apparently, whoever drafted this language for the Interior Department was not familiar with the facts. Finally, the Interior amendment provides that for the land that is owned by the Hualapai Corp., the only compensation to be paid will be paid not to the landowners or their corporate treasurer but to the Treasury of the United States, where it will be deposited in an account over which the Hualapai Indians have no control, but which is primarily at the disposal of the Bureau of Indian Affairs.

What would the members of this committe think of this bill, with the suggested Interior Department amendments, if we struck out the word "Indian" and applied this to white men or black men? What would any court say of a law that authorized a Government official to take land of white men or colored men now and decide at some indefinite future time what he wanted to pay them for the land and then went on to provide that if and when Congress appropriated the requested sum, it would be placed in the hands of that official to spend in ways that he considered beneficial to expropriated landowners?

We hope that this committee will reject the proposed Interior Department amendment to this bill and will insist that the owners of Bridge Canyon, regardless of the color of their skin, shall reecive fair and prompt payment for whatever land is taken from them.

PROPOSED AMENDMENT TO BRIDGE CANYON BILL (S. 75)

Add to section 2:

"*And provided further*, That the Secretary is hereby authorized to purchase or lease from the Hualapai Tribe of Arizona lands, rights-of-way, and other property belonging to the said tribe which are to be flooded by the Bridge Canyon Dam, or which may be needed for other purposes authorized by this Act, and the Hualapai Tribe of Arizona is hereby authorized, notwithstanding any provisions of existing law to the contrary and notwithstanding any limitations of existing law contained in the constitution and corporate charter of the said tribe, to

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[1] See: Opinion of Supreme Court in *United States* v. *Santa Fe Pacific R. R. Co.* (314 U. S. 339 (1941)).

sell or lease, for any period of time, any such lands, rights-of-way, and other property to the United States. The Secretary is directed to make every reasonable effort to negotiate such a contract of sale or lease upon reasonable terms, and if he is unable to do so, he shall report the facts to the Congress. Pending such report and action thereon, this Act shall not be deemed to authorize the institution of any condemnation proceedings against the lands or other property of the Hualapai Tribe."

RESOLUTION NO. 166 OF THE GOVERNING BODY OF THE HUALAPAI TRIBE OF THE HUALAPAI RESERVATION, A FEDERALLY CHARTERED INDIAN CORPORATION

Whereas, there is now pending in the Congress of the United States legislation known as Senate bill 75 and H. R. 935 and 934 covering the construction, operation, and maintenance of a dam on the main stream of the Colorado River at Bridge Canyon, and for other purposes; and

Whereas, in the event said Bridge Canyon Dam project should be constructed and operated, the lands and rights of the Hualapai Tribe would be materially affected in that the townsite for the dam and a great many of the rights-of-ways would be on the Hualapai Reservation, and unless said lands and rights of the tribe are protected, the tribe and its members will be severely damaged; and

Whereas, in the legislation now pending in the Congress of the United States there is no mention of the rights of Hualapai Tribe in the event of the construction of said Bridge Canyon project: Now, therefore, be it

Resolved by the Hualapai Tribal Council, That the Arizona congressional delegation take immediate steps to amend Senate bill 75 and H. R. 935 and 934 now pending in Congress covering the Bridge Canyon project so as to include a recognition of the rights of the Hualapai Tribe; be it further

Resolved, That the tribal attorneys, Marks & Marks, continue their efforts to have the Arizona congressional delegation recognize the rights of the Hualapai Tribe in the legislation covering Bridge Canyon project, and if necessary the attorneys are requested and instructed to appear before the congressional committees in Washington to present the views of the Hualapai Tribe; be it further

Resolved, That copies of this resolution be forwarded to the members of the Arizona congressional delegation and to other Members of Congress who may be helpful in protecting the rights of the Hualapai Tribe.

CERTIFICATION

I, the undersigned, as secretary of the Hualapai Tribal Council, hereby certify that the Tribal Council of the Hualapai Tribe is composed of nine members, of whom seven, constituting a quorum, were present at a meeting thereof this 5th day of March 1949; and that the foregoing resolution was duly adopted by the affirmative vote of seven members

JACOB HONGA, *Secretary.*

Approved March 8, 1949.

THOMAS H. DODGE,
Superintendent, Truxton Canon Agency.

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