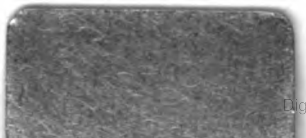

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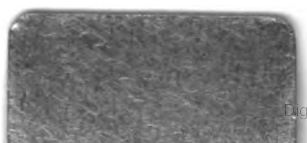
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BRIDGE CANYON PROJECT

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON PUBLIC LANDS UNITED STATES SENATE

EIGHTIETH CONGRESS

FIRST SESSION

ON

S. 1175

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

JUNE 23, 24, 25, 26, 27, 28, 30, AND JULY 1, 2, AND 3, 1947

Printed for the use of the Committee on Public Lands



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BRIDGE CANYON PROJECT

MONDAY, JUNE 23, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to notice, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin, presiding.

Present: Senator Millikin (presiding).

Present also: Senators McFarland, Hayden, and Downey.

Senator MILLIKIN. The committee will come to order.

This is a hearing on S. 1175, a bill authorizing the construction, operation, and maintenance of a dam and incidental work in the main stream of the Colorado River and Bridge Canyon, together with certain appurtenant dams and canals, and for other purposes.

S. 1175 will appear in the record at this point.

[S. 1175, 80th 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, 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 conduits and canals, including a tunnel and main canal from the reservoir above the dam at Bridge Canyon to the Salt River above Granite 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, together with such other canals and laterals as may be required to effectuate the purposes of this Act; (3) 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 of this project and sale in coordination with other Federal projects; and (4) 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 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 below the head of the Virden 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 from Lake Havasu 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 uses 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, and fish and wildlife conservation, respectively, 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 from revenues derived from sources other than the water users; (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 of the Interior shall have determined that costs allocated to power, municipal water supply, irrigation, or other miscellaneous purposes as herein provided will probably be returned to the United States within the periods prescribed by the Federal Regulation laws: *Provided,* That the repayment period for costs allocated to irrigation and assigned for repayment by the water users shall be a reasonable period of years not to exceed the useful life of the project.

Sec. 4. Electric energy developed at any of the generating plants constructed as parts of the works herein authorized shall be used first for the operation of pumping plants and other facilities embraced within the said works and the remainder sold for effectuating the purposes of this Act. In the production, sale, and distribution of electric energy generated by any of the works herein authorized above that required for the operation of said pumping plants and said other facilities, and in the provision of water for municipal water supply, the Secretary of the Interior shall be governed by the Federal reclamation 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 works along the project herein authorized; and such contracts shall be made with irrigation districts, persons, and corporations who have or shall obtain rights to the use of such water under the water laws of the State of Arizona or of the State of New Mexico.

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 said works 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 of the Interior may in his discretion enter into arrangements for the operation or use of a unit or units of said works with the State of Arizona or any irrigation district, reclamation project, or other subdivision or agency thereof; and in such event the Secretary of the Interior shall prescribe and enforce rules and regulations respecting maintenance of works in condition of repair, adequate for their efficient operation, recapture, or emergency use by the United States of such units, and penalties for enforcing regulations made under this Act or penalizing failure to comply with such regulations or provisions of this Act.

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 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 MILLIKIN. Senator Hayden.

STATEMENT OF HON. CARL HAYDEN, A UNITED STATES SENATOR FROM THE STATE OF ARIZONA

Senator HAYDEN. Mr. Chairman, I want an opportunity to just say a few words.

There are 12 great annual appropriation bills and only three of which have passed the Senate, and none of them are law, and work on the Appropriations Committee is such that I cannot attend the hearings regularly.

This is legislation just based on sheer necessity. We have in central Arizona a desert area, the rainfall on the Atlantic coast is seven times as much as it is there. To make up for that moisture deficiency we have to irrigate our land. We have done it by impounding all the water in the streams in Arizona. We have done it by digging wells until we

have exhausted the underground water supply. It is absolutely essential a supplementary water supply be obtained, and the only source is from the Colorado River.

We will demonstrate we have a perfect right to water from the main stream of the Colorado River which will be sufficient to meet our needs. We will demonstrate also successfully it is an engineering possibility to provide that water for the land and ultimately reimburse the Federal Government for the entire cost of the project. We have the climate and the soil and the men with the know-how, who have made the acres as highly a productive place as any place in the United States.

We are exactly in the same situation as they were in the San Joaquin Valley, the same situation in eastern Colorado when they initiated the Big Thompson project.

I want to commend the witnesses who will appear from Arizona. I know they will tell you the truth, the plain unvarnished truth about the situation there. You can really depend on what they have to say.

That is about all I want to say to you this morning because I know there are many to be heard, and simply to impress upon you that there is no other way out.

We have returned to the Federal Treasury many times, every dollar that has been expended in reclamation by taxation, taxes we pay into the Treasury. This will maintain a source of Federal taxation that is of great value, and without the water we cannot do it.

I thank you very much.

Senator MILLIKIN. We are glad to have you, Senator Hayden. Senator McFarland.

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

Senator McFARLAND. Mr. Chairman, I do not want to make a statement as such. I merely want to elaborate just a little bit upon what Senator Hayden has so well said, and to tell you what the Central Valley of Arizona—what the Arizona Central Valley consists of—and to give you an idea of what we expect to show by our testimony.

First, I want to say that I do not believe there is any State that has a higher appreciation of the value of water than has Arizona. We have placed in cultivation in central Arizona approximately 750,000 acres of land. We have done well with the water from the Gila River and the Salt River—the Salt River being a tributary of the Gila River—and by the pumping of water. Now this land is along the Salt River. The Salt River is—let me see if I can locate here on this map—the Salt River is along here [indicating] and here is the Salt River Valley project. In that valley proper there are about 242,000 acres of land. Adjoining that project and down below where the Salt River empties into the Gila River there is additional land, making about 200,000 acres of additional land in cultivation, and on the Gila River as we go on up this way we have the Coolidge Dam and we have the San Carlos project on down below here, which is irrigating this area down here [indicating].

The San Carlos project comprises about 100,000 acres of land, which is half on the Indian reservation and half on white land, and we have, in addition, 150,000 acres, approximately, which are irrigated there

entirely by pumping. Then up the river in Graham and Greenlee Counties, near Safford and Duncan, there are approximately 50,000, and there is a small acreage in New Mexico on the Gila.

The virgin flow of the Gila River at its mouth where it empties into the Colorado is estimated at 1,270,000 acre-feet per annum, so you can readily see that we have overdeveloped these lands within the area of the central Arizona project.

According to the testimony which will be presented here, we are depleting the Gila River at its mouth on the Colorado River by approximately 1,135,000 acre-feet per year.

Now, with that water, we have done all of this development, but in doing that we are exhausting our reservoir in the underground water supply. All of this will be explained to you in detail and I am not going to go into it at this time, although I am rather familiar with it, for the reason that, as attorney for the San Carlos district, before I went on the bench, I represented them in some of the water litigation, and while I was on the bench I presided over two water cases which affected practically every water right in central Arizona.

According to the testimony, we will need as a supplemental water supply for the central Arizona project about 1,200,000 acre-feet of water per annum. The only water supply left that we can resort to is the Colorado River water from the main stream of the Colorado River.

Now, S. 1175 is for the purpose of giving us that water. As Senator Hayden says, and as we will develop here in the testimony we will show a definite and firm right to that water; but in passing I would just like to call your attention to something with which you are all familiar, and that is the Colorado River compact.

As you know, this compact was signed in 1922. Arizona did not want to enter into this compact for the reason that it included the Gila River system of which we were already beneficially using the water as a part of the Colorado River system; we felt the Gila should not be included, and for that reason Arizona refused to sign the compact until provision was made for additional water to compensate her in full for the inclusion of the Gila in the Colorado River system.

The so-called III (a) provision of the compact provides—

that 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 that may now exist * * *

and then after additional verbiage the article known as III (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.

The latter is the amount it was then estimated the Gila River amounted to per year as it emptied into the Colorado; and the provisions for the additional 1,000,000 acre-feet was intended, as the testimony will well show, for the use of Arizona.

Now this contract only divided the water between the upper and lower basins. It did not divide it between the respective States embraced in the upper and lower basins. It did not divide it between the States; and we were never able to come to an agreement with

California as to the division of that water, and for that reason we did not enter into the compact.

Senator MILLIKIN. Senator, it might be a good point to get into the record the division between the upper and lower basins.

Senator MCFARLAND. Well, I did.

Senator MILLIKIN. I mean in terms of totals.

Senator MCFARLAND. There was an apportionment of a total of 15,000,000 acre-feet, with the addition of the 1,000,000 acre-feet for the lower basin, making 8,500,000 acre-feet which might be used by the lower basin, and 7,500,000 acre-feet by the upper basin, for consumptive use.

Now time rocked along and we were unable to come to an agreement. All this will be testified to in detail.

I am trying to give you a little bird's-eye view of what you may expect.

Finally the Boulder Canyon Project Act was passed. California very much needed the Hoover Dam for the protection of the Imperial Valley, and they also needed the dam for water for Los Angeles and other cities, and for the development of hydroelectric power. So, in 1928, then, the Boulder Canyon Project Act was passed. I want to call your attention to the fact that this act, among other things, provided that it would not take effect, that no authority should be exercised thereunder, no work begun or money expended, no water rights claimed or initiated thereunder, and no steps be taken to initiate or perfect any claims to the use of water pertinent to the works or structures provided for in the act, unless and until, first, the seven States ratified the compact, or second—

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 the 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 6-State approval, and the President by public proclamation shall have so declared, and, further—

and this is the important provision—

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.

Then the act further provides:

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;

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;

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—

and so forth.

Now, Mr. Chairman, Arizona did not immediately enter into that compact. All these provisions are evidence of the concern of Congress which required California to enter into this limitation upon its own right to water, thus definitely fixing and protecting the rights of the other six States, and particularly the rights of the lower basin, and more especially by setting out what was the intent of Congress that Arizona should have; namely, 2,800,000 acre-feet, and the million acre-feet of III (b) water, and one-half of excess or surplus water. It is plain that California cannot use any of the apportioned water, as it is so set out in the law, which in effect was a proposal for a contract, and which in fact became a contract later when California passed its water limitation act. Arizona later on ratified the compact, relying upon the provisions of the contract which was thereby made between the State of California and the other States, for the benefit of the other States, particularly for Nevada and Arizona. Our testimony will show that it was the intention of Congress that we would have all of the waters of the Gila River system, which was then estimated at a little over 1,000,000 acre-feet, but roughly speaking it was called 1,000,000 acre-feet.

The only other States that could use this additional water in the river were Nevada and Arizona. The Federal act and the California statute in effect gave to Arizona a total of 2,800,000 acre-feet of apportioned water and Nevada 300,000 acre-feet thereof. Both of these States now have contracts with the Interior Department for that water.

Now, we will show by way of evidence that we have not used anywhere near that amount of water. We are depleting the main stream of the Colorado River, by the use of the Gila River, some 1,135,000 acre-feet. The evidence will show we are otherwise using now less than 400,000 acre-feet of water, 395,000, I believe, to be exact, from the Colorado River proper.

The Senate has passed the Yuma Mesa Wellton Mohawk bill which provides for 600,000 acre-feet of water to be used from the Colorado River; but the latter amount includes 20,000 acre-feet of the 395,000 which I have just mentioned; so it will be readily seen the 1,200,000 acre-feet of water which we hope to bring in through the operation of S. 1175, all of which is firm water, do not exhaust the amount of water to which Arizona is entitled.

Now these matters, as I say, will be explained to you by witnesses in detail, and I do not want to take much more of your time now; but I would like, if agreeable to the Chair, for the Reclamation Service to testify next.

The objective of the bill is proposed to be accomplished briefly by this method: We hope to build a dam at Bridge Canyon; and from Bridge Canyon, here, we hope eventually there will be a tunnel which will bring the water down to this point [indicating], and on through in an aqueduct to Granite Reef, and from Granite Reef to the Ashurst-

Hayden Dam on the Gila River. By trading Colorado River water for Gila River water, we hope to give the people in Graham and Greenlee Counties and in New Mexico a supplemental water supply for lands now under irrigation from water of the Gila River.

We have introduced several bills. S. 433 provides only that water be brought from Bridge Canyon by gravity; but we reintroduced the measure as S. 1175, which provides for the substitution of a pumping plant at Parker Dam, to pump the water up to an elevation where it will run by gravity to Phoenix.

The bill provides for delaying the building of the tunnel and aqueduct until prices come down and economic conditions will justify their construction.

We did that for the reason the cost of construction has so increased that we felt we could save very much by building this aqueduct and by building the pumping plant, the cost of the two being estimated at \$20,000,000. In fact, we would save much more than the cost of the pumping plant, and then it could be used later as a stand-by plant.

The evidence will show just how much that tunnel would cost under present prices, and what it would have cost under 1940 prices, the latter of which being what we relied on when we introduced S. 433; eventually this tunnel should be built, but only when the price of materials and the price of construction go down to the point where it will be more economical to build and use it, rather than to use the high lift at Parker Dam.

With that opening statement, we will now ask the Reclamation Service for their testimony. I believe they have three witnesses, the first is Mr. Warne, Assistant Commissioner of Reclamation.

Senator MILLIKIN. Will you take a seat opposite the reporter, Mr. Warne, and state your name and business?

STATEMENT OF WILLIAM WARNE, ASSISTANT COMMISSIONER OF RECLAMATION AND ASSISTANT SECRETARY DESIGNATE OF THE DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Mr. WARNE. My name is William E. Warne. I am Assistant Commissioner for the Bureau of Reclamation and Assistant Secretary of the Department of the Interior, Designate.

I am appearing here this morning in behalf of the Bureau of Reclamation, and I have with me Mr. Moritz, regional director of region 3 of the Bureau of Reclamation, Boulder City, Nev., who will follow me and give you additional information concerning this proposal.

Mr. Vaude Larson, assistant regional planning engineer for region 3 of the Bureau of Reclamation, in direct charge of investigations of the central Arizona project, in Phoenix.

I am also accompanied by Mr. N. B. Bennett, who is Assistant Director of our Branch of Project Planning and who will be here at the convenience of the committee during your hearings, and Mr. John R. Riter, Chief of the Hydrology Division, whose offices are in Denver and who likewise is here at the convenience of the committee.

Now, for the benefit of the committee, copies of the report which is known as Report on Feasibility—Bridge Canyon Route—Central Arizona Project and Memorandum Supplement Feasibility of Parker Route and Comparison of Parker and Bridge Canyon Routes, are submitted.

Senator MILLIKIN. The one is the tunnel project and the other is the pumping project?

Mr. WARNE. That is correct, sir, and a comparison of the two, all included in the binder here.

This report is preliminary. It is not a report adopted by the Secretary of the Interior as his report but is subject to discussion with the States. It makes a recommendation which will be of interest to the committee.

Senator MILLIKIN. Have you gentlemen from California been supplied with copies?

Senator DOWNEY. Yes, sir.

Senator McFARLAND. May I suggest the advisability of having this report printed as part of this record. There will be so much demand for it I think it will make a better picture if printed as part of the record. The Chair may consider that later on, however.

Senator MILLIKIN. I would like to get a better view of what ultimately will come into the record before I decide on this.

(The report referred to is on file with the committee.)

Mr. WARNE. This report in its preliminary form under the provisions of the Flood Control Act of 1944 was exchanged with the seven States in the Colorado River Basin for their consideration and also with the other agencies of the Federal Government, the Department of Agriculture, War Department, Corps of Engineers War Department, the Commerce Department, and the Federal Power Commission, which are members with Interior of the Federal Interagency River Basis Committee, and that likewise being our common procedure, and they were all told that a hearing had been scheduled on this particular bill and the committee had requested a report on the bill.

We have here copies of letters received in response to that circular.

Now all these commenting agencies recognize this as a preliminary rather than a final report and did not set out their comments in great detail.

One from the Department of Agriculture, the War Department, the Corps of Engineers of the War Department, a copy of which was attached to the letter from Secretary Patterson, from the Commerce Department, from the Governor of California, and from his director of public works, Mr. Charles Percell, letters addressed to both Commissioner Straus and Regional Director Moritz, all with Governor Warren's letter, a letter from the State of Wyoming, the State of Nevada and from the State engineer's office of New Mexico, from the State of Colorado and from the State of Utah, and I suggest, sir, that these might well be useful.

Senator MILLIKIN. We will enter them in the transcript. What reports are missing, if any?

Mr. WARNE. None. The Federal Power Commission—I should have said the Federal Power Commission letter is not here.

Senator MILLIKIN. Are you prepared to give us the gist of these letters at the present time?

Mr. WARNE. Most of them are noncommittal with regard to the matter.

The State of California said that each comment in detail would be submitted to us if and when the report had been adopted by the Secretary of the Interior as his report and thereby proposed for formal submission to Congress.

The State of California indicated in a preliminary way its objection to the project.

Senator MILLIKIN. How about the other States?

Mr. WARNE. The other States did not indicate objections to the project.

Senator MILLIKIN. Did any of them indicate approval?

Mr. WARNE. Some said they would have no further comment on it.

Senator MILLIKIN. Under the law they are required to state their objections if they have any, are they not?

Mr. WARNE. That is correct. None of them assumes that this correspondence is in complete fulfillment of section 4 of the 1944 Flood Control Act. They all recognize it rather as a step in the process of clearance set up by the 1944 Control Act.

Senator MILLIKIN. So far as that provision of the law is concerned, none of these reports can be considered as compliance with that provision of law. Is that correct?

Mr. WARNE. No, sir; and our proposal to the State should not be so interpreted, as it has not been adopted by the Secretary of the Interior as his report.

Senator DOWNEY. Mr. Chairman, to clarify the situation, could I read into the record about five lines in reference to this report?

Senator MILLIKIN. What report are you referring to?

Senator DOWNEY. This preliminary report to which Mr. Warne has referred that was submitted to the different States for comment.

I have a letter dated May 6 on the letterhead of the United States Department of the Interior at Boulder City, by L. R. Douglas, the regional director, in which he is discussing the project planning report to which the Assistant Secretary has been referring, and I read now from his next to the last paragraph:

It has been our view that the data provided in the report and its supplement support our recommendation—and please note that this is our one recommendation—that detailed studies of the central Arizona project be concentrated on the plan employing the Parker route.

Senator MILLIKIN. Go ahead, Mr. Secretary.

Mr. WARNE. I hand you the letters referred to.

(The letters referred to are as follows:)

DEPARTMENT OF AGRICULTURE,
Washington, April 30, 1947.

Mr. MICHAEL W. STRAUS,
Commissioner, Bureau of Reclamation,
Department of the Interior, Washington 25, D. C.

DEAR SIR: Reference is made to your letter of April 11, 1947, addressed to Mr. E. H. Wiecking of this office, regarding the proposals for bringing Colorado River water into the central portions of Arizona, with which you transmitted copies of project planning reports on the proposed Bridge Canyon and Parker routes.

In answer to your inquiry, it is our desire that comments from this Department be included with the material which you will make available for the Senate committee hearings on S. 433. These comments include those made by our field representatives to your regional director, Mr. Moritz, and the following which we transmit for this purpose.

We are of the opinion that the selection of areas to be served by the water of the Colorado River and a commitment relative to the construction program should not take final form until the affected States and the Federal Government have formulated a comprehensive plan for the basin. It is our understanding

that the officials of your agency have recommended such a course of action on several occasions and we find ourselves in agreement with you on this question.

We should like to emphasize, in this connection, that inasmuch as one of the primary purposes to be served is the use of water for agricultural purposes, the agricultural factors should be thoroughly investigated and evaluated as an essential step in the completion of a comprehensive basin plan for construction and development. In our letter of September 27, 1946, to you commenting on the Department of the Interior's Colorado River Basin report, we emphasized this requirement and at the same time, concurred with the opinion expressed in the report that, while considerable information had already been assembled, much work remains to be done before such a comprehensive plan will be completed. According to the above-mentioned report, there is not enough water to serve all the lands otherwise suitable for agricultural use. Therefore, the most beneficial use of both land and water should be of paramount concern.

We take this means of extending again the offer of this Department to participate in cooperation with other Federal and State agencies in the formulation of a development plan for the Colorado Basin.

We trust that these comments will be of value to you and to the Congress in the consideration of the important matters before you.

Sincerely yours,

CHARLES F. BRANNAN, *Assistant Secretary.*

WAR DEPARTMENT,
Washington, D. C., April 30, 1947.

The honorable the SECRETARY OF THE INTERIOR.

DEAR MR. SECRETARY: Reference is made to a letter from Mr. Michael W. Straus, Commissioner of the Bureau of Reclamation, dated April 11, 1947.

The formal views and comments of the War Department with respect to the central Arizona project have not been formulated for the reason that the final report from the Bureau of Reclamation on the central Arizona project has not been submitted for study.

It is my opinion that the Bureau of Reclamation, may at the hearing before the Senate Public Lands Committee in connection with S. 433, "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," offer comments presently made available to the Bureau by the district engineers at Los Angeles. It is necessary, however, that the committee be advised beforehand that the comments are not the official views of either the Secretary of War or of the Chief of Engineers, for the reason that the War Department has not received a final report from the Bureau of Reclamation or the Secretary of the Interior in compliance with the River and Flood Control Act of December 22, 1944.

Sincerely yours,

ROBERT P. PATTERSON, *Secretary of War.*

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 22, 1947.

MR. MICHAEL W. STRAUS,
*Commissioner, Bureau of Reclamation,
Department of the Interior, Washington, D. C.*

DEAR MR. STRAUS: Receipt is acknowledged of your letter dated April 11, 1947, with which you inclosed for my information a copy of a letter to the Secretary of War and two copies of the preliminary report on the central Arizona project.

The Secretary of War will inform you at an early date concerning his views and desires with respect to the release of any comments Mr. Moritz may have received from Col. A. T. W. Moore, the Department's district engineer at Los Angeles, Calif., on the regional director's report on the central Arizona project.

Sincerely yours,

R. A. WHEELER,
Lieutenant General, Chief of Engineers.

BRIDGE CANYON PROJECT.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington 25, April 25, 1947.

MR. MICHAEL W. STRAUS,
Commissioner, Bureau of Reclamation,
Department of the Interior, Washington 25, D. C.
(Attention: 737.)

DEAR MR. STRAUS: Mr. McCoy has asked me to acknowledge and thank you for your letter of April 11 and the accompanying two copies of Report on Feasibility Bridge Canyon Route Central Arizona Project and memorandum supplement: Feasibility of Parker Route and Comparison of Parker and Bridge Canyon Routes, dated February 1947. Mr. McCoy is glad to have these reports in connection with his work on the Federal Interagency River Basin Committee.

Sincerely yours,

V. B. STANBERRY,
Acting Chief, Area Development Division,
Office of Domestic Commerce.

GOVERNOR'S OFFICE, STATE OF CALIFORNIA,
Sacramento, April 21, 1947.

HON. MICHAEL W. STRAUS,
Commissioner, United States Bureau of Reclamation,
Washington 25, D. C.

DEAR MR. STRAUS: I have your letter of April 11, 1947, with reference to project planning report No. 3-8b-4-1, in two volumes, entitled "Report on Feasibility, Bridge Canyon Route, Central Arizona Project" and memorandum supplement to that report, both dated February 1947.

It is noted in your letter that the report is preliminary in character and the values or figures contained therein are not final and have not been approved by the Department and that comments are solicited before the report is put into final form.

The report is presently under review by the Department of Public Works and the Colorado River Board and brief preliminary comments will be submitted to Regional Director E. A. Moritz, with a copy to you before April 30, with the understanding that such comments will be filed with the Public Lands Committee holding hearings on S. 433.

In connection with this matter, I call your attention to section 1 of the Flood Control Act, approved December 22, 1944 (Public Law 534, 78th Cong., 2d Sess), wherein it is provided that the proposed reports of the Secretary of the Interior on works for irrigation and purposes incidental thereto shall be submitted to each affected State for its written views and recommendations which shall be transmitted to the Congress with the report of the Secretary of the Interior. In this case, S. 433 would authorize the central Arizona project without first receiving the official views and recommendations of the State of California and other affected States, which procedure is not in conformity with present policy as set forth in the Flood Control Act of 1944.

The views and recommendations of the State of California will be submitted upon the proposed report of the Secretary of the Interior on the central Arizona project after the receipt thereof.

Sincerely,

EARL WARREN, Governor.

STATE OF CALIFORNIA,
DEPARTMENT OF PUBLIC WORKS,
Sacramento, April 30, 1947.

HON. MICHAEL W. STRAUS,
Commissioner, United States Bureau of Reclamation,
Washington 25, D. C.

DEAR MR. STRAUS: Enclosed is a copy of letter from me to Regional Director E. A. Moritz, submitting preliminary comments on project planning report No. 3-8b-4-1 in two volumes, entitled "Report on Feasibility, Bridge Canyon Route, Central Arizona Project," and memorandum supplement to that report. These comments are submitted in accordance with request contained in your letter to Gov. Earl Warren, dated April 11, 1947.

It is respectfully requested that these preliminary comments be filed with the Senate Public Lands Committee holding hearings on S. 433, with the understanding that the final views and recommendations of the State of California will be submitted upon the proposed report of the Secretary of the Interior after receipt thereof.

Yours very truly,

C. H. PUBCELL, *Director of Public Works.*

STATE OF CALIFORNIA,
DEPARTMENT OF PUBLIC WORKS,
Sacramento, April 30, 1947.

E. A. MORITZ,
*Regional Director, Region III, United States Bureau of Reclamation,
Boulder City, Nev.*

DEAR MR. MORITZ: In accordance with the letter of Gov. Earl Warren to Commissioner Michael W. Straus, dated April 21, 1947, the following brief preliminary comments are submitted on project planning report No. 3-8b-4-1 in two volumes, entitled "Report on Feasibility, Bridge Canyon Route, Central Arizona Project," and memorandum supplement to that report, both dated February 1947.

The State of California is not in accord with the assumption in the report that 1,200,000 acre-feet annually could be diverted from the Colorado River for the central Arizona project based upon interpretation of existing contracts and compacts for Colorado River water made by "responsible officials of the State of Arizona." The availability of Colorado River water for the proposed central Arizona project depends upon the interpretation of the Colorado River Compact, the Boulder Canyon Project Act, and relevant statutes, decisions, and instruments. There are conflicting views in this regard and the State of California does not agree in the interpretation set forth in the report.

In the views and recommendations of the State of California on the proposed report of Secretary of the Interior entitled "The Colorado River," dated February 1947, the following is recommended: "* * * that negotiations be initiated forthwith among the States of the lower basin acting through their respective governors, for the purpose of determining the rights of each of the States of the lower basin to the use of the waters of the Colorado River system, in accordance with the Colorado River Compact, the Boulder Canyon Project Act, and relevant statutes, decisions, and instruments." To date no results have materialized from this recommendation. The feasibility of a project of this character hinges upon the availability and adequacy of the water supply. It is not demonstrated in the report that there is an adequate water supply available for the project.

In connection with the estimation of the requirements for supplemental water for the gross area of 662,000 acres as given in the report, the methods employed therefor and the resulting amounts of supplemental water as calculated are erroneous. Monthly operation studies should be presented setting forth the total annual water requirements by basins for the entire net irrigable area and the local water supplies available, utilizing the storage capacity both in available surface and underground reservoirs and covering a cycle of years.

With respect to the determination of safe yield and overdraft in a ground-water basin, such determination involves evaluation of all items entering into the hydrologic equation. Apparently this has not been done. Preliminary estimates from available basic data indicate the overdraft on ground waters is much less than the figure used in the analysis. Importation of water from the Colorado River to the central Arizona project in excess of actual requirements for consumptive uses would necessitate works for artificial disposal of such excess from the basin to prevent damage to the area. Decrease of proposed diversion to actual water requirements for water conservation and maintenance of salt balance may vitally affect revenues, unit costs, and feasibility of the importation. Obviously, a plan of comprehensive development of the project area should be preceded by a complete and thorough hydrologic and geologic investigation.

Data and information on the financial studies are lacking in sufficient detail for the purpose of a check of the results given in the report. Detailed data should be supplied as to capital and annual costs, and revenues from water and power sales.

These comments are preliminary and incomplete and not to be considered as final. The final views and recommendations of the State of California will be submitted upon the proposed report of the Secretary of the Interior on the central Arizona project after the receipt thereof.

It is understood that the foregoing comments will be filed with the Public Lands Committee holding hearings on S. 433, in accordance with the request of Gov. Earl Warren to Commissioner Michael W. Straus, dated April 21, 1947. A copy of this letter is being transmitted directly to Commissioner Straus.

Yours very truly,

C. H. PUBCELL, *Director of Public Works.*

STATE OF WYOMING,
STATE ENGINEER'S OFFICE,
Cheyenne, April 23, 1947.

MR. MICHAEL W. STRAUS,
Commissioner of Reclamation,
Washington 25, D. C.

DEAR MR. STRAUS: On April 14, 1947, our office received copies of two preliminary reports on the central Arizona project for review and comment, under the provisions of the Flood Control Act of 1944.

This constitutes my comments on the two preliminary reports herein above mentioned.

While I have not had the time to make careful study of these reports, I am of the opinion that the one that merits further consideration is the so-called Parker route.

If our approval of the Parker route is in line with the recommendations of the State of Arizona, you may consider Wyoming as favoring that plan.

Yours very truly,

L. C. BISHOP, *State Engineer.*

STATE OF NEVADA,
OFFICE OF STATE ENGINEER,
Carson City, Nev., April 25, 1947.

HON. MICHAEL W. STRAUS,
Commissioner, United States Bureau of Reclamation,
Washington, D. C.

DEAR MR. STRAUS: First of all, let me apologize for waiting so long in complying with your request communicated to me through Regional Director E. A. Moritz for an opinion on the relative merits of the proposed diversion of Colorado River waters into central Arizona via the Bridge Canyon route, and the Parker route. I can only say that a great press of work has prevented me from making detailed study of the excellent reports submitted by the Bureau. I have, nevertheless, found time to read these reports and find that in the main they agree with my former ideas on this matter.

In my opinion, the Parker route is to be preferred for all of the reasons your engineers have advanced. Less construction risk will be entailed due to the elimination of tunnels, cost of which is always an indeterminate factor. The construction time will be shorter, and the cost substantially lower.

It is noted in your report that the estimated cost will not permit repayment under the existing reclamation laws, and that a large subsidy will be required. Undoubtedly before such construction can be undertaken by the Bureau, amendments of the present law will be necessary.

Another point not cleared up by the report, probably for the reason that it was not considered an appropriate part of such a report, which must proceed on certain definite conditions and assumptions, is that the amount of water available to Arizona assumed to be 1,346,000 acre-feet is not a definitely allocated quantity.

Under the authorized tri-State compact, which is a part of the Boulder Canyon Project Act, Arizona was allotted 2,800,000 acre-feet, Nevada 300,000 acre-feet, and California 4,400,000 acre-feet. There were other conditions as to use of surplus water, the Gila River, etc., not especially pertaining to my comment. This interstate compact has never been ratified. The water allotted to the downstream

States is 7,500,000 acre-feet per year. In this allotment, California has State and Federal rights and contracts on the river for 5,362,000 acre-feet, most or all of which are established by beneficial use. Nevada and Arizona present uses from the river, including the Gila project, are not large. As this tri-State compact did not materialize because of differences of opinion between California and Arizona regarding the meaning of the Boulder Canyon Project Act in this respect, how many Arizona now be assured of 1,346,000 acre-feet of water available at either the Bridge or the Parker diversions? Arizona and Nevada have United States contracts with the Bureau of Reclamation for storage in Lake Mead, but in the absence of any interstate agreement the actual use of water will seemingly depend upon State laws which are based upon priority of claim and beneficial use.

In any event, we will assume that Arizona has rights to water in some amount in the Colorado River, as has also Nevada, for future use.

We favor the Parker route for another reason. This is that the Parker route will leave the Bridge Canyon site free for the construction of a dam for power and flood-control purposes only, without in any way decreasing the water supply to the States or obstructing the required use of such water downstream from Bridge Canyon. If the Bridge Canyon site is used for irrigation in Arizona, a part of its capacity for power will be forever lost to the Colorado River system. There is a rapidly increasing need for more electric energy in Arizona, southern California, and Nevada, and if it can be obtained from new sources it will allow a more flexible and satisfactory operation of Boulder Dam plant. It may also enable Nevada to secure energy more freely from the distressing regulations which now prohibit effective use of the Nevada allotment of energy at Boulder Dam plant.

Very truly yours,

ALFRED MERRITT SMITH, *State Engineer.*

STATE OF NEW MEXICO,
OFFICE OF STATE ENGINEER,
Sante Fe, April 21, 1947.

MICHAEL W. STRAUS,
*Commissioner, Bureau of Reclamation,
Department of the Interior, Washington 25, D. C.*

MY DEAR MR. STRAUS: In reply to your letter of April 11 to Governor Mabry, requesting the comments of the State of New Mexico on the Bureau of Reclamation project planning report No. 3-8b-4-1, dealing with the Bridge Canyon route of the central Arizona project and the supplemental memorandum dealing with the Parker route and comparison of the two routes, the State of New Mexico has no comment to make which would bear directly on this report of feasibility.

New Mexico's reasons for not commenting are as follows:

1. It is apparent from the regional director's letter of transmittal and from the report and memorandum supplement (p. 10, par. 43) that this is in the nature of a reconnaissance report, made as a basis for comparing the feasibility of the two routes, in order that detailed investigations may be made on the one found to appear most feasible. New Mexico has no direct concern in such a report.

2. Certain assumptions have been used in the preparation of data contained in the report, which deal with possible revisions of the reclamation law as set forth in bill S. 2346, introduced in the Seventy-ninth Congress. According to your letter a substitute bill, S. 433, has now been introduced. New Mexico is not in position to comment on the effect of either of the proposed measures, and reserves comment on future findings of feasibility in the light of any legislation pertinent thereto which may be adopted by Congress.

3. This State has not been acquainted with the details of the studies of feasibility, and therefore, must necessarily accept the engineering facts summarized in the report without comment.

Respectfully yours,

JOHN H. BLISS,
State Engineer.
By JOHN R. ERICKSON,
Engineer.

APRIL 16, 1947.

THE SECRETARY OF THE INTERIOR.

SIR: On behalf of the State of Colorado, and pursuant to section 1 of the act of December 22, 1944 (58 Stat. 887), there is herewith transmitted the comments, views, and recommendations of the State of Colorado concerning project planning report No. 3-8b.4-1 dated February 14, 1947, entitled "Report on Feasibility—Bridge Canyon Route—Central Arizona Project" and a memorandum supplement covering the feasibility of the Parker route and comparison of the Parker and Bridge Canyon routes.

These comments, views, and recommendations are submitted under the authority of chapter 265, Session Laws of Colorado of 1937, creating the Colorado Water Conservation Board and defining its functions and in accordance with the designation of such board by the Governor, pursuant to section 1 of the act of December 22, 1944, (58 Stat. 887), as the official State agency to act in such matters.

In response to the inquiry made by Commissioner of Reclamation Straus in his letter of April 11, 1947, you are advised that the State of Colorado desires to have its comments included within the factual materials which the Bureau of Reclamation has indicated that it will make available for the proposed hearings for the Public Lands Committee of the Senate in connection with S. 433.

The comments of the State of Colorado are as follows:

1. The subject report is preliminary in nature and is for the purpose of providing an acceptable measure of the relative feasibilities of the Bridge Canyon and the Parker routes for supplying Colorado River water to central Arizona. The regional director recommends that detailed studies for the project be concentrated on a plan employing the Parker route. This recommendation is concurred in by the Commissioner.

2. Colorado's position is that each State of the Colorado River Basin should decide upon the manner in which it shall use its equitable share of Colorado River water. Colorado's conclusion, therefore, with respect to the subject report is that the choice of routes to supply Colorado River water to central Arizona is an Arizona problem.

3. Colorado believes Arizona's equitable share of Colorado River water is defined within narrow limits by the terms of the Colorado River compact, the provisions of the Boulder Canyon Project Act, the self-limitation statute of California, and the physical limitation for the use of Colorado River water in the lower basin by Nevada, New Mexico, and Utah. All of these factors are recognized in the water delivery contract between the Secretary of the Interior and the State of Arizona dated February 9, 1941.

4. The part of Arizona's equitable share of the Colorado River water supply which is available for the central Arizona project is dependent upon the present and prospective use of Colorado River water by other projects in Arizona.

5. The Secretary has knowledge of all of these factors and it is presumed he will make a finding as to the water supply that is available for the project.

Respectfully submitted.

LEE KNOUS,
Governor and Chairman of the Board.
CLIFFORD H. STONE,
Director of the Board.
R. T. TIPTON,
Consulting Engineer.
JOHN S. BREITENSTEIN,
Attorney.

STATE OF UTAH,
OFFICE OF THE GOVERNOR,
Salt Lake City, April 23, 1947.

Commissioner MICHAEL W. STRAUS,
Bureau of Reclamation, Department of the Interior,
Washington 25, D. C.

DEAR SIR: Receipt of your letter of April 11 and the accompanying report on the central Arizona project is acknowledged.

Mr. Ed H. Watson, State engineer of Utah, has written a letter to Mr. E. A. Moritz, regional director, Bureau of Reclamation, complimenting him on his preparation of a well-written report.

Please be advised that no further comments of factual information will be available for the hearings on Senate bill S. 433 from this State.

Sincerely yours.

HERBERT B. MAW, *Governor.*

Mr. WARNE. The Bureau of Reclamation has been asked to furnish information on the potential central Arizona project. We of the Bureau of Reclamation are always happy to present such facts as we may have on projects which are under consideration in the Congress. It is not my intent to describe in detail the central Arizona project as visualized by the Bureau; I shall leave that for Mr. E. A. Moritz, regional director of the Bureau of Reclamation of Boulder City, Nev., who is here, and Mr. Vaud Larson, of the Phoenix office of the Bureau of Reclamation, who is in charge of the central Arizona studies, who is here accompanying Mr. Moritz. Both will testify later.

The central Arizona project area lies in the valleys and flood plains of the Gila River system in Arizona and New Mexico upstream from the vicinity of Gila Bend, Ariz.

Archeologists tell us that these fertile valleys were first irrigated by the prehistoric Indians called the Hohokam. From notes made at the time of the explorations of the Spanish in the sixteenth century we learn that the Pima Indians were then irrigating land in the same area. From the time of the arrival of the first padres to the present, irrigation has continued to develop in the project area.

The Americans began the development of irrigation from normal stream flows in this area in the latter part of the nineteenth century. By 1900 the need for storage of floodwaters, and regulation of stream flows had become obvious. The first such river regulation in the area here under consideration was accomplished by Roosevelt Dam on the Salt River. That dam, one of the first to be started by the then new Bureau of Reclamation, was completed in 1911.

Subsequently, three other storage dams were built by the Salt River Valley Water Users' Association, on the Salt River between Roosevelt Dam and Granite Reef Dam—the main diversion structure on the Salt River serving the Salt River Federal reclamation project. Two storage reservoirs were formed by dams built on the Verde River, one on the Augua Fria, and one reservoir on the main stem of the Gila River.

Senator MILLIKIN. Are those Federal projects?

Mr. WARNE. Yes; I believe most of them. The Augua Fria is not a Federal project.

Senator MILLIKIN. All except the Augua Fria which you mention are Federal projects?

Mr. WARNE. Yes. The three built by the Salt River Valley Water Users' Association are a supplementary part of the Salt River Valley reclamation project.

Senator MCFARLAND. It might be well to note that the total storage capacity of the dams on the Salt River and the two dams on the Verde is approximately 2,000,000 acre-feet.

Mr. WARNE. The continuing increase in the irrigated areas has led to the almost complete development of the surface flows of the Gila River system, and exhaustive development of ground waters. Structures contemplated under the central Arizona project would conserve small additional flows that are susceptible of conservation, and provide for maximum utilization of the flow of the Gila River system.

Senator MILLIKIN. Do the ground waters feed from the Gila River system?

Mr. WARNE. Yes.

Senator MILLIKIN. They have no independent source of supply?

Mr. WARNE. None that we can conceive of; no, sir.

This additional conservation, however, would not provide adequate supplemental water for the area. Additional water must be obtained from some other source if the present agricultural development in the irrigated area that is encompassed by the proposed central Arizona project is to be maintained at its present level. Let me repeat to make sure the statement is understood that more water is required than is available in the Gila River system to maintain the present farms that have been developed by irrigation in central Arizona.

The only remaining source of substantial quantities of water that might be used in the State of Arizona is the Colorado River. Diversion of Colorado River water into central Arizona has been considered by various engineering and agricultural organizations in Arizona for many years. While the exact date of the first proposal for the diversion is not definitely known, it probably was suggested some time during 1920. Since that time many plans have been suggested. All of these plans, though differing greatly in detail, have one feature in common—the diverted water would be delivered to Granite Reef diversion dam on the Salt River for final distribution.

Senator MILLIKIN. The Verde water would be to the Granite Reef Dam?

Senator McFARLAND. Right along here [indicating].

Mr. WARNE. The Granite Reef if the dam from which diversion was made from the Roosevelt Dam.

Senator MILLIKIN. Is that a part of the original Salt River project?

Mr. WARNE. Yes.

Senator MILLIKIN. There is no new condition involved in the bringing of water to that dam?

Mr. WARNE. I think nothing at that point; no.

Senator MILLIKIN. All right.

Mr. WARNE. By the time the project reaches there, the main structures will have been put in.

Now, Granite Reef, as you say, comprises the major part of the area colored green on that map, which is the irrigated area in central Arizona.

Investigations of these early proposals were undertaken by comparatively small organizations. Surveys and studies were restricted by the lack of sufficient funds to carry out the type of investigative programs required for projects of this magnitude.

Preliminary investigations of the problem were begun by the Bureau of Reclamation late in 1940. In 1944 an agreement between the Bureau of Reclamation and the State of Arizona, providing for joint financing of the investigations, was executed. Under this agreement the recent studies of the central Arizona project have been conducted.

That agreement included advancing by the State of Arizona of \$200,000, and with that \$200,000 and something in excess of \$150,000 of our appropriated funds for general investigation we have carried on the work that has been in progress that has led to this preliminary report.

The studies have provided data for the issuance of preliminary drafts of two reports. The first report entitled "Comparison of Diversion Routes, Central Arizona project, Arizona," was issued in September 1945. That report provided the basis for narrowing consideration of alternatives to two general plans, one employing the Bridge Canyon or "gravity" route, the other using the Parker or "pumping" route. In February 1947, there was issued a preliminary draft of a report entitled "Report on Feasibility, Bridge Canyon Route, Central Arizona Project," with a supplemental memorandum on the Parker route, and a comparison of the two routes. This report provided the basis for a recommendation that detailed studies be concentrated on the plan employing the Parker route. It provides for a long tunnel.

Senator MILLIKIN. How long?

Mr. WARNE. I think altogether some 80 miles.

The people of Arizona have long believed that the future of agriculture in Arizona, and thus the basis of their economy, was directly linked to the Colorado River and the use of its water on lands of the State. Six States, in addition to Arizona, and Mexico, have interests in the Colorado River and its water.

In an effort to apportion the water of the Colorado on an equitable basis, numerous compacts and contracts have been entered into by the States and the United States and a treaty between the United States of America and the United States of Mexico has been effectuated. These documents, as is frequently the case with contracts, are subject to varying interpretations. It is neither the prerogative nor the intent of the Bureau of Reclamation, or Department of the Interior, to adjudicate controversies arising thereunder. In our studies of the central Arizona project, we have used, as a basis for our calculations of available water, the interpretations by officials of the State of Arizona. These interpretations are not those of the Bureau of Reclamation, since, as I have explained, our agency has neither the prerogative nor intention of rendering such interpretations. With the interpretations that were thus provided, our engineers were enabled to proceed with the investigations using a diversion figure for the measurement of water for the project.

The investigations were based on a 1,077,000 acre-foot depletion of the Colorado River by the proposed central Arizona project under the conditions that ultimately would prevail.

Senator MILLIKIN. Under either of the alternatives?

Mr. WARNE. Under either of the alternatives; yes, sir.

This water would be used to replace present overdrafts on the ground-water basis, supplement present surface water supplies, provide for replacement of salt-laden waters, and allow for recreation of some acreage that is presently idle because of lack of water.

Senator MILLIKIN. Let me interrupt.

Mr. WARNE. Certainly.

Senator MILLIKIN. When you speak of depletion of 1,077,000 acre-feet are you figuring on the net or gross depletion after allowance for return flow?

Mr. WARNE. It is net depletion.

Senator MILLIKIN. Net depletion.

Mr. WARNE. Yes.

Senator MILLIKIN. All right.

Mr. WARNE. Let me point out parenthetically that not all the land in the proposed project's surface area that has been irrigated at one time or another would be supplied water by the project. There just is not enough water available.

Districts holding surface water rights have for many years followed a practice of supplementing their water supply by pumping from the underground water basins. I am referring to irrigation districts.

In addition, many areas have been developed which depend solely upon pumping as a source of supply. The expansion of irrigated acreage has brought about an increased dependence on underground storage until about half the water used in the area now comes from that source. This pumpage greatly exceeds the safe annual yield of the ground-water basins.

Senator MILLIKIN. I assume we will have some exact figures.

Mr. WARNE. Mr. Larson and others can give you that in considerable detail.

The water table underlying the most of the land has been lowered until wells on the outer edges of the basin can no longer obtain an adequate supply or have been dried up completely. In addition, sales are being concentrated in the remaining ground water, which makes for a higher mineral content in that water and a higher water requirement on the lands. As these waters are pumped and pumped and percolate and reused again, the salt content rises.

Senator MILLIKIN. What is the average use of Arizona per acre?

Mr. WARNE. It is 3.2 acre-feet.

I would like to point out the position of the Bureau of Reclamation as to the necessity for control of the ground water in the project area, and the relation of pumping in the project area to the successful operation of the potential project.

Ground water is, and always will be, an important contributor to the irrigation water supply. Our plans take into account the important role of the ground water on a controlled basis. However, the lack of adequate control over the use of ground water in the State of Arizona, if continued, would be very detrimental to the project, as well as to the State. In fact, without adequate control of the ground water, the State would probably find itself in a short time, even though the project is constructed, again faced with the situation which now exists.

To assure the solvency of the project throughout its repayment period, and therefore the repayment of the reimbursable portion of the project, I strongly recommend that the State of Arizona enact an adequate ground-water control law.

Senator MILLIKIN. I should like to ask Senator McFarland if you have a code in Arizona with reference to the use of ground water?

Senator MCFARLAND. We have not any that is effective at this time. It only provides for the appropriating of underground water when it is an underground stream.

Senator MILLIKIN. As distinguished from a feeding source to an existing stream?

Senator MCFARLAND. That is right, as distinguished from percolating water. There is nothing to control percolating water, or water that might be in a basin.

Senator MILLIKIN. Proceed, Mr. Secretary.

Mr. WARNE. I understand, sir, that a special call to the legislature has gone out by Governor Osborne and one of the points in that call at the present time is consideration of this matter. They have had it on their agenda for some time down there.

Senator MILLIKIN. Does anyone know here whether any of the States have a comprehensive underground water code?

Senator McFARLAND. New Mexico.

Mr. WARNE. New Mexico has one that is pretty effective.

Senator MILLIKIN. Proceed, please.

Mr. WARNE. In addition to furnishing the project area with a much-needed water supply, the potential central Arizona project would provide for silt retention, flood control, river regulation, municipal water supply, recreation, fish and wildlife propagation, and for the generation of power.

The market area for energy produced in the plants of the potential project comprises the State of Arizona, southern California, and southern Nevada. The area involved is one in which a rapid growth is taking place, and I may add it has been growing rapidly for many years.

Demands for electrical energy are exceeding the capabilities of existing plants. The power plants included in the potential project would have an installed capacity of 770,000 kilowatts. The average annual energy produced during the first 50 years of operation would be 4,491,000,000 kilowatt-hours. Of that total production annually, 1,393,000,000 kilowatt-hours would be required annually, during the same period, for pumping plants of the project if the Parker route were used. Thus an average of over 3,000,000,000 kilowatt-hours annually would be available for commercial sale. This power would provide the increased supply required in the market area for several years after installation.

Senator MILLIKIN. Is there a power shortage at the present time?

Mr. WARNE. A critical power situation in southern California and southern Nevada, and nearly all the areas of Arizona at the present time.

Senator MILLIKIN. What would be the extreme economic area? How far would you reach?

Mr. WARNE. Through interconnections with our power plant on the river as the other power plants presently are being interconnected, this power from this project could reach several areas.

Senator MILLIKIN. It could reach where?

Mr. WARNE. Well, the greater metropolitan area of Los Angeles, Tucson, and points in Arizona, and it would serve the area Las Vegas and Midway and those now industrial areas of southern Nevada. In other words, it would be contemplated this power from Bridge Canyon Dam would go into the system and would supplement and augment the supplies from Davis Dam and Parker Dam, which are already there or will be there before Bridge Canyon.

The cost of the project is high. However, provisions of the bill, S. 1175, would afford a basis for repayment of its reimbursable costs.

The proposed project is one to rescue an existing agricultural system of proven productivity upon which the economy of the State of Arizona is based. A serious reduction in the productivity of the lands of central Arizona presently is threatened. If possible to do so, it will be of great value to the Nation to avoid the consequences to

Arizona of a failure to supplement the supply of water available to lands in the Gila River Basin.

Senator MILLIKIN. What is your total water head from the pumping station to the general impounding dam you mentioned a while ago? What is the name of that impounding dam?

Mr. WARNE. That is the diversion dam at Granite Reef.

Senator MILLIKIN. What is your head?

Mr. WARNE. It is 1,985 feet lift—to get it high enough to flow through the aqueduct.

Senator MILLIKIN. Are there any intermediate pumping plants?

Mr. WARNE. Combined pumping plants, four. There would not be any others. There is one in the vicinity of McDowell site. That is a special one to get it into a higher canal. That is not a part of the initial Parker aqueduct main system.

Senator MILLIKIN. I suppose your power would be made under the pumping-plant theory at the beginning of the line of the project?

Mr. WARNE. No, sir; all power would be made in the main at the Bridge Canyon Dam site above the Hoover Dam at the head of Lake Mead, so that Bridge Canyon Dam and the aqueduct would be considered part of this potential project.

Senator MILLIKIN. All right. There will be no power features from the pumping plant over to your distribution system?

Mr. WARNE. No; there will be no generation from the aqueduct itself.

Senator McFARLAND. Am I not correct, if and when this tunnel is built, there will be a drop of 100 feet?

Mr. WARNE. Yes; there will be a drop near the junction point of the tunnel and the Parker aqueduct dam.

Senator MILLIKIN. What are the total costs of the project and how are those costs allocated?

Mr. WARNE. I believe Mr. Moritz can answer that question better than I.

Senator MILLIKIN. Never mind.

Mr. WARNE. I believe the cost is approximately \$600,000,000.

Senator MILLIKIN. Never mind.

Senator McFARLAND. I may call attention to the three dams now on the Salt River and Verde. There is now less than 300,000 acre-feet of stored water and Coolidge Dam is dry.

Mr. WARNE. There is this year, as Senator McFarland has stated, as there was in 1940, a serious water shortage in the whole of the southwest country, especially in Arizona.

Senator MILLIKIN. Any questions?

Senator DOWNEY. I have a few, very few questions.

Senator MILLIKIN. Proceed, Senator.

Senator DOWNEY. As I understand from correspondence which has been submitted to me, an excerpt which I read, the whole recommendation of the Department of the Interior so far on this project is that additional studies be made as to the Parker pumping route?

Mr. WARNE. Yes; the Department has not in fact made a formal recommendation with regard to the project. Our Bureau of Reclamation recommends as to that and we concentrate our efforts on the Parker pumping route.

Senator DOWNEY. How long do you anticipate it will be before there are findings on the Parker pumping route?

Mr. WARNE. Well, some of the findings that are missing at the present time are not really findings that have direct reference to any of the proposed routes for getting the water to central Arizona, but deal with other matters, but we can usefully employ additional time on perfecting our engineering plans on the Parker route.

Senator DOWNEY. As I understand the law, before the Department of the Interior can make a recommendation on this project, your final recommendations must be submitted to the seven States?

Mr. WARNE. That is right.

Senator DOWNEY. How long will it be before the Department of the Interior is ready to submit its data and proposed recommendations to the seven States?

Mr. WARNE. I cannot tell you, sir. We do not have a schedule that will enable me to fix a date to that point.

Senator MILLIKIN. Would it be a month?

Mr. WARNE. Oh, no; it will not be a month or 6 months.

Senator MILLIKIN. A year?

Mr. WARNE. It could not be less than a year.

Senator DOWNEY. And it might be several years?

Mr. WARNE. Well, it could be. We need to know a little better the needs of the several States with regard to the water supply.

Senator DOWNEY. Do you need to know a little bit more about the economic advisability of it before you reach a final conclusion?

Mr. WARNE. No; the economics of it would not fit under the 1939 Reclamation Project Act, but we do know considerably about the economics of the project, and we know about what the limits of the project are from the point of view of being able to repay the irrigation costs, and also to be able to tell approximately the power from the dam.

Senator DOWNEY. Mr. Warne, after the Department has reached its final conclusions and assembled its final data and made its recommendations, a year from now or longer, then how much time after that may under the law be originally consumed by the States in their investigation of your data and their comments upon your recommendation?

Mr. WARNE. They are given under the Flood Control Act 90 days to make and submit comments on the departmental report.

Senator DOWNEY. I understood you to say there was presently a deficiency of hydroelectric power in Arizona and southern Nevada. Is that so?

Mr. WARNE. Yes; and also in southern California.

Senator DOWNEY. We would be prepared on that. I am asking about Arizona and Nevada.

Mr. WARNE. Yes; that is true.

Senator DOWNEY. Now is it not true that Arizona has the right to purchase and utilize 18 percent of all power that is generated at Hoover Dam?

Mr. WARNE. Yes. The law provides the State of Arizona can withdraw for its use 18¾ percent of the power to be generated at Hoover Dam.

Senator DOWNEY. And how much of that is Arizona now using?

Mr. WARNE. She is not utilizing power from the dam at the present time.

Senator DOWNEY. And why not, if she needs it?

Mr. WARNE. You will have to ask the State of Arizona that.

Senator DOWNEY. You are the one who stated that there is a deficiency in the State of Arizona.

Mr. WARNE. That is a fact. There is a deficiency at the present time, and Arizona agencies are buying power from Parker and preparing to buy power from the Davis Dam.

Senator DOWNEY. Would not the 18 percent from Hoover Dam supply all the water-power requirements for several decades to come?

Mr. WARNE. I would doubt that.

Senator DOWNEY. How much is the power generated at Hoover Dam? Give the amount in kilowatts.

Mr. WARNE. It is 4,250,000 firm.

Senator DOWNEY. Which is about the same amount of power which you believe will be generated by this project?

Mr. WARNE. That is right.

Senator DOWNEY. The State of Nevada likewise has a right to 18 percent of the power from Hoover Dam, has it not?

Mr. WARNE. Yes; it has.

Senator DOWNEY. How much of that is being utilized?

Mr. WARNE. They are taking part of it at the present time. They are not taking the full amount. Perhaps Mr. Moritz can tell you.

Mr. MORITZ. They are taking about 20 percent.

Mr. WARNE. About one-fifth.

Senator DOWNEY. They did formerly take a considerable amount, which was utilized in factories at Las Vegas?

Mr. WARNE. The big factory, the magnesium plant at Las Vegas, I do not believe came under the withdrawal of Nevada power. It came under some arrangement worked out by the agencies for temporary use.

Senator DOWNEY. As I understand, it is anticipated that of the 5,000,000,000 kilowatt-hours that will be generated under this project that is being contemplated, and if it is ever constructed, about a third will be required for the pumping of this water up 1,000 feet from Parker Dam to the necessary elevation in Arizona?

Mr. WARNE. That is about right; yes, sir.

Senator DOWNEY. You say there is a deficiency of power in southern Nevada and Arizona that should be made up by construction of this dam.

Now, how much do you think of the remaining two-thirds of that power could ever be used in Arizona and Nevada?

Mr. WARNE. Well, I do not have those figures. I think some of our power people here—Mr. McPhail can answer. Can you answer that question, Mr. McPhail?

STATEMENT OF H. F. McPHAIL, DIRECTOR, BRANCH OF POWER UTILIZATION, BUREAU OF RECLAMATION

Mr. McPHAIL. I cannot answer offhand. We can present that information.

Senator DOWNEY. I would like to have it presented in two forms; that is, how much additional power will be required by southern Nevada and Arizona, and when it will be required, above and beyond their present right to take 36 percent of the Hoover Dam power production.

Senator MILLIKIN. Will you please furnish for the record full information on the point the Senator has raised?

Mr. MCPHAIL. Yes, sir.

(The information requested is as follows:)

Estimated power-load growth for lower California, Arizona, and southeastern Nevada in Bridge Canyon power market

[In thousands]

	1945, actual	1950, estimated	1960, estimated	1970, estimated
Southern California:				
Energy (kilowatt-hours).....	10,031,000	13,192,000	21,358,000	30,547,000
Demand (kilowatts).....	1,757	2,496	4,152	6,052
Arizona:				
Energy (kilowatt-hours).....	1,752,000	2,516,000	3,678,000	4,544,000
Demand (kilowatts).....	343	481	713	886
Southeastern Nevada:				
Energy (kilowatt-hours).....	233,476	506,313	880,741	1,179,180
Demand (kilowatts).....	65	116	201	269

FURTHER STATEMENT OF WILLIAM E. WARNE

Senator DOWNEY. Now, Mr. Warne, is not what you are talking about—that this project must be ultimately financed by the sale of this great body of power in Los Angeles?

Mr. WARNE. No doubt the greater portion of it will move into the Los Angeles metropolitan area.

Senator DOWNEY. Is not the whole financial structure of the plan based on that?

Mr. WARNE. The financial structure of the plan is based on selling power; but this is good power, and Los Angeles badly needs it.

Senator McFARLAND. And if they do not want it, we will find a market for it.

Senator MILLIKIN. Of the power which it is possible to generate at Hoover Dam, how much is being used?

Mr. WARNE. All has been, I think, without exception from the outset. As a matter of fact, there has been pressure on us nearly every year to release water that was not needed for irrigation to increase the power output at Hoover Dam.

Senator MILLIKIN. Is that the long-term prospect?

Mr. WARNE. Yes, sir.

Senator MILLIKIN. That is, that all the power produced at Hoover Dam would be used?

Mr. WARNE. Yes; and not only that, but power from Parker and Davis Dams, and I do not think there is any question about the market absorbing, not only the power from Bridge Canyon but power from other dams possibly on the lower Colorado.

Senator MILLIKIN. Would it be fair to say if Arizona exercises the right to 18 percent of the Hoover Dam power, it would thereby lessen the supply, 18 percent, where it is now being used?

Mr. WARNE. Yes.

Senator DOWNEY. Do you know anything about the plan of the Los Angeles Water and Power Bureau, of Los Angeles, to put in additional steam plants to generate electricity?

Mr. WARNE. Well, I know they have been contemplating that. I understand, however, that the fuels that have commonly been used in

southern California for steam, namely, oil and gas, are not nearly so plentiful as earlier, and I think without doubt that every hydroelectric possibility on the Colorado River will be needed seriously, not only by Los Angeles but by these other areas, before its installation can be completed.

Senator MILLIKIN. Senator Downey, may I inquire if that steam is from oil or coal?

Senator DOWNEY. Oil and natural gas, but I think our supplies of natural gas are pretty adequate.

Mr. WARNE, I do not want to belabor this point, because I think there will be experts on it, but I think it goes right to the heart of the matter.

It is true, that in order to work out the financial structure of the central Arizona project it has been contemplated it will be necessary to sell the great percentage of this power in the southern California market at a price sufficient to pay out the project, whatever that price may be?

Mr. WARNE. Yes, sir.

Senator DOWNEY. All right; I think that is all.

Senator McFARLAND. I have just two or three questions, Senator.

Senator MILLIKIN. Senator McFarland.

Senator McFARLAND. You mean to sell it—that is, power—in Los Angeles or other areas?

Mr. WARNE. Yes.

Senator McFARLAND. There are other places where there is a market for power?

Mr. WARNE. Yes; the metropolitan area of Los Angeles is a principal power market area at the present time, and also it is one that is most seriously threatened with depletion of its present supplies.

Senator McFARLAND. That is the reason you mentioned that area primarily, because they are badly in need, and not mentioning other areas?

Mr. WARNE. I do not think it is any question about their wanting it.

Senator DOWNEY. You are not answering Senator McFarland's question.

Mr. WARNE. It is a big market.

Senator MILLIKIN. We will have testimony on that?

Mr. WARNE. We will have testimony on that.

Senator MILLIKIN. By experts who will tell about that and deal with the power that is to be generated, where it is expected to be sold?

Mr. WARNE. Yes, sir.

Senator McFARLAND. We will do that, and will have it developed that if Los Angeles does not want it, it is wanted in other places.

Senator MILLIKIN. Are there any further questions?

Senator McFARLAND. That is all.

Senator MILLIKIN. I have a letter from Senator Wherry, who asked me to read it into the record. It is dated today, June 23. [Reading:]

My good friend Sam R. McKelvie, who you will recall as former Governor of Nebraska and a prominent rancher and farm-magazine publisher, is vitally interested in legislation in behalf of the central Arizona project and Senate bill 1175, which I am advised is before your subcommittee for hearing today. Because it is necessary for me to be in attendance at other committees this morning, I shall deeply appreciate your acceptance of this letter in lieu of a personal appearance by me. Governor McKelvie desires to be on record in favor of this project; but since he was unable to make the trip to Washington today, he has

asked me to submit for the record the following extracts from recent letters which he has sent to me:

"We have purchased a small irrigated tract in this beautiful valley (Salt River Valley) and are very busy improving it for a winter home. The time we have spent in Arizona acquaints me with the imperative need for Government aid in preserving one of the richest agricultural regions in the United States. Maricopa County stands fifth in value of agricultural products.

"Bear in mind that this is not a new project. All of it is now richly producing farm land. Successive droughts have reduced the supply of gravity water for irrigation to a fraction of reservoir capacity. To meet this pump irrigation has accentuated an already serious situation.

"Additional water from the Colorado River has been allocated to Arizona. The need now is to make it available. That requires an act of Congress.

"This is not a case of bringing new lands into production, but of saving what we already have. It would be short-sighted economy to lose millions of dollars in productive value and income, already existent by failure to do a little more in preserving it."

Senator Wherry continues:

I am also attaching a newspaper clipping dealing with the problem in the central Arizona project area, which is likewise submitted by Governor McKelvie. I am confident that your committee will give every consideration to the thoughts of Mr. McKelvie, who is held in the highest regard by all of us in Nebraska.

The letter will appear in the transcript, and the clipping will be filed in the record.

(The clipping referred to was received and is filed with the committee.)

Senator McFARLAND. There are only one or two questions I want to ask. I will pass over the power situation, as suggested by the Senator.

Mr. WARNE, you would not advise any more engineering data on the Parker route until it is known whether it is going to be authorized, would you?

Mr. WARNE. I think we have about all the engineering data that is needed.

I would rather have Mr. Larson say. There may be some other matters that could be handled.

We do know now sufficient about the Parker route that it can be built, and it is feasible from an engineering point of view.

Senator McFARLAND. You know the approximate cost?

Mr. WARNE. Yes; we do.

Senator McFARLAND. And you know the approximate amount that would be realized from the sale of water and power from the building of this project?

Mr. WARNE. We have run our calculations on this.

Senator McFARLAND. And you know the approximate amount of water there is in the Colorado River?

Mr. WARNE. Yes.

Senator McFARLAND. So far as your department is concerned, the only thing that you do not have at this time is the comment of the other States in regard to this project?

Mr. WARNE. Well, we do not have the comments of the other States; that is right.

Senator McFARLAND. And for that reason, you have not made a recommendation as yet—that is, as far as coming out and making an outright recommendation?

Mr. WARNE. Yes; for that reason and the further reason that under our calculation so far run, the project would not fit the dominant authorized feature of the 1939 Reclamation Project Act.

Senator McFARLAND. But that is true of almost all projects up and down the river, is it not?

Mr. WARNE. It is true of a great many of them; yes, sir.

Senator McFARLAND. If Congress should liberalize repayment provisions in this act as has been set out in this bill, would you have any difficulty in completing your data as provided under the bill?

Mr. WARNE. Well, I think that is right. We could go ahead.

Senator McFARLAND. So there is really nothing to wait for, if Congress adopts the policy for you?

Mr. WARNE. That is right, and if in debating the policy it clears up the water question, as it would—

Senator McFARLAND (interposing). And of course in making this report and presenting this evidence, you have for the purpose of this presentation taken the position on the theory that the water is available as Arizona contends. That is it?

Mr. WARNE. That is right.

Senator McFARLAND. And you would never be in position to determine the law anyway, would you?

Mr. WARNE. No; I am afraid we would not.

Senator McFARLAND. So we had just as well go ahead now and determine it in Congress—whether Congress is going to do anything—as we would a year, 2 years, or 5 years from now?

Mr. WARNE. Well, certainly we advocate the settlement of this issue. If Congress is to settle it, it might just as well do it now as 5 years from now.

Senator McFARLAND. There is no use of waiting then for it to be settled, if it is settled as we say?

Mr. WARNE. No.

Senator McFARLAND. I think it is clear, Mr. Chairman, the engineering data is complete; and as far as the authorization is concerned, we will present our position, which we feel without any question has already been settled by act of Congress, and by the United States entering into this contract with the State of Arizona—

Senator MILLIKIN. When do you expect to have your report complete so the States may in turn enter their formal approval or objection?

Mr. WARNE. We have been working on this steadily for some 6 or 7 years. We do have the material from which the final report can be prepared.

There are several questions here that have a bearing on that report. One is, the project cannot be used under the 1939 act.

Senator MILLIKIN. Are there any impingements under the 1939 act represented by this bill?

Mr. WARNE. No, sir; none.

Senator MILLIKIN. And how much time is required under this bill?

Mr. WARNE. Eighty years.

Senator McFARLAND. That is the way you have it?

Mr. WARNE. Yes.

Senator MILLIKIN. I would like to get it a little more definite as to when you will have your report ready.

Mr. WARNE. We have been working on it steadily. It is my estimation it will take another year to complete that report. It might be done a little sooner than that, but it may not.

Senator MILLIKIN. Any further questions?

Senator DOWNEY. I have one or two brief questions.

Senator MILLIKIN. Senator Downey.

Senator DOWNEY. I hold here a copy of the letter dated April 11 from Mr. Straus, and the second paragraph reads as follows:

As you will observe these reports give information as developed to date from the Central Arizona project. As those investigations are in a preliminary stage, the values of the figures included in the report are not final and have not been approved by the Department.

Is that a correct statement?

Mr. WARNE. Yes, sir.

Senator DOWNEY. I now reread the excerpt from Mr. Douglas' letter I read before:

It has been our view that the data provided in the report and supplement support our recommendation—and please note that this is our one recommendation—that detailed studies of the central Arizona project be concentrated on the plan employing the Parker route.

Does that properly express the present attitude of the Department of the Interior?

Mr. WARNE. That certainly expresses the attitude of the regional office and it has not been changed by action in the Department to date.

Senator DOWNEY. That is all.

Senator McFARLAND. You say "preliminary"; any figure is "preliminary" until a contract is let.

Mr. WARNE. It is still preliminary. It is preliminary until we are done.

Senator McFARLAND. So the figures you have in here are just as final as they will be in any other report, except as they may be changed by the changes in prices and labor and so forth?

Mr. WARNE. I think they are in about the same state as most of our other reports.

Senator McFARLAND. And in the same state as most of them are when legislation is passed authorizing a project?

Mr. WARNE. I think that is right; yes. It depends on when your engineering investigations are made. You can carry them on. You run some risk of changes in your estimate.

Senator McFARLAND. So far as the major portion of this project is concerned—that is, the part of it which consists of the Bridge Canyon Dam and that part which consists of the pumps which would lift the water—I am talking about the Parker pumping plan and the aqueduct from the lake over to Granite Reef and from Granite Reef over to the Ashurst-Hayden Dam—those figures are all as correct as they need to be until you actually start in to construct the aqueduct; are they not?

Mr. WARNE. Well, I think you could expect that at the present time for that purpose there has been much more work done on the Bridge Canyon Dam, some \$400,000 which had been spent in preparation of construction of the dam earlier, and I think probably we have got enough information now to go ahead with the Bridge Canyon Dam.

Senator McFARLAND. But as far as concerns the aqueduct, which we are postponing, you do have sufficient data to know that the cost increased about how much since 1940?

Mr. WARNE. Sixty percent.

Senator McFARLAND. And that you would not need to have more engineering data later on when it was thought it would be economically feasible?

Mr. WARNE. Now you are talking about the big tunnel?

Senator McFARLAND. Yes; the alternate route.

Mr. WARNE. The alternate route is not engineered to completion. We have done considerable work on it this last year in order to make sure our recommendation was correct.

Senator MILLIKIN. I should like to ask you whether it is the desire of the sponsors of the bill that it be considered on its own bottom so far as the pumping project is concerned, or do we take a double view of it and look to the future in connection with possible completion of the tunnel?

Senator McFARLAND. We would like to take a double view of it in the long run; but as far as the present is concerned, it is desired only to consider the Parker route, because we have provided in the bill that the other need not be done until the economic conditions justify it, which might be a year or years to come; but we do feel ultimately that the tunnel should be built and I think everyone interested will want it to be built. It may be 25 years from now, or it may be a hundred years from now.

Senator MILLIKIN. What is the ultimate weighting you wish the committee to give to the ultimate possibility of the tunnel?

Senator McFARLAND. The only present thing about the tunnel is this: We would like the committee to authorize that it be built, if and when the economic conditions would justify. We would rather not have to go back and get another bill at that time, but we have no intention of doing any construction or asking for an appropriation to be made for it until prices and labor go way down from what they are now.

We originally started out with all of it, and in view of the cost at that time, under S. 433, it was feasible, as we said, to have it in the bill; but the prices have gone up so much that it is not feasible at this time.

Senator DOWNEY. I had one very brief question on another matter.

Senator MILLIKIN. Senator Downey.

Senator DOWNEY. Mr. Warne, has it not been the position of the Interior Department and Bureau of Reclamation that the dispute between Arizona and California as to their respective rights in the Colorado River could never be fairly or conclusively settled except in the Supreme Court of the United States?

Senator McFARLAND. Mr. Chairman, I do not think that is a fair question.

Senator DOWNEY. That is a question that calls only for a "yes" or "no" answer.

Mr. WARNE. No, I do not think so. I do not think our Department has taken the position it had to go to the Supreme Court for an equitable settlement.

We are cognizant of the fact it has not been settled; that the two States are still in disagreement.

Senator DOWNEY. That is all.

Senator MILLIKIN. Have you finished your answer?

Mr. WARNE. Yes.

Senator MILLIKIN. Who is the next witness, Senator McFarland?

Senator McFARLAND. Mr. Moritz, regional director, region 3.

**STATEMENT OF E. A. MORITZ, REGIONAL DIRECTOR, REGION III,
BUREAU OF RECLAMATION**

Mr. MORITZ. Mr. Chairman.

Senator MILLIKIN. State your name and business.

Mr. MORITZ. Mr. Chairman and gentlemen, my name is E. A. Moritz, regional director of region III of the Bureau of Reclamation. I appreciate the opportunity of presenting to you the information I have on the central Arizona project.

The Commissioner has outlined the central Arizona project and the position of the Bureau of Reclamation. I shall expand upon the foundation thus laid, but will leave the details for Mr. Larson, who has been very closely connected with the investigations. The investigations have been conducted to determine the best method for providing a supplemental water supply for the project area.

Central Arizona has been the center of an agricultural development that started in 1867, when a canal that delivered to about 1,700 acres was completed. By 1880 five more canals had been constructed, the irrigated acreage increased to more than 8,000 acres, and the population to 10,000. From that beginning the area has expanded until in 1944 about 575,000 acres were irrigated. Most of the population, urban and rural, is dependent directly or indirectly upon agriculture for its livelihood. By 1946 the population of the project area was 387,000.

In a desert area the establishment of an economy based on agriculture is not an easy task. The growth of the area to its present position in the agricultural field was accomplished, first, by construction of canals and temporary diversion dams which made use of the normal flow of the rivers; second, by construction of dams such as Roosevelt on the Salt River and Coolidge on the Gila River—to mention only two—which developed hold-over storage so that almost the entire surface flow could be used for irrigation; and, third, by pumping from the underground.

During the period 1940-44 the average irrigated acreage was about 566,000 acres. Of this acreage 428,000 acres were supplied by varying percentages of surface and underground water, and 138,000 acres were irrigated entirely by water pumped from the underground. There is, of course, considerable land that has established water rights to surface flow sufficient for their requirements. Actually, however, practically no land has been supplied entirely from surface water for the past several years.

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 1,673,000 acre-feet. This figure includes some reuse of surface water. To supplement the surface supply an average of 1,163,000 acre-feet was pumped from the underground for 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 basin, as estimated by the Geological Survey from preliminary studies.

Obviously, continued pumping at the present rate will lower the water table to such a point that many of the wells will become dry holes. 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.

Reduction in pumping to the safe annual yield of the ground-water basin would reduce a portion of the presently irrigated land

out of production. This reduction, coupled with a further reduction that will be required for maintenance of a salt balance in the area, will eventually return about one-third of the irrigated land to idleness and desert. In the testimony to be given by Mr. Larson, he will elaborate on these items, so I will not consume time now with details.

I do wish to point out the necessity for the enactment of an adequate ground-water code by the State of Arizona. A law regulating pumpage from the underground is essential to the operation of the project proposed in the bill under consideration.

In an effort to determine what relief could be afforded the area, the Bureau of Reclamation started in 1940 the investigation of a diversion route, similar to the one we now designate as the Parker route, to bring Colorado River water to central Arizona. These investigations were discontinued shortly after the beginning of the war. At a special session of the Arizona Legislature held in February 1944, funds in the amount of \$200,000 were made available to be used—

to make surveys, investigations, and compilations of the water resources of the State, and their potential development.

On July 31, 1944, the Bureau of Reclamation and the State of Arizona consummated a contract authorizing the Bureau to conduct the investigation on a cooperative basis, each party to make available the sum of \$200,000. Actual work started under this contract in August 1944 and has continued to date.

Numerous routes have been considered for the transportation of Colorado River water to central Arizona. They have all been studied and analyzed sufficiently for the purpose of comparison. On a comparative basis, financial studies indicate the most favorable return-cost ratios for the Parker route and the Commissioner has recently approved concentration of the more detailed investigations on the project plan employing this route.

Our studies have indicated the need for a supplemental water supply if the existing economy of the area is to be maintained. The surface water that could be developed in central Arizona is minor—far from sufficient to meet the need for supplemental water. The ground water is at present being seriously depleted and, therefore, must be replaced in part by a supplemental supply if the present agricultural development is to be continued. The only source of an adequate supply is the Colorado River. In estimating the amount of water which could be diverted from the Colorado River for the central Arizona project, the Bureau has made no attempt to interpret the Colorado River compact, and associated documents. The necessary interpretations are those of the State of Arizona. The use of these interpretations is not intended to prejudice the contentions of other Colorado River Basin States. The Bureau of Reclamation has neither the authority nor the wish to adjudicate these contentions.

Complete development of the project, as visualized by the Parker route plan of development, would cover a wide area and include many features.

The wall chart depicts the different features.

The Bridge Canyon Power and Dam plant is the key structure so far as power is concerned and would supply the power needed for pumping water into the aqueduct.

The elevation of the Granite River Reservoir which is the focal point for the delivery of all waters under the plan is in the neighborhood of 1,300 feet.

The reservoir elevation above Parker Dam from which reservoir the water will be pumped into the aqueduct is 450 feet.

The total lift is 985 feet to the last pumping plant.

There will be four under this plan, four different plants, which will be part of the project.

That brings the water up high enough so the balance of the run to Granite Reef Dam would be by gravity.

The Bluff Dam, which is in Utah is for the purpose of river regulation, flood control, and silt retention. It is a necessary part of the construction of Bridge Canyon because it is needed for the retention of silt. The reservoir above the potential Bridge Canyon site has a capacity of only about $3\frac{1}{4}$ million acre-feet, which would be dissipated very rapidly if silt kept pouring into it at the rate it does naturally.

Is there a question, Senator?

Senator MILLIKIN. No. Go ahead.

Mr. MORITZ. The Coconino Dam on the Little Colorado River, which is a tributary to the main Colorado and runs into it just above the Grand Canyon, has a similar purpose as the Bluff Dam and Reservoir.

The other development proposed as a part of the over-all project would include McDowell Dam and adjacent pumping plants.

The purpose of that dam and plant at that point would be to take the excess flows from the aqueduct during periods when the water was not needed immediately for irrigation purposes. The plan contemplates pumping water continuously at full capacity through the aqueduct over an 11 months' period, allowing about a month for general maintenance work. During that time the requirements for water are not necessary. During that period it would be pumped for conservation and use later.

Now, to get to the higher elevations of the green area that you see on the map, which area is now inadequately supplied with either pumped or surplus water, a diversion canal is proposed from a point above Stewart Mountain Dam. Therefore, it will take water from Salt River and will be diverted by a stream from there, and in exchange for that water the Granite Reef aqueduct will supply the equivalent. In other words, that is an exchange of water plan that is involved in the project.

The other project mentioned are supplementary to the whole project in order to conform to the water supply of the entire Central Valley, the Stafford Valley land on the Gila River. The Hooker Dam site serves other purposes to the other dam site, flood control and supplemental water.

The Charleston Dam, in addition to irrigation, will firm and store up water supply on the San Pedro River, and also supply the municipal supply to the city of Tucson.

I think that pretty well covers all the facts.

Senator MILLIKIN. Any questions?

Senator DOWNEY. I have a few, Senator.

Senator MILLIKIN. Go ahead, Senator.

Senator DOWNEY. Mr. Moritz, what is the total average, safe annual consumptive supply of water in the Gila Valley?

I am talking about the entire amount of water that may be of beneficial use.

Mr. MORITZ. In the Gila Valley?

Senator DOWNEY. In the Gila Valley.

Mr. MORITZ. I would like to call on our hydrologist.

Senator DOWNEY. Well, you have your figures in your statement here, Mr. Moritz. You say the 1941-44 annual surface water supply was 1,673,000 acre-feet.

Is that a figure that may be safely relied upon over a long period of time?

Mr. LARSON. That is about an average figure for that controlled run-off in that area.

Senator DOWNEY. Then you said that, to supplement the surface supply, an average of 1,163,000 acre-feet was pumped from the underground for 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 basin.

If we deduct that 488,000 from 1,163,000, the result would indicate that there is about 700,000 acre-feet of safe yield in the underground supply. Is that correct?

Mr. LARSON. Six hundred and ninety-five thousand.

Senator DOWNEY. Your figures would indicate that Arizona has a consumptive use in the Gila, without perhaps certain other additions I will ask you about, of about 2,375,000 acre-feet. Is that correct, Mr. Moritz?

Mr. MORITZ. I think so.

Senator McFARLAND. Now the consumptive use—

Senator MILLIKIN. Senator McFarland, let the witness answer.

Senator McFARLAND. I think he answered.

Senator MILLIKIN. Read the answer.

(The reporter thereupon read the answer of Mr. Moritz as recorded.)

Senator DOWNEY. Is there other water available there farther down the stream that is not in these figures of yours that we have had so far?

Mr. MORITZ. On the Gila?

Senator DOWNEY. They are doing some irrigation there, but it is a very minor item?

Mr. MORITZ. Yes; mostly pumping.

Senator DOWNEY. Do you consider the Gila River a part of the Colorado River system?

Mr. MORITZ. It is a tributary to the Colorado.

Senator DOWNEY. You know it is a part of the Colorado River system, don't you, Mr. Moritz?

Mr. MORITZ. It is a part of the Colorado River system; yes, I would say it was.

Senator DOWNEY. So Arizona has available a safe average annual supply of about something around 2,000,000, almost 400,000 acre-feet of beneficial consumptive use in the Gila.

Mr. MORITZ. What was that figure you said?

Senator DOWNEY. I said 2,375,000 acre-feet. So, consequently, she has that much of the beneficial use there in the Colorado River system. Is that correct?

Mr. MORITZ. Yes, sir.

Senator DOWNEY. That is all.

Senator MCFARLAND. What is the engineering data of the amount of water of the Gila River at the mouth where it empties into the Colorado?

Mr. MORITZ. What is that?

Senator MCFARLAND. What is the annual flow estimate out of the Gila River where it empties into the Colorado, if no water were used on the Gila River at all?

Mr. MORITZ. If no water was used?

Senator MCFARLAND. Yes.

Mr. MORITZ. In other words, the virgin flow at the mouth?

Senator MCFARLAND. Yes.

Mr. MORITZ. That is 1,270,000 acre-feet.

Senator MCFARLAND. As I understand it, by your engineering data, your estimate is that the Colorado River itself is now being depleted by use in central Arizona 1,135,000 acre-feet per annum?

Mr. MORITZ. Yes, sir.

Senator MCFARLAND. So, of this water, all this supply the Senator speaks of, a large part is being used and reused, by return flow and by pumping?

Mr. MORITZ. That is correct.

Senator MCFARLAND. That is all.

Senator MILLIKIN. What is the river delivering into the Colorado? What does the Gila River deliver to the Colorado?

Mr. MORITZ. Practically none at the present time.

Senator MCFARLAND. That, I think, will be developed a little more in detail, Mr. Chairman, by other witnesses.

Senator MILLIKIN. Any further questions?

Senator MCFARLAND. No further questions.

Senator MILLIKIN. Do you have a short witness, Senator McFarland?

Senator MCFARLAND. We really have not. We might call one witness, but I think it would probably be better, let us say, if we have—

Senator MILLIKIN. Have you any miscellaneous witness that would take only a few minutes?

Senator MCFARLAND. If I might, I believe it would be better if Mr. Larson started in.

Senator MILLIKIN. How long would it take Mr. Larson to finish his testimony in the main?

Senator MCFARLAND. I think quite a while.

Senator MILLIKIN. We will go on until 12:30.

Senator MCFARLAND. Very well, Senator.

STATEMENT OF V. E. LARSON, ASSISTANT REGIONAL PLANNING ENGINEER FOR REGION III, BUREAU OF RECLAMATION

Senator MILLIKIN. Mr. Larson, will you give your name and your business?

Mr. LARSON. V. E. Larson, assistant regional planning engineer for region III of the Bureau of Reclamation in direct charge of investigations of the central Arizona project for the Bureau.

Assistant Commissioner Warne and Regional Director Moritz have outlined the present conditions in the Central Arizona project area, and have stated briefly the needs for water and power; the preliminary

plan under which these needs might be satisfied; and the current status of our investigations.

I now propose to expand on these informative statements by presenting factual data thus far compiled by the Bureau of Reclamation.

LOCATION OF CENTRAL ARIZONA PROJECT

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 several places, it extends beyond these borders into the States of Utah and New Mexico.

Relative to the prime purpose of the project, irrigation, the area embraced, and 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 green-shaded portions of the location map. Due to the existence of favorable temperatures, diversified cropping is practiced throughout the year.

HISTORY OF IRRIGATION IN PROJECT AREA

Farming in the project area without irrigation is impossible. Rainfall in the vicinity of Phoenix averages but 8 inches annually. In addition to rainfall, the optimum irrigation requirement is delivery to the farm of 4 acre-feet of water per acre per year.

Farming by irrigation is by no means a new art. Remains of an extensive canal system, and ruins of numerous villages and storehouses in this area are archaeological evidences of a prehistoric agricultural civilization. Apparently large-scale direct diversions were made from the natural flows of the Salt and Gila Rivers for the irrigation of crops. Within the scope of modern history, Spanish explorers in the sixteenth century found the Indians of this region engaged in a simple irrigated agriculture which continues today.

Irrigation, as now conducted along the Gila and Salt Rivers, may be in the nature of a revival of both prehistoric and ancient arts, although on a more stable basis through storage of erratic stream flows, and the pumping of ground waters for the dual purpose of adding to storage control and of avoiding high ground-water tables.

While it is recorded that the first major canal in the project area for diversion of water from the Salt River was constructed in the year 1867, 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. It has been advanced since by other similar developments in various locations on the Upper Gila River system.

PRESENT PROBLEMS

Water—agriculture, the sustaining base of the economy in the project area, has long since outstripped the water supply made available by surface reservoirs. About the time that occurred the need for drainage developed in some sections of the area. To meet both problems, pump-

ing from the ground-water basin was rapidly extended. The stage now has been reached where almost one-half of the total water applied in the area is pumped.

Since 1930 withdrawals have almost continuously exceeded recharge to the underground basin. During the period 1940-44 this excess withdrawal average about 468,000 acre-feet a year. As a result, ground-water levels are dropping progressively, thereby not only requiring the deepening of wells but, most important, the water in shallower portions of the ground-water basin will become exhausted.

Senator MILLIKIN. How deep are the wells?

Mr. LARSON. The depth of pumping varies from about 30 feet to as much as 285 feet.

Thus, some irrigated areas that depend entirely upon pumped water will, of necessity, be abandoned because of dry wells. To clarify this condition, reference is made to the chart which depicts a typical situation and the graph showing "Trend of ground-water levels," which is shown to the right.

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. In some localities the water is becoming concentrated with mineral salts toward the point where the water is toxic to vegetation.

As I say, it is shown to the right as to the water already applied to the land. Excess water seeps to the water basin and forms a ground-water reservoir.

For the past several years that water has been pumped and recirculated. The salinity is increasing and as shown by the well to the right, the water has been drawn away from that well.

Senator MILLIKIN. Which well are you referring to?

Mr. LARSON. The one to the right.

Senator MILLIKIN. All right.

Mr. LARSON. That well is located outside of the water-bearing strata, and there would be no possible chance of getting water by deepening the well.

At the second one, the water has almost been pulled away from it.

The third well could be deepened and a supply of water made available.

As the water is reused the salinity increases.

Senator MILLIKIN. There are several water tables?

Mr. LARSON. Yes; there are several ground-water strata.

The next graph shows trend of ground-water levels.

Senator MILLIKIN. May I say, if you are not going to leave those charts that you arrange to have them put into the record.

Senator McFARLAND. You will have them.

Senator MILLIKIN. All right.

Mr. LARSON. This chart indicates a movement of the ground-water table. You can see how it has lowered in Maricopa County and in almost a straight line since 1930. Since 1940 it has steepened to some extent.

Senator MILLIKIN. Have rainfalls been normal during the period you mentioned?

Mr. LARSON. I believe the rainfall was a little below normal for that period. The bottom graph represents the Pinal County area. Up to 1936 there was a gradual lowering, but since 1936 the drop has greatly increased.

Senator MILLIKIN. Let me ask you again if there have been any unusual ground-water conditions during the period on which you base your percentage?

Mr. LARSON. In the thirties there was a dry period. Since 1940 the precipitation has been higher.

Senator MILLIKIN. Where is 1940?

Mr. LARSON. Right there; 1941 is the high year.

Senator MILLIKIN. All right, go ahead.

Mr. LARSON. During the period 1940 to 1944 is just about an average of the long-time run-off conditions. The trend indicates the average of the salt condition.

Because of this continual reuse of water the salinity is increasing, and you can see in 1946, the water at the lower end of the project has reached a salt content of about 4,000 parts per million.

Senator McFARLAND. That is in the lower part?

Mr. LARSON. That is in the lower reaches of the project.

Senator MILLIKIN. Go ahead.

Mr. LARSON. This trend is graphically represented on the drawing titled, "Salt Concentration Trend." Such areas will spread through the ground-water basin unless the progress in salt concentration is reversed. Surface waters diverted to the area each year are estimated to contain 845,000 tons of mineral salt. Local experience indicates that water containing concentrations in excess of $5\frac{1}{2}$ tons of 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.

EFFECTS OF WATER DEFICIENCIES

Mr. LARSON. Of the 672,000 acres in the project area which at one time or another have been irrigated and are still considered irrigable, an average of about 566,000 acres annually have been so used during the period 1940-44, inclusive. If irrigation was limited to lands that could be adequately supplied from the existing supply, while also maintaining a proper salt balance in the area, about 152,500 acres of the presently irrigated land would, of necessity, revert to desert wasteland. The alternative, but with equally serious effects, would be to maintain present acreages on a considerably less than optimum irrigation basis and accept the loss in the form of reduced crop production per acre.

Senator MILLIKIN. Does the watershed of the Gila have an exceptional salt contributing nature?

Mr. LARSON. No; it is not high.

Senator MILLIKIN. Is there any difference between that water so far as salinity is concerned and the Colorado River water?

Mr. LARSON. The Colorado River water is slightly less than the Gila River water.

Senator MILLIKIN. All right.

Senator McFARLAND. When you say "Gila River," do you mean the Salt River or the Gila River?

Mr. LARSON. The Gila itself. The Salt River is a little less than the Gila. The Verde has a low salt content.

Senator DOWNEY. Is not the water at Parker Dam 725 parts of salt per million?

Mr. LARSON. Yes; just about that.

Senator DOWNEY. You spoke about 500 parts per million.

Mr. LARSON. No; I said 5½ tons per acre-foot in every half ton. That is about 4,000 parts per million.

Senator DOWNEY. Oh, I did not understand. I beg your pardon.

Senator MILLIKIN. Proceed, Mr. Larson.

MUNICIPAL WATER SUPPLY

Mr. LARSON. The growth of the city of Tucson and adjacent residential areas has developed a critical problem of domestic water supply. The ground-water basis now serving this city is overdrawn. Supplemental supplies from other sources must be developed.

Senator MILLIKIN. How much is Tucson?

Mr. LARSON. The population?

Senator MILLIKIN. Yes.

Mr. LARSON. The population in 1946, or rather 1940, was 36,818. The city of Tucson and the outlying area includes a population of 56,000.

Senator McFARLAND. It has practically doubled in size since then (1940). So it would be about 75,000, I would judge.

Mr. LARSON. They estimate a population of 100,000 by 1968.

Senator McFARLAND. Oh, by 1968. What do they estimate it now?

Mr. LARSON. I do not have the figures.

Senator McFARLAND. I think about 75,000. I hope someone from Tucson does not hear me, and say I put it too small.

Senator MILLIKIN. Go ahead.

POWER DEFICIENCIES

Mr. LARSON. There is an urgent and measurable need for additional electrical energy in Arizona, southern California, southern Utah, and southern Nevada. Appropriate indexes support a belief that this shortage, resulting from a normal increase in demand, will soon become critical. This situation is illustrated by the chart labeled "Estimated Energy Requirements and Supply."

The solid line indicates the power consumption in the area up to the present time.

Senator MILLIKIN. You are speaking of Arizona, southern California, southern Utah, and southern Nevada. Is that right?

Mr. LARSON. That is right.

Senator MILLIKIN. That is the area you are referring to?

Mr. LARSON. Yes, sir. That is the area usually referred to by the Federal Power Commission as power supply area Nos. 47 and 48.

Information required in that estimate was supplied by the Federal Power Commission. It is based on the record from 1920 to 1943 and extended to 1980.

Senator MILLIKIN. Just one moment. What are the further power potentials of Hoover Dam, if any?

Mr. LARSON. All of the potential Hoover power is now being produced. In fact, during the past few years they have drawn on the storage above the inflow to produce power.

The firm output at Hoover is about four and a quarter billion, and I think during the past few years it has been approximately 6,000,000,000.

Senator MILLIKIN. What would be the additional power supplied by the project farther down on the Colorado which has already been authorized?

Mr. LARSON. At Davis, which is one that has been authorized, the output is about 850,000,000.

Senator MILLIKIN. Are there any sources of power contemplated along the power route?

Mr. LARSON. Not downstream.

Senator MILLIKIN. What is contemplated upstream?

Mr. LARSON. Bridge Canyon.

Senator MILLIKIN. That is in connection with this project?

Mr. LARSON. That is in connection with this project.

Senator MILLIKIN. Other than this project?

Mr. LARSON. The next development upstream would be Glen Canyon, possibly. After Glen Canyon is completed another potential development would be the Marble Canyon and Kanab tunnel. There is approximately a thousand-foot drop between Marble Canyon dam site and Bridge Canyon Reservoir.

Senator MILLIKIN. In your power estimate are you giving weight to the possible additional power supplied by these projects?

Mr. LARSON. Beg pardon?

Senator MILLIKIN. In figuring your power market over the future, are you giving weight to the projects you have mentioned farther down and farther up on the Colorado?

Mr. LARSON. Yes; we have.

The heavy dashed line, as shown, would indicate the need of approximately 575,000 kilowatt-hours annually.

The market would require increase in that amount, or assuming a 60-percent load factor, it would amount to about 110,000 kilowatts.

The estimate based on more recent data would indicate a requirement of 930,000,000 kilowatt-hours annual increased load, and with a load factor of 60 percent that would amount to 175,000 kilowatts annually that would be required to meet the demand.

The portion shown in black represents the amount of power that would be available for the commercial market by this potential development.

Assuming that all of the needs were served by that increased development the power could be absorbed in approximately 5 years.

Senator MILLIKIN. All right, proceed.

Mr. LARSON. 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 on the Colorado River constitute a large source of low-cost power for Arizona, southern California, southern Utah, and southern Nevada. When the generating units now under construction or authorized have been completed, the total installed capacity available to the power market area will be about 3,000,000 kilowatts.

Transmission lines in the State of Arizona are inadequate to meet the growing demand. Interconnection between the lines is impeded by the fact that two generating frequencies, 25 and 60 cycles, are used. In southern California most of the transmission systems are satisfactorily interconnected.

The population of the power market area is in excess of 4,500,000 and the average annual per capita power consumption is in excess of 2,400 kilowatt-hours.

Senator DOWNEY. May I intervene to ask——

Senator MILLIKIN. Yes.

Senator DOWNEY. You said the prospective population of the area is $4\frac{1}{2}$ million.

Mr. LARSON. Yes; at present.

Senator DOWNEY. What proportion of that is in southern Nevada and Arizona?

Mr. LARSON. I am unable to give that break-down.

Senator DOWNEY. About 10 percent or less?

Mr. LARSON. No.

Senator DOWNEY. You do not have the population of Arizona?

Senator McFARLAND. The population of Arizona is estimated at 700,000. I do not know what the population of Nevada is.

Senator MILLIKIN. Proceed, Mr. Larson.

Mr. LARSON. Total annual power consumption has grown from 1.5 billion kilowatt-hours in 1920 to the present annual usage of over 12 billion kilowatt-hours.

Senator MILLIKIN. We will resume at 10 o'clock tomorrow morning.

(Whereupon, at 12:15 p. m., the subcommittee adjourned until 10 a. m., Tuesday, June 24, 1947.)

BRIDGE CANYON PROJECT

TUESDAY, JUNE 24, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin presiding.

Present: Senators Millikin (presiding) and Ecton.

Present also: Senators McFarland, Downey, and Knowland.

Senator MILLIKIN. The committee will come to order.

Is there a witness here?

Mr. LARSON. Yes, sir.

FURTHER STATEMENT OF V. E. LARSON, ASSISTANT REGIONAL PLANNING ENGINEER FOR REGION III, BUREAU OF RECLAMATION

Senator MILLIKIN. You may proceed, Mr. Larson.

ORIGIN OF INVESTIGATIONS

Mr. LARSON. 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 investigations of a potential diversion route in a preliminary way, late in 1940.

In February, 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 investigational funds, and a formal agreement on procedure was executed July 31, 1944.

OBJECT OF INVESTIGATIONS

The purpose of these specific investigations to date has been to consider by what means Colorado River water could be diverted most satisfactorily 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 requirement. Concurrently with this concentrated study, other investigations have been conducted relating to probable improvement in the utilization of existing water supplies in the project area.

SCOPE OF INVESTIGATIONS

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.

Senator MILLIKIN. Yesterday we were discussing two plans. Which is the third of the three we did not discuss yesterday?

Mr. LARSON. The Marble Canyon.

Senator MILLIKIN. Let us have that delineated. What would that involve?

Mr. LARSON. That would involve a tunnel 143 miles in length.

Senator MILLIKIN. That is a pretty long tunnel.

Mr. LARSON. Yes, sir.

Senator MILLIKIN. That would be an in-and-out tunnel? It would not be a continuous tunnel?

Mr. LARSON. It would be a continuous tunnel.

Senator MILLIKIN. All right.

Mr. LARSON. These studies culminated in a preliminary draft of a Bureau report dated September 1945, and entitled, "Comparison of Diversion Routes, Central Arizona Project." It recommended the elimination of the Marble Canyon route from consideration for economic reasons, and indicated the necessity of further investigation of the other two routes before final selection of a route worthy of the detailed study required in connection with the development of a final project plan.

A conference was held in Washington, D. C., during February 1946, and was attended by officials of the State of Arizona, the State's congressional delegation, and representatives of the Bureau of Reclamation. At the conference, agreement was reached that the Bureau would prepare a report on the engineering and economic feasibility of the Bridge Canyon route.

Senator MILLIKIN. I wonder if the Bureau would be good enough to supply us with a contour map of Arizona. It is not necessary at this moment but let us have one before we go much further.

Mr. LARSON. Yes, sir.

It was recommended that it include financial studies based not only on existing reclamation law, but also upon certain modifications of that law.

Subsequently, on June 18, 1946, Senator E. W. McFarland, of Arizona, introduced for consideration by the United States Senate, Senate bill 2346, for the purpose of authorizing construction of the central Arizona project on the basis of the Bridge Canyon route. Significant among its provisions were modifications of existing reclamation law to extend the repayment period for costs allocated to irrigation from 40 to 80 years, and to reduce the interstate rate for costs allocated to power from 3 to 2 percent. It also provides for exclusion from the

requirements of repayment, in addition to allocations of construction costs to flood control, navigation, and fish and wildlife propagation, all costs allocated to silt retention, river regulation, and recreation.

Senator MILLIKIN. Have you arrived at a tentative allocation of those various costs?

Mr. LARSON. Yes; those will be covered.

Senator MILLIKIN. Is this the proper place to put that in or will you give that later?

Mr. LARSON. We will come to that later.

Senator MILLIKIN. All right.

PRESENT INVESTIGATIONS

Mr. LARSON. In February 1947 the Bureau issued a preliminary draft of a report entitled "Report on Feasibility, Bridge Canyon Route, Central Arizona Project." The supporting studies include a special report by a group of consultants engaged to conduct a geologic and engineering reconnaissance relative to the practicability of constructing the 77-mile Big Sandy diversion tunnel.

Senator MILLIKIN. Which is the Big Sandy?

Mr. LARSON. The one shown in green.

Senator MILLIKIN. All right.

Mr. LARSON. That is a 77-mile continuous tunnel.

The Bureau report affirmed previous contentions that the central Arizona project is essential to sustain the existing economy in the area and that it is feasible from a construction standpoint. However, operation of the project would not provide sufficient revenue from power and irrigation to repay the construction costs allocated to these benefits in accordance with present reclamation law. Full repayment within the fixed time limits would require a power rate such as would preclude the sale of electrical energy. Under the provisions of Senate bill 2346, Seventy-ninth Congress, the project was found to be self-liquidating.

The report was accompanied by a memorandum supplement, part 1 of which is a report on the Parker route on the same basis as for the Bridge Canyon route, and part 2 of which provides a comparison of the two routes.

The investigations indicate that either route could be constructed under modern engineering and construction methods, and that the preponderance of advantages lie with the Parker route, because of its lower total cost, shorter construction time, and greater economic feasibility. Therefore, the Parker route plan was recommended by the Bureau for further detailed studies.

Senator MILLIKIN. That is the pumping plant?

Mr. LARSON. That is the pumping plant.

Senator MILLIKIN. Proceed.

Mr. LARSON. The statements which follow apply only to the Parker route for the Central Arizona project. The statements have been prepared in conformance to the repayment provisions contained in Senate bill 2346. The Congress adjourned before hearings could be held on this bill. Senate bill 433, which contains the same repayment provisions, was prepared for introduction in the Eightieth Congress but it has been recently superseded by Senate bill 1175.

Senator MCFARLAND. If I might interrupt, S. 433 is the same as S. 1175 except the former provides for the immediate construction of the tunnel and a portion of the canal from the reservoir above the dam. That is practically the same bill.

Senator MILLIKIN. S. 1175 is the only bill before us.

Senator MCFARLAND. That is the only one before us, but I thought I ought to explain it.

Senator MILLIKIN. Go ahead, Mr. Larson.

Mr. LARSON. Under this bill provisions for repayment have been revised. Time has not permitted revising all studies based upon S. 1175 but rough estimates indicate that the end results would be about the same under either S. 433 or S. 1175 if it is assumed that the useful life of the project is about 80 years. This statement also includes an analysis of financial feasibility under the provisions of the existing reclamation law.

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 the waters of the Colorado River between the upper and the 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, as it would be in the absence of any development. The following table presents for the period 1897 to 1943, inclusive, the estimated average annual flow at Lee Ferry and other points to the international boundary under virgin conditions.

Average annual flows for 1897 to 1943, inclusive, under virgin conditions:

	<i>Acre-feet</i>
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 main stream channel losses.....	1, 030, 000
Gain, Hoover Dam to international boundary.....	390, 000
Colorado River at international boundary.....	17, 720, 000

Senator MILLIKIN. Do you have any statistics set forth in here on the low flows in these 10-year periods?

Mr. LARSON. I can give it for the period 1931 to 1940.

Senator MILLIKIN. That is the period I have in mind. Is it in your report?

Mr. LARSON. I have some notes here.

Senator MILLIKIN. I do not care when you do it, but the record should have some data on that.

Mr. LARSON. All right.

(The matter referred to is as follows:)

Average annual flows under virgin conditions

	<i>Acre-feet (1931-40)</i>
Flow at Lee Ferry-----	12, 214, 000
Gain, Lee Ferry to Hoover Dam-----	750, 000
Flow at Hoover Dam-----	12, 964, 000
Tributary inflow, Hoover Dam to international boundary:	
Williams River and minor washes-----	160, 000
Gila River at mouth-----	877, 000
Subtotal-----	1, 037, 000
Less natural main stream channel losses-----	1, 000, 000
Gain, Hoover Dam to international boundary-----	37, 000
Colorado River at international boundary-----	13, 001, 000

Mr. LARSON. Potential projects in the upper basin could 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. In any determination of the availability of water under ultimate conditions, it should 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.

	<i>Acre-feet</i>
Virgin flow, Colorado River at international boundary-----	17, 720, 000
Apportioned to upper basin by art. III (a) of Colorado River compact-----	7, 500, 000
Apportioned to lower basin by art. III (a) of compact-----	7, 500, 000
Apportioned to lower basin by art. III (b) of compact-----	1, 000, 000
Estimated delivery to Mexico pursuant to treaty-----	1, 500, 000
Total apportioned water-----	17, 500, 000
Unapportioned waters-----	220, 000

Senator MILLIKIN. The Mexican obligation is absolute; is it not?

Mr. LARSON. That is right.

In the absence of a compact dividing among the various States involved, the water apportioned to the lower basin by the Colorado River compact, 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. It is recognized that these interpretations are not the same as those of some other States in the Colorado River Basin.

Arizona contends that of the 8,500,000 acre-feet of water apportioned to the lower basin in the Colorado River compact, California may use not to exceed 4,400,000 acre-feet of apportioned 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 leaves 3,800,000 acre-feet of apportioned water for use by Arizona, Utah, and New Mexico.

Arizona officials recognize the rights of Utah and New Mexico to use of waters in the lower basin.

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 Kanah Creek by 7,000 acre-feet. Ultimate depletions in the lower basins 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, 1936. The unapportioned water is computed 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:

	<i>Acre-feet</i>
Water from article III (a) and (b)-----	3,800,000
Less uses by New Mexico and Utah in lower basin-----	130,000
Net water available from article III (a) and (b)-----	3,700,000
One-fourth share of unapportioned water-----	55,000
Total available for Arizona-----	3,725,000

Senator MILLIKIN. Is it the theory of Arizona that Arizona and the other lower basin States are entitled to all the water in excess of California's self-limitation?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Is not California entitled to one-half of the surplus?

Mr. LARSON. We divided one-half to the upper basin and one-half to the lower basin—

Senator MILLIKIN. I notice your statement assumes it is one-fourth of the unapportioned water or 55,000 acre-feet will be made.

Mr. LARSON. That would be one-fourth to Arizona, one-fourth to California, and one-half to the upper basin, if it is so divided.

Senator MILLIKIN. I see.

Mr. LARSON. It would be one-half of the surplus water available in the lower basin.

Senator MILLIKIN. Would not New Mexico and Utah have made some claim on the unapportioned water?

Mr. LARSON. I could not answer that.

Senator MILLIKIN. Go ahead.

Mr. LARSON. 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 870,000 acre-feet of water will be lost annually to evaporation from main stream reservoir surfaces in the lower basin.

Senator MILLIKIN. What will be the calendar period of storage as distinguished from use under the proposed plan?

Mr. LARSON. Beg pardon?

Senator MILLIKIN. What will be the calendar period of storage as distinguished from use under the proposed plan? You are putting the water into the reservoirs over there. Will all of the water be used as fast as it is put in?

Mr. LARSON. No; in some periods there will be an excess of water.

Senator MILLIKIN. In normal years will there be times when the inflow exceeds the outflow?

Mr. LARSON. In the spring the inflow will greatly exceed the outflow.

Senator MILLIKIN. The use of water in Arizona is almost the year round, is it not?

Mr. LARSON. Yes; however, it is considerably less during the winter months than during the summer.

Senator MILLIKIN. It is?

Mr. LARSON. That is right.

Senator MILLIKIN. Go ahead.

Mr. LARSON. This amount is in addition to the quantities lost from the same areas prior to the construction of any dams. Inasmuch as these losses represent a depletion of the water supply of the lower basin as a whole it has been assumed 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 system exclusive of the Gila River Basin.

On this basis, with main-stream reservoir losses of 870,000 acre-feet, Arizona would be charged with 316,000 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.

Senator MILLIKIN. Will that formula for division of reservoir losses work out fairly as far as you can see in relation to the projected reservoirs?

Mr. LARSON. Well, it probably would. 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 thus compute the amount of water available for the central Arizona project:

Total available for Arizona-----	Acre-feet 3, 725, 000
Less main-stream reservoir losses (present and future)-----	316, 000

Senator DOWNEY. May I interrupt, Mr. Larson, for a short question?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. Mr. Larson, is it true that Arizona has a much greater consumptive use in the Gila River Basin than 1,135,000 acre-feet?

Mr. LARSON. All of our studies are based on depletion at three points on the river.

Senator DOWNEY. Mr. Larson, you are not answering the question. I am asking you about the consumptive use in the Gila River Basin. You understand what I mean by that, what the consumptive use of water is?

Mr. LARSON. The consumptive use of water in the Phoenix area is 3.2 acre-feet per acre.

Senator DOWNEY. Do you not know the total amount of water beneficially used and consumed in the Gila River Basin?

Mr. LARSON. On the basis of consumptive use?

Senator DOWNEY. That is what I am asking you, what is it? You must know that.

Mr. LARSON. I do not have it. I can get it for you.

Senator DOWNEY. You know it is more than double this amount you have here as depletion, is it not?

Mr. LARSON. It may not be double.

Senator DOWNEY. Is it not 2,400,000?

Mr. LARSON. Possibly 2,000,000.

Senator DOWNEY. The figures were introduced by your colleague yesterday showing 2,300,000 or 2,400,000 acre-feet.

So, if we should charge Arizona under the contract with the amount of water she beneficially consumes in the Colorado River system, this table would be erroneous?

Mr. LARSON. Not the way the table is set up. The table is correct the way it is set up. It indicates depletion.

Senator DOWNEY. You have presented this under the Arizona theory. You know the California theory is that Arizona is charged with whatever amount of water she beneficially uses in the Colorado River system. I am trying to sharpen up the issues between California and Arizona. If you do not understand California's position, I will not intrude further on the committee.

Senator MILLIKIN. I think the committee understands.

Senator McFARLAND. Mr. Larson, this two-million-odd acre-feet you spoke of, that is water that is used and reused?

Mr. LARSON. That is right.

Senator McFARLAND. There is not that amount of water available in the Gila River system except by use and reuse of some water?

Mr. LARSON. That is right.

Senator MILLIKIN. Your basis of procedure, Mr. Larson, is to take the water, to measure the water that comes out of the Colorado for use in Arizona, measure the water which returns to the Colorado after use in Arizona and charge the net to Arizona. Is that your method?

Mr. LARSON. This depletion.

Senator MILLIKIN. Have we both used the same language?

Mr. LARSON. Beg pardon.

Senator MILLIKIN. Did my explanation of your procedure coincide with your definition of depletion?

Mr. LARSON. That is right, the depletion at the Mexican boundary.

Senator MILLIKIN. And California, on the contrary, states Arizona should be charged with the use of the reuse of water that is taken from Colorado.

Senator DOWNEY. Mr. Chairman, there is no question of any use or reuse. It is a question of the total amount of beneficial use.

For instance, if Colorado has totally used—

Senator MILLIKIN. I do not misunderstand your position.

Senator DOWNEY. Perhaps not, only to this extent. It is a question of beneficial consumptive use of the amount of water. This may include some consumption by repumping of water or reuse, or it may not. Our contention is, Senator, that Arizona is chargeable with all of the beneficial use in the Gila River because the Gila River is a part of the Colorado River system and the compact provides for a charge against any State according to its beneficial use.

If we in California repump and reuse our water, we are charged with the amount consumed. We are seeking to apply against Arizona the rule applied to every other State in the Colorado River Basin.

Senator MILLIKIN. Let us assume the amount of water taken out of the Colorado for use, initially speaking, in Arizona is x amount. Let us say that through pumping and reapplication of the water on the land, you finally have had a use in Arizona of $2x$.

It is your contention that Arizona is charged with $2x$. Is that correct?

Senator DOWNEY. If you had x amount of water, you could not have $2x$ amount of consumptive use.

Arizona on the Gila River has more than 2,300,000 acre-feet of water developed. She loses some of it, but she finally has the beneficial use of 2,300,000 acre-feet. Her gross use and reuse greatly exceeds that, Senator.

Senator MILLIKIN. It is necessary for the committee to understand the point. So, Senator, will you illustrate just exactly what is involved, in your own way?

Senator DOWNEY. I just assume for the purpose of the discussion that presently in the Gila River and its tributaries, which we contend are necessarily a part of the Colorado River system, there may be as much as 2,750,000 acre-feet available for application.

Some of that is lost and is not beneficially used, but out of that gross amount Arizona actually enjoys 2,300,000 acre-feet of water. It seems plain to us under the compact that that amount of water is chargeable against Arizona by the same rule it would be chargeable against every other State.

Senator MILLIKIN. What is the difference between your position and that of Arizona?

Senator DOWNEY. Senator, Arizona's position is this, that while there are 2,375,000 acre-feet on the average developed in the Gila Valley, due to the long desert stretch, between central Arizona and the mouth of the Gila River, if it was still in condition of virgin flow, only approximately a million acre-feet would reach the Colorado.

Consequently, Arizona claims that by using all the 2,300,000 acre-feet this water has only depleted the river about a million acre-feet. It asserts it should be charged upon the theory of depletion and not beneficial use. Under the compact, it seems every State should be charged not on depletion, but on the theory of consumptive beneficial use.

Senator MILLIKIN. Regardless of what comes back to the stream or what is taken out of the stream?

Senator DOWNEY. No; Senator.

Senator MILLIKIN. Would you simply add up the beneficial use and attribute that as a charge to the State?

Senator DOWNEY. That is right.

Senator MILLIKIN. Would that include the reuse of water through pumping, for example?

Senator DOWNEY. To whatever extent that pumping gave you beneficial use.

Senator MILLIKIN. The California contention is that you add up the amount of beneficial consumptive use, whether by direct application or by pumping?

Senator DOWNEY. That is right, sir.

Senator MILLIKIN. Regardless of the number of applications or reapplications, you keep track of the use that is made of that water and you attribute that to the stream?

Senator DOWNEY. That is right, Senator.

Senator MILLIKIN. Whereas the Arizona position is: We take so much water out of the stream; we restore so much water to the stream. The difference is what we are charged with.

Is that a roughly accurate statement of the two positions?

Senator DOWNEY. Except, Senator, Arizona says it is not chargeable with the amount of water which it takes out of the Gila.

If in your statement you say that Arizona would be chargeable with the amount of water it takes out of the Gila, that is a correct statement of our position. We want to charge Arizona with the amount of water it takes out of the Gila.

Arizona has a totally different theory and says that while there is in the Gila 2½ million already developed, that would never, under virgin conditions, reach the Colorado River. Only a million acre-feet would reach the Colorado.

It is our contention the compact allocates the rate to each State upon the measure of beneficial consumptive use and Arizona is chargeable with the beneficial consumptive use it gets from the Gila.

Senator MILLIKIN. I am not attempting to resolve any of these questions.

Senator DOWNEY. I understand.

Senator MILLIKIN. That I want understood. Otherwise, we cannot resolve the testimony.

Senator DOWNEY. Arizona has the theory of depletion, as applied to the Gila River. We apply to it the general rule applicable to every other State and that is the measure of consumptive use.

Senator MILLIKIN. It would be the same whether it is the Gila or any other stream that is part of the Colorado system. The Gila, because it is the Gila, makes no difference in your theory?

Senator DOWNEY. That is right.

Senator MILLIKIN. You add that up and that is a charge against the State?

Senator DOWNEY. That is correct.

Senator MILLIKIN. The Arizona theory is that you strike a figure on what you take out of the stream and you strike a figure on what you put back into the stream, and the difference is what is chargeable against the State. Is that correct?

Senator McFARLAND. Putting it this way, Senator, Arizona feels that she should be charged only with such water as she uses that affects the other States.

In other words, if by the use of the water we deplete the river a million acre-feet at the mouth where it empties into the Colorado, that is the only thing that affects the other States. They are not interested in the other water, and there could not be any other interpretation of "consumptive use" as applied to the compact, because the other States are not interested except as to the amount of water which we use that affects the other States.

If we only deplete the Colorado River 1,000,000 acre-feet, the other States are not interested in what you have used that water for.

Senator MILLIKIN. Senator, are you saying anything different from what I said?

Senator McFARLAND. Not at all.

Senator MILLIKIN. I have to understand this. It has got to be in a groove that I understand.

Is Arizona any different? She measures what she takes out, what she puts back in and charges herself with the difference.

Senator McFARLAND. The difference at the mouth.

Senator MILLIKIN. That results from doing those two steps?

Senator McFARLAND. Yes. The amount that results from taking it out and putting it back in at the mouth of the Gila River where it empties into the Colorado.

Senator MILLIKIN. I think I understand.

Senator McFARLAND. One other point. This use and reuse is not only from pumping. I would call the committee's attention to the fact, as it will be developed in other testimony, that at this dam here [indicating], the diversion dam for the Salt River project, all of the water is diverted most of the time. Then you will find this river dry down here [indicating] and then by use of return flow they again divert all the water of the Salt and Gila Rivers. They distribute that. More water comes in the river down here by return flow, and they again divert; and they distribute all that water; and when we get down to Gillespie Dam the return flow is again diverted.

Senator MILLIKIN. I think I understand.

Senator DOWNEY. Senator, if I may correct myself, I recognize that beneficial consumptive use is equal to diversion from the river less returns to the river, but I want to say we apply that rule not only to the Colorado but to the waters of the Gila.

In other words, we claim that Arizona is chargeable with the waters diverted from the Gila less the return to the Gila.

Senator MILLIKIN. His theory is the Gila is a tributary of the Colorado and therefore forms part of the Colorado system, and therefore the charges and credits apply to the Gila or any other stream that similarly affects the flow of the Colorado—

Senator DOWNEY. Exactly so.

Senator MILLIKIN. Proceed, Mr. Larson.

Mr. LARSON. The table goes on:

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.....	882, 000
Subtotal.....	924, 000
Total.....	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

Senator MILLIKIN. Now you are measuring your depletion under the formula we have discussed in all cases?

Mr. LARSON. That is right.

Senator MILLIKIN. And you are measuring your future depletions in the same way?

Mr. LARSON. That is right.

Senator MILLIKIN. Where you have the line "Potential depletion by central Arizona project, 1,077,000," do you not mean available potential depletion?

Mr. LARSON. Yes, that would cover the term.

Senator MILLIKIN. You are not regulating your depletion that will result from the central Arizona project as a result of all these mathematical calculations. That simply brings you down to the balance of water available for Arizona, does it not, and which could be charged against central Arizona project?

Mr. LARSON. Water available for that particular project.

Senator MILLIKIN. All right, go ahead.

Mr. LARSON. 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 flood waters which cannot now be put to beneficial use. The enlarged capacity would provide an additional yield from the Verde Reservoir system of 42,000 acre-feet a year.

Senator MILLIKIN. Where is the Verde Reservoir system?

(The Verde Reservoir system was pointed out from the map.)

Senator MILLIKIN. All right, go ahead.

Mr. LARSEN. The construction of Buttes Dam on the Gila River would impound flood waters 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 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 in the area. The net effect of these developments on the main stem of the Gila River would provide 19,000 acre-feet of supplemental water for this area.

A dam could be constructed at the Charleston site on the San Pedro—

Senator MILLIKIN (interposing). Just a moment. Where is that? (The San Pedro River was pointed out on the map.)

Senator MILLIKIN. Go ahead.

Mr. LARSON. A dam could be constructed at the Charleston site on the San Pedro River to provide regulation of the stream, supplemental irrigation water for the area, and a municipal water supply for the city of Tucson. It is estimated that this development would conserve 7,000 acre-feet of water which otherwise would be lost in the river channel.

TOTAL NEW WATER

The following table has been prepared to summarize the new water developed under the central Arizona project:

	<i>Acre-feet</i>
Colorado River-----	1,200,000
Less aqueduct losses-----	250,000
Total-----	950,000

Senator MILLIKIN. You are taking that water out of the Colorado River?

Mr. LARSON. Yes.

Senator MILLIKIN. All right.

Mr. LARSON. To continue:

	<i>Acre-feet</i>
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

WATER NEEDED

The need for additional water in the central Arizona project area is fivefold. Additional water is needed: (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 land now idle for the lack of water.

Senator McFARLAND. Mr. Chairman, I might add one thing, in order to give a little better picture of underground water conditions.

Part of this pumped water is percolating water which has never been in a stream of surface water, and never would be if it were not pumped out; it never would reach the Colorado River.

Senator ECTON. Senator, is that water that is pumped out of the ground you mentioned?

Senator McFARLAND. Yes.

Senator ECTON. Is that charged against Arizona under this theory of consumptive use?

Senator McFARLAND. We contend it is not charged against Arizona except as we reduce the flow of the Gila River at the mouth as it enters into the Colorado, because no one could have used it anyway.

Senator MILLIKIN. All right.

REDUCTION IN PUMPING

Mr. LARSON. During the period of 1940 to 1944, the pumping overdraft is estimated to have averaged about 468,000 acre-feet a year. Without the Central Arizona project it would ultimately be necessary to decrease pumping by this amount. However, under the Central Arizona project new water would be introduced into the area to replace the required reduction in pumping. In addition, the required water supply made available under the Central Arizona project would increase the recharge to the underground basin.

It is estimated that the increased recharge to the underground basin resulting from the Central Arizona project would amount to about 400,000 acre-feet a year. This increased recharge would reduce the rate of ground-water depletion from 468,000 to 68,000 acre-feet a year. Thus, under the Central Arizona project, it would be necessary to reduce withdrawals from the underground basin by 68,000 acre-feet a year.

Senator McFARLAND. I would like to call attention to this, for emphasis. What you are saying is that we are making overdrafts on this basin which will eventually play out; that this is not permanent water we are talking about, and it will eventually get down so low that we cannot use it?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. Go ahead.

SALT BALANCE

Mr. LARSON. Water diverted to lands in Maricopa and Pinal Counties each year contains an average of 845,000 tons of salt. As there is insufficient drainage from these lands, salt are accumulating in the soil and ground water. In some portions of the area the salt content of the water has already become a serious problem. These concentrations are continuing to increase until some lands will be forced out of production unless some adequate provision is made for salt removal. It is estimated that under present conditions it would be necessary to release 154,000 acre-feet of water with a salt content of $5\frac{1}{2}$ tons per acre-foot, in order to maintain a salt balance within the area.

Diversion of Colorado River water into the area and increased diversions of Gila River water as contemplated under the Central Arizona project would result in a greater introduction of salts. Under ultimate development it is estimated that the diverted water would contain about 2,070,000 tons of salt.

Assuming concentrations in outflow water averaging $5\frac{1}{2}$ tons per acre-foot, 376,000 acre-feet of salt-laden water would have to flow out of the area each year in order to maintain a salt balance after completion of the central Arizona project. Although all water released

from the area for salt balance would not necessarily be pumped water, it has been assumed in lieu of a definite determination that all such water would represent a depletion of the ground-water supply.

REPLACEMENT FOR REDUCTION IN PUMPING AND SALT BALANCE

It has been previously demonstrated that pumped water available for irrigation, after completion of the central Arizona project, would be 68,000 acre-feet less than that which is now being pumped. This would result in a required reduction in pumping for irrigation of 444,000 acre-feet annually.

The average loss of pumped water between the pumps and the farmer's head gates has been estimated at 15 percent. On that basis, 444,000 acre-feet of pumped water would provide a delivery of 377,000 acre-feet to the individual farmers. Therefore, under the central Arizona project, it would be necessary to replace 377,000 acre-feet at the farm head gates, if the farmers are to be supplied with an amount equal to that now obtained and still limit withdrawals from the ground-water basins to the safe annual yield of these basins, and in addition, provide sufficient outflow from the area to maintain a salt balance.

It has been estimated that losses of surface water occurring between the district head gates and the farm head gates average 30 percent of the diverted water. On this basis 538,000 acre-feet of surface water would be required each year at the district head gates to replace the 377,000 acre-feet reduction at the farm head gates.

Senator MILLIKIN. Is that not a heavy loss?

Mr. LARSON. Beg pardon?

Senator MILLIKIN. Is that not a heavy loss of water?

Mr. LARSON. That is the average loss of the irrigated area from the head gate to the farm head gate.

Senator MILLIKIN. Consisting of seepage and evaporation?

Mr. LARSON. That is right.

Senator MILLIKIN. Which is the heavier factor?

Mr. LARSON. Seepage.

Senator MILLIKIN. That seepage, I presume, theoretically finds its way into the underground basin?

Mr. LARSON. Part of it does except that portion that is used by trees and growth and so forth.

Senator MILLIKIN. Go ahead.

SUPPLEMENTAL SUPPLY

Mr. LARSON. During the period 1940-44 about 566,000 acres were irrigated in the project area. The available surface supply and pumped water which included an overdraft of the ground-water basin did not furnish a full supply. An additional 113,000 acre-feet a year would be required as a supplemental supply for this area.

MUNICIPAL SUPPLY

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.

IRRIGATION OF NEW LANDS NOW IDLE

The quantity of water available for developed lands now idle for lack of water would be the remainder of the 1,082,000 acre-feet of new water developed, after the requirements for reduction in pumping, supplemental water needed for lands now irrigated, and municipal water supply have been deducted. The availability of water for new lands now idle because of lack of water is shown in the following tabulation :

	<i>Acre-feet</i>
New surface water available at district headgates-----	1,082,000
Surface diversions required to replace the necessary reduction in pumping-----	538,000
Supplemental water needed for lands now irrigated-----	113,000
Required for municipal water supply-----	12,000
Subtotal-----	663,000
Water available for lands formerly irrigated, but now idle for lack of water-----	419,000

It is estimated that this 419,000 acre-feet of water would furnish an adequate supply for 73,500 acres of land formerly irrigated but now idle for lack of water. Although this 73,500 acres does not represent all the lands in the area having an irrigation history but now idle because of lack of water, it does represent the apparent maximum that could be returned to cultivation with new water the project would make available.

Senator DOWNEY. Mr. Chairman, may I interrupt and ask Mr. Larson a question?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. My attention is directed to the fact that you allocate 419,000 acre-feet of water against 73,500 acres of land or about 5½ acre-feet of water per acre of land.

Mr. LARSON. That is on the basis of 5.7 acre-feet per acre. The loss between the diversion head gate and the farmer's head gate is about 30 percent.

Senator DOWNEY. And that water—those losses of water—would not be picked up any other place?

Mr. LARSON. Part of it would return to the underground water basin and part of it would be absorbed by growth that is not irrigated.

Senator DOWNEY. I understand your figures would show what Mr. Moritz testified to, that there would be an equivalent of about 150,000 acres irrigated by the project.

Mr. LARSON. I do not quite get that question.

Senator DOWNEY. I think Mr. Moritz's statement was to the effect there would be an equivalent of about 150,000 acres irrigated by this project. Figuring it on an acreage basis would there be the equivalent of about 150,000 acres irrigated?

Mr. LARSON. Without the project there would be an equivalent of approximately 152,000 acres that would go out of production. Assuming a full water supply to land that would remain in production—

Senator DOWNEY. Did you say 152,000?

Mr. LARSON. One hundred and fifty-two thousand.

Senator DOWNEY. Thank you.

Mr. LARSON. Operation: Under present conditions, the extensive reuse of irrigation water has caused the dissolved salts in the water to accumulate in the soils and ground waters of the area. The damaging effect of this gradual accumulation is becoming apparent in some districts where salinity of return flows and pumped water is increasing. The introduction of Colorado River water to sweeten the present irrigation water supply for these areas and to replace the present overdrafts on the underground basin, would temporarily abate this problem. Therefore, at the beginning of project operation it would not be necessary to increase the outflow for salt balance. However, after a few years, the practice of reusing irrigation water will cause the salinity concentration to increase in the return flows and pumped waters until it will be necessary to increase outflows.

This outflow water will need to be replaced by additional surface water to maintain a firm water supply. It is apparent that this practice could be followed until the total diversion available from the Colorado River was utilized. Our studies indicate that a period of 50 years would be required for stabilization of the area with the available water supply. This state of operation has been designated as ultimate development. At the beginning of project operation, it is planned to divert Colorado River water sufficient in quantity to maintain only the same acreage as could be stabilized under ultimate development. This requirement is estimated at 850,000 acre-feet annually and would be increased gradually as the requirements for releases of salt-laden water arose, until the total annual diversion of 1,200,000 acre-feet would be required.

It is evident that excess deliveries of water to the project could be utilized for the development of new land. However, it would not be desirable at the beginning of the project operation to divert surplus water for the development of new land, which would later have to revert to desert as the need for that water for salinity control arose. Temporary development of new land would thus defeat the primary purpose of the Central Arizona project.

Senator McFARLAND. Reverting back to that 152,000 acres that would go out of production, do you not think you might be low on that amount?

Mr. LARSON. That is based on a full water supply available for 414,000 acres that would be left in production.

Senator McFARLAND. We get the use or the reuse of that water that is brought in, which lets us keep in quite a larger acreage, and we have to recharge this underground water.

Some of the engineers have estimated more. Some have estimated it may be a larger amount. I do not want to make any point of it.

Mr. LARSON. It probably would be. The average acreage used in these studies is for the period 1940 to 1944. That would be the correct acreage as near as we can determine.

Senator McFARLAND. You are already reducing the acreage.

Mr. LARSON. To what was used in the period 1940 to 1944.

Senator DOWNEY. I want to be clear on my understanding of what the Bureau representatives have said.

As I understand, the water under this project which will be brought in from the Colorado, in addition to serving some minor uses, such as Tucson municipal supply with 12,000 acre-feet, would provide a full supply for the equivalent of 150,000 acres.

I know some of it is going to be replenished, but as I understand you the supply would be insufficient for 152,000 acres of new land to be irrigated.

Is that what you and Mr. Moritz mean by your statement?

Mr. LARSON. It is somewhat correct and the only way we could show the amount that would go out of production is on the basis a full water supply would be made available to the land left in production. If they spread the water thinner there would be less acreage go out of production, but the net result would be the same because the productive capacity would be less.

Senator DOWNEY. My final conclusion is this water would provide roughly the equivalent of the supply for 152,000 acres.

Mr. LARSON. Plus releases for salt balance.

Senator DOWNEY. Plus releases for salt balance and some minor amount for Tucson.

Is there any other municipality or other use besides the irrigation use?

Mr. LARSON. That would cover it.

Senator DOWNEY. And Tucson is only 12,000 acre-feet?

Mr. LARSON. That is right.

Senator DOWNEY. Thank you.

Senator McFARLAND. If we did not have this water to release for salt balance, we would have to take additional water and release it for salt balance which would probably affect a much larger area than 152,000 acres.

I do not make any point of it. I just want to bring it out.

Senator MILLIKIN. Proceed, Mr. Larson.

PLAN OF DEVELOPMENT

Mr. LARSON. 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 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 broken into 17 units, or features, listed as follows:

1. Bluff Dam.
2. Cocomino Dam.
3. Bridge Canyon Dam and power plant
4. Havasu pumping plants.
5. Granite Reef Aqueduct.
6. McDowell pumping plant and canal (that is a short canal from the pumping plant to the reservoir).
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. Irrigation drainage systems.
17. Power transmission system.

The necessity for all of these features may not at first be apparent; let us therefore consider their relationship. Bridge Canyon Dam and power plant would be constructed on the Colorado River, 117½ miles upstream from Hoover Dam. Part of the power developed at this site would be utilized to operate the pumping plants needed to raise the water from the Lake Havasu for delivery to central Arizona.

The remainder of the power generated at this site 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 3,700,000 acre-feet a year without any upstream developments. Silt inflow to this reservoir would amount to over 100,000 acre-feet a year. Unless preventative measures were taken, this silt would soon infringe on the active storage capacity of the reservoir.

In addition, the capacity of Bridge Canyon Reservoir is 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.

Senator MILLIKIN. Now where is that indicated?

(The location was indicated on the map.)

Senator MILLIKIN. All right.

Mr. LARSON. For the foregoing reasons, two upstream reservoirs have been considered as essential adjuncts to the Bridge Canyon Dam. The farthest upstream of these is the 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 22 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 21 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 Dam site 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 235 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 continuous 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. At such times, excess water delivered to the Granite Reef Dam would be raised 90 feet by the McDowell pumping plant, which would be located near Granite Reef Dam, and delivered by 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. Primarily it would be used to impound water of the Colorado River delivered during the winter months when irrigation demands are light. A reservoir at this site would flood the present intake for domestic water for the city of Phoenix, and it would therefore be necessary to relocate the intake for the city water supply system. A pipe line connecting to an outlet in the dam and furnishing mixed Salt, Verde, and Colorado River water to the existing city aqueduct, would be provided for this purpose, and a softening and filtering plant would be installed to assure the city of a water supply comparable in quality to that obtained at present. McDowell Reservoir would also be used to regulate releases from upstream storages and provide flood-control storage for the protection of downstream developments. A power plant would be installed to utilize the available head.

Senator DOWNEY. Mr. Chairman, may I ask a brief question here of the witness?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. You have described several reservoirs here, including Bluff Dam and the Bridge Canyon Dam.

In your figures are you charging the evaporation from those dams against the Arizona allotment of water?

Mr. LARSON. Bluff Dam is in the upper basin. Coconino Dam is only a flood-control dam. Water would not be held in that dam.

Senator DOWNEY. Let us talk about the Bluff Dam site. The evaporation from that would probably amount to 100,000 acre-feet a year or more?

Mr. LARSON. I do not believe the evaporation at the Bluff Dam site would have any significance at this time because some time will pass before the upper basin has utilized its full amount of water.

The upper basin depletion is about $2\frac{1}{2}$ million, so they could easily stand the loss at Bluff.

Senator DOWNEY. Do I understand from what you say while Bluff Dam is necessary for the consummation of this project, it would not be some time in the future?

Mr. LARSON. Some time in the future before it would be used by the upper basin.

Senator DOWNEY. Let us ask some questions categorically. The evaporation loss there would be about 100,000 acre-feet a year or more?

Mr. LARSON. I do not know. Something less than that.

Senator DOWNEY. About that?

Mr. LARSON. No, possibly close to 50,000.

Senator DOWNEY. What will the area be?

Mr. LARSON. I do not know. I could furnish it for the record. I do not have it available.

Senator DOWNEY. In any event you are not charging that against the Arizona allotment?

Mr. LARSON. No, under initial conditions at the time the project was first placed in operation it could be charged against Arizona, because there is surplus water in the river and it would not make any difference, and when you get down to the last drop of water it would be operating as an upper-basin development.

Senator DOWNEY. To what extent are you charging the evaporation losses in Bridge Canyon to the Arizona allotment?

Mr. LARSON. The loss in the downstream reservoirs; Bridge Canyon, Hoover, and Parker were included in the estimate that was prorated on the use of water in the lower basin.

Senator McFARLAND. And consequently by the method you are using, you are only charging a quarter of that evaporation against Arizona?

The LARSON. The reservoir losses are prorated in accordance with the amount of water used by the States.

Senator McFARLAND. Is any other State going to have any privileges of irrigation from water in Bridge Canyon, under your plan?

Mr. LARSON. Other States would have the benefit of the power development.

Senator DOWNEY. Not of the irrigation development?

Mr. LARSON. The irrigation development would not amount to much because the storage capacity is so limited.

Senator DOWNEY. It is necessary for Arizona, this project?

Mr. LARSON. What would you suggest?

Senator DOWNEY. What will be the evaporation loss in Bridge Canyon Reservoir?

Mr. LARSON. It is approximately—

Senator DOWNEY (interposing). Mr. Chairman, may we have that put in the record?

Senator MILLIKIN. Yes.

Mr. LARSON. The evaporation at Bridge Canyon?

Senator DOWNEY. Yes; and also I wish you would check the evaporation from the Bluff Dam Reservoir.

(Furnished for the record by Mr. Larson:)

The average annual evaporation loss at Bluff Reservoir is 52,000 acre-feet. The increased loss of water resulting from the construction of Bridge Canyon Dam would be 49,000 acre-feet.

Senator McFARLAND. I suggest you might also answer this question as to whether this same amount of water proposed to be stored in Bridge Canyon would not otherwise be stored in the reservoir of the Hoover Dam and have the same evaporation there—

Senator DOWNEY. It would have an additional evaporation there, Senator, undoubtedly.

Senator McFARLAND. Stored water wherever it is, at so much—

Senator DOWNEY. This will not relieve——

Senator MCFARLAND. I do not want to argue about it.

Senator MILLIKIN. For the purposes of your calculation I think you explained a while ago you are charging evaporation in the same percentage as you are allocating rights to water. Is that correct?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. It might be interesting if you have some evaporation data on reservoirs in the lower basin.

(The statement referred to is as follows:)

Estimated reservoir losses, lower Colorado River Basin

Name of reservoir	Estimated losses in acre-feet		
	Under virgin conditions	Total loss from reservoir surface area	Increased loss by construction of reservoir
Marble Canyon.....	11, 000	24, 000	13, 000
Bridge Canyon.....	33, 000	82, 000	49, 000
Lake Mead.....	202, 000	794, 000	592, 000
Davis.....	71, 000	164, 000	93, 000
Lake Havasu.....	65, 000	156, 000	91, 000
Headgate Rock.....	16, 000	28, 000	12, 000
Imperial Diversion.....	29, 000	40, 000	11, 000
Laguna.....	18, 000	27, 000	9, 000
Total.....	445, 000	1, 315, 000	870, 000

Senator DOWNEY. I think the suggestion of the chairman was a very pertinent one. We may have to consider to what extent lands are benefited by surface flow and to what extent they benefit by irrigation. That was my purpose in developing this matter.

Senator MCFARLAND. In regard to Glen Canyon Dam, that would be a dam in which the upper basin would benefit to regulate the water which they are required to deliver under the compact?

Mr. LARSON. That is right.

Senator MILLIKIN. We will have a recess for a moment or two.

(Whereupon a short recess was taken.)

Senator MILLIKIN. The committee will come to order. Go ahead.

Mr. LARSON. As a part of the central Arizona project, the existing Horseshoe Dam on the Verde River would be increased 40 feet in height, to provide a 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 the Verde River water-energy production.

By an exchange of Colorado River water it would be possible to divert Salt River water from Stewart Mountain Dam.

Senator DOWNEY. May I intervene with a short question there?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. Is that exchange operation considered an essential part of the working out of the project, Mr. Larson?

Mr. LARSON. Well, it would be the most feasible way.

Senator DOWNEY. If they cannot work it out that way, it would require additional pumping.

Mr. LARSON. It would require additional pumping.

Senator DOWNEY. A considerable item?

Mr. LARSON. I cannot tell how much it would amount to. It would involve pumping approximately 200 feet.

Senator DOWNEY. Has the Bureau or anyone else any assurance that the older water districts on the Salt River would consent to such an exchange?

Mr. LARSON. I cannot answer that. We have not at this stage of the investigation made any attempt to work out that particular problem.

Senator DOWNEY. If it should develop that these water users who now have the Salt River water would not consent, the plan would have to be changed?

Mr. LARSON. Yes, sir.

Senator DOWNEY. And the water would have to be pumped?

Mr. LARSON. About 200 feet.

Senator MILLIKIN. Senator McFarland, what is your theory as to this exchange?

Senator MCFARLAND. We have gone on the theory that in order to have an exchange of water there would have to be an agreement, and in order to protect these people, that it would have to be an equitable exchange.

We have provided that there could not be an exchange except by an agreement under section 2 of the act.

Now in regard to these exchanges, we found that it is not advisable to work out in detail what the exchange will be until we know the project will be authorized.

If and when it is, we will go to work on that.

The people on the Gila River, in particular the San Carlos people, have agreed to exchange water in order to give benefits to the upper-basin people as well as New Mexico, and to benefit Tucson; but those are matters which we will get to work on in detail when and if we know the water will be available.

Senator MILLIKIN. You might put something in the record, Mr. Larson, that will indicate the added cost if an agreement were not reached. Go ahead.

Mr. LARSON. All right, sir.

(The matter requested is as follows:)

Senator Downey requested that information be supplied for the record in regard to his question as to the increased cost of water if Colorado River water had to be pumped from Granite Reef for delivery to the Salt Gila aqueduct instead of diverting Salt River water by gravity through an exchange of Salt River water for Colorado River water.

The following is an answer to this question: If Colorado River water had to be delivered to the Salt-Gila aqueduct it would be necessary to pump the water from Granite Reef Dam. This would require a static lift of about 200 feet. In estimating the difference in costs for the two alternatives the following were considered: (a) Construction costs, (b) operation and maintenance, and (c) the difference in power production and consumption of the two alternatives. The result would be that water pumped to the Salt-Gila aqueduct would cost approximately \$1 more per acre-foot during the repayment period than for delivery of Salt River water to the same aqueduct by exchange.

Mr. LARSON. 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 over-all 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 four 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 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 now diverted to the irrigated lands during the summer months. The silt 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 Charleston 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 lands 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 Tucson.

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. The high-line 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, on the upper Gila River, about 7 miles northeast of Cliff, N. Mex., is considered as a potential development to serve requirements upstream from the Safford Valley. A dam at this site would provide partial flood control and silt reten-

tion 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, and the Duncan-Virden 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, an addition to the irrigation-distribution system would be required for the delivery of water.

Despite water shortage 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 an irrigation-drainage system to prevent waterlogging and to remove excess dissolved salts from the area. 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, primary purposes of each have been outlined. In addition to these enumerated, each of the features would have secondary purposes or incidental benefits which, considered in the aggregate, are of considerable importance. Possibly the most important of these is 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.

Senator DOWNEY. The use of Hoover Dam calls to my mind that yesterday I was guilty of a very serious faux pas several times in that I called it Boulder Dam. In each and every case where I said Boulder Dam I would make it Hoover Dam, and I apologize for that.

Senator MILLIKIN. Senator, after having been in error so many years, you cannot be expected to get right overnight.

Senator DOWNEY. Mr. Chairman, at least to the extent of your good nature and the diligence of the reporter will permit, I desire that correction made. I realize, to start out with, it would be a hopeless task to try to correct all errors.

Senator MILLIKIN. This will be a whole lot easier to correct.

Go ahead, Mr. Larson.

Mr. LARSON. The importance of this may be more fully realized when it is recalled that 354,500 visitors were conducted through the power house at Hoover Dam during 1946. During this same year more than 1,000,000 persons visited the Hoover Dam recreational area. 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 all the reservoirs to be created under the central Arizona project.

General—the power features of the potential central Arizona project 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 on 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.

OPERATION

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.

Senator MILLIKIN. How much power can be put in at Hoover Dam?

Mr. LARSON. About 300,000 kilowatts.

Mr. MORITZ. Four units have not been installed.

Senator MILLIKIN. How many units have been installed?

Mr. MORITZ. Thirteen in all.

Senator MILLIKIN. The units all deliver the same amount of power?

Mr. LARSON. No, they vary.

Senator MILLIKIN. What percentage of power of the Hoover Dam is at the present time developed?

Mr. LARSON. There is 1,030,000 now installed and ultimately there will be 1,370,500 kilowatts.

Senator MILLIKIN. All right.

Mr. LARSON. 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 operation for power, river flows for the years 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 assumed as the critical period for the reservoir operation studies. These studies were computed for three conditions of development of the central Arizona project, namely; (1) initial conditions, assumed to be those resulting at the completion of construction of the project; (2) ultimate development, assumed to be 50 years after initial conditions; and (3) average conditions, assumed midway between initial and ultimate development.

Virgin stream flows were depleted for conditions estimated as representative of the above conditions or 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 to the same level whether Hoover power plant was operated independently or integrated; (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.

These reservoir-operation studies show that for the 10-year critical period Bridge Canyon power plant would produce an average firm power equal to its yearly credit although during years of above-average run-off it would produce energy in excess of its required firm output. This would enable Hoover power plant to reduce its output to that which is needed to firm the system requirement, and to store water in Lake Mead. In turn, during years of below-average run-off, Hoover power plant would utilize this stored water to generate energy to repay the amount borrowed from Bridge Canyon. All use of water for power production, however, would be governed by demands for release or storage for irrigation, river regulation, and flood control.

POTENTIAL OUTPUT

The potential output of the Colorado River plants under the coordinated operation previously mentioned and at initial conditions is 10,725,000,000 kilowatt-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.

Table 9 shows the generation of central Arizona project for the three stages of development studies.

It is estimated that by the time Bridge Canyon Dam and power plant are completed that the power market area will be able to absorb the entire output of the central Arizona project.

Senator DOWNEY. Mr. Chairman, may I interrupt with a brief question?

Senator MILLIKIN. All right.

Senator DOWNEY. I understand, Mr. Larson, it is contemplated the pumping project will require one-third of all the power developed at the Bridge Canyon power plant?

Mr. LARSON. That is right.

Senator DOWNEY. That is right?

Mr. LARSON. Yes, sir.

Estimates made by the Federal Power Commission and the Bureau of Reclamation indicate that a minimum increase of 100,000 kilowatts of generating capacity should be added in the power market area each year. Allocating 240,000 kilowatts of the capacity of the central Arizona project to pumping at the Havasu plants, the energy production of about 530,000 kilowatts of the capacity of the project would be available for commercial sale. It is estimated that this power would be absorbed in about 5 years.

Table 10 shows the estimated energy requirements and peak demands from 1946 to 1970, inclusive.

(Tables 9 and 10 follow:)

TABLE 9.—Summary of power plants

Power plants	Installed capacity	Gross average power head (feet)	Annual firm energy in million kilowatt-hours		
			Condition A ¹	Condition B ²	Condition C ³
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 ⁴			25	28	32
Total.....			4,748	4,463	4,176
Pumping requirements: Havasu and McDowell.....			⁵ 1,154	⁵ 1,393	⁵ 1,633
Net energy production.....			3,594	3,070	2,543

¹ 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.

² Upper basin depletions are assumed to be the mean between conditions A and C diversion to the project of 1,025,000 acre-feet.

³ 50 years after condition A assuming 75,000,000 acre-feet delivered at Lee Ferry during 10-year low period, and releases approximating 7,500,000 acre-feet a year; 1,200,000 acre-feet annual diversion to central Arizona; no coordination needed because of the regulated condition of stream flow.

⁴ Replacement of energy which would be required if diversions to Salt-Gila aqueduct were made from above Stewart Mountain Dam.

⁵ Includes 7 percent transmission losses.

TABLE 10.—Estimated energy requirements and peak demands, lower basin power area

Year	Estimated annual energy require- ments (millions of kilowatt-hours)			Estimated peak demand at 60 percent annual load factor (thousand kilowatts)
	Total	Load increase		
		Increment for 5 years	Accumula- tive total	
1946	¹ 12, 080			¹ 2, 200
1950	14, 164	² 2, 084	2, 084	2, 695
1955	17, 650	3, 486	5, 570	3, 358
1960	20, 687	3, 037	8, 607	3, 936
1965	23, 350	2, 663	11, 270	4, 443
1970	25, 971	2, 621	13, 891	4, 941

¹ Actual requirements for year 1946.² For 4 years.

Part of this high rate of demand increase is attributable to the high per capita energy requirement. In 1943, the per capita demand for the area was 2,420 kilowatt-hours a year as against the average demand of 1,677 kilowatt-hours a year for the whole country.

Mr. LARSON. In the year 1946 the power used in the market area was 12,080,000 kilowatt-hours.

Senator DOWNEY. That is table 10?

Mr. LARSON. Was it the other table you were referring to?

Senator MILLIKIN. Go ahead.

Mr. LARSON. In 1950 it is estimated the requirement would be 14,164,000,000 kilowatt-hours; and in 1955, 17,650,000,000 kilowatt-hours; in 1960, 20,687,000,000 kilowatt-hours; in 1965, 23,350,000,000 kilowatt-hours; and in 1970, 25,971,000,000 kilowatt-hours.

Senator MILLIKIN. How do you figure your population growth?

Mr. LARSON. The population?

Senator MILLIKIN. Yes.

Mr. LARSON. By plotting the data from census records and extending the curve which gives an indication of the trend.

Senator MILLIKIN. As far as you know, are you in coincidence with the theories of California and Arizona on that?

Mr. LARSON. I think so. I think anyone in the area will admit there is a power market there that will absorb all the power that can be produced in these hydro developments.

Senator McFARLAND. As a matter of fact, when there is some additional power there is trouble as to who is going to get it, is there not?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. All right, go ahead.

COSTS AND ALLOCATIONS.

Mr. LARSON. Construction costs: estimated construction costs are present in tables 11 and 11A, "Summary of costs, central Arizona project." Cost estimates by the Bureau of Reclamation were computed on unit prices prevailing during April 1946. Estimates and costs of Buttes and Charleston Dams, the Tucson aqueduct, and the Safford Valley improvements were prepared from basic data supplied by the United States engineer office, Los Angeles, Calif. These estimates were based on prices prevailing in 1939 and were adjusted to April 1946 levels by the Bureau of Reclamation. All costs include allowances for engineering and contingencies.

Senator MILLIKIN. How long will it take you to complete the project?

Mr. LARSON. The minimum construction period?

Senator MILLIKIN. Yes, sir.

Mr. LARSON. In my opinion a minimum of 5 years.

Senator McFARLAND. That would not include all the projects, would it, Mr. Larson?

Mr. LARSON. I believe if you assume money was available, the work could be strung out so that it could all be completed within that minimum period. That would be rushing it considerably. The normal period would be longer.

Senator McFARLAND. You would not start to construct the Coconino Dam before the Bridge Canyon Dam was built?

Mr. LARSON. Those dams could be under construction concurrently.

Senator McFARLAND. They probably would not be.

Mr. LARSON. That is right.

Tables 11 and 11A also include allocations of costs and annual operating costs of the project. The allocations as shown in table 11 are based upon the provisions of Senate bill 433 and those in table 11A are based upon the provisions of the existing reclamation law.

Allocations of construction costs to project features have been segregated on the basis of being either reimbursable or nonreimbursable. Repayment and amortization periods and national benefits have been established on two bases:

(1) To accord with the proposed Senate bill 433 which would modify the financial procedure of existing reclamation law, and (2) to accord with existing reclamation law.

Under the terms of Senate bill 433, allocations to flood control, silt control, river regulation, recreation, and fish and wildlife conservation are considered as nonreimbursable, while irrigation, power production, and municipal water supply allocations would be repaid. Under existing reclamation law, allocations to irrigation, power production, and municipal water are reimbursable, while flood control, navigation, and fish and wildlife propagation are nonreimbursable.

(Tables 11 and 11A are as follows:)

TABLE 11A.—Summary of costs—Central Arizona project, Parker route

Item	Feature	Construction costs (1946)						Annual expense	
		Total	Allocation (reclamation law)					Operation and maintenance	Reserve for replacement
			Power interest-bearing	Irrigation interest-free	Municipal interest-bearing	Flood control nonreimbursable	Fish and wildlife nonreimbursable		
1	Bluff Dam and Reservoir	\$25,695,000	\$15,418,000	\$6,838,000	-----	-----	\$3,340,000	\$20,000	\$6,500
2	Cienega Dam and Reservoir	6,356,000	4,396,000	1,970,000	-----	-----	-----	14,800	2,200
3	Bridge Canyon Dam and Reservoir	104,195,000	110,668,000	49,751,000	-----	-----	3,775,000	22,500	67,100
4	Bridge Canyon power plant	60,807,000	41,957,000	18,850,000	-----	-----	-----	1,078,100	688,600
5	Havasai pumping plants	20,503,000	-----	20,503,000	-----	-----	-----	1,297,400	148,800
6	Gillette feed aqueduct	107,373,000	-----	107,373,000	-----	-----	-----	1,073,300	24,700
7	McDowell pumping plant and canal	2,652,000	103,000	2,549,000	-----	-----	-----	37,600	12,700
8	McDowell Dam and Reservoir and Phoenix water supply replacement	13,671,000	3,921,000	6,504,000	-----	\$2,437,000	809,000	467,000	16,200
9	McDowell power plant	810,000	559,000	251,000	-----	-----	-----	33,000	7,200
10	Horseshoe Dam (enlargement) and reservoir	5,890,000	2,097,000	3,169,000	-----	-----	624,000	5,800	1,900
11	Horseshoe power plant	1,992,000	1,374,000	618,000	-----	-----	-----	53,200	16,300
12	Salt-Gila aqueduct	26,842,000	-----	26,842,000	-----	-----	-----	251,400	50,500
13	Bufiles Dam and Reservoir	25,398,000	6,023,000	14,899,000	-----	3,762,000	724,000	16,600	-----
14	Bufiles power plant	908,000	627,000	281,000	-----	-----	-----	38,800	8,200
15	Charleston Dam and Reservoir	8,070,000	-----	867,000	\$5,329,000	836,000	1,038,000	6,300	-----
16	Tucson aqueduct	6,046,000	-----	-----	6,406,000	-----	-----	35,200	2,900
17	Irrigation distribution system	20,879,000	-----	20,879,000	-----	-----	-----	208,800	-----
18	Irrigation drainage system	3,781,000	-----	3,781,000	-----	-----	-----	156,800	8,200
19	Hooker Dam and Reservoir	13,394,000	-----	12,917,000	-----	428,000	49,000	10,000	-----
20	Safford Valley improvements	3,341,000	-----	2,920,000	-----	421,000	-----	35,200	-----
21	Power transmission system	86,113,000	59,418,000	26,695,000	-----	-----	-----	1,269,700	973,900
	Total	604,717,000	246,551,000	328,547,000	11,375,000	7,884,000	10,360,000	5,130,600	1,965,700

Senator DOWNEY. Mr. Chairman, at this point may I clarify the record by asking Mr. Larson a question?

I notice the total cost is \$604,717,000 with all its features?

Mr. LARSON. That is right.

Senator DOWNEY. How much of that total cost in money will come from the construction of the irrigation features, including cost of the pumping plants allocated to irrigation purposes?

Mr. LARSON. The percentage allocated to irrigation is that it?

Senator DOWNEY. No; I understand it would take about \$300,000,000 to construct the irrigation units to these projects, including allocation to irrigation of the cost of the pumping plants. Is that approximately right?

Mr. LARSON. That is right.

Senator MILLIKIN. Go ahead.

Mr. LARSON. Will it be satisfactory to pass the tables?

Senator MILLIKIN. Unless you think there is some special feature that should be commented on.

Mr. LARSON. I do not believe it would be necessary.

Senator MILLIKIN. All right.

ANNUAL COSTS

Mr. LARSON. Annual costs of the project development would include repayment of the reimbursable construction costs, operation, and maintenance costs, and reserve for replacement?

Total operation and maintenance expenses include operation and maintenance on nonreimbursable project features.

COST ALLOCATIONS

Cost of the central Arizona project have been allocated to the functions provided for in Senate bill 433, and also to those functions recognized by existing reclamation law. In making the allocations, each facility was given individual consideration. Many of the project works would be constructed for single functions only, and the costs of such were considered chargeable solely to the function involved. Where a facility would serve multiple-purpose functions, its cost was apportioned to the uses served.

In general, construction costs of multiple-purpose facilities were allocated to the various functions on the basis of the proportion of the total benefits that would accrue to each function.

ESTIMATED RETURNS

Direct returns would accrue to the central Arizona project from the sale of irrigation water, municipal water, and power. The estimated returns from these functions over an 80-year period would average \$14,070,000 annually under the terms of Senate bill 433. The returns for the first 50 years of project operation would average \$14,810,300 annually.

Senator DOWNEY. Mr. Larson, do you show in your statement what the operation and maintenance expenses of the irrigation project would be?

Mr. LARSON. Yes; they are included in the tables.

Senator DOWNEY. All right, if you discuss them later.

I understand that the returns from the water users would not be sufficient even to pay the operation and maintenance expenses of the irrigation project?

Mr. LARSON. That depends on the way you consider the project. By singling out features it would probably be true. Considering the project as a whole, it would not be true.

Senator DOWNEY. What I want to consider is the amount of money the Government receives from water users for the irrigation water, as against the operation and maintenance items of maintaining the system by which they get that water.

Is it not true that the return from the farmers will not be anywhere near sufficient even to pay the operation and maintenance expenses of the irrigation end of the project?

Mr. LARSON. That is probably true. However, it would depend on the cost you would set on the 31 percent of the power produced at Bridge Canyon.

Senator McFARLAND. May I suggest—

Senator MILLIKIN (interposing). Is the answer satisfactory?

Senator DOWNEY. I would just like to sharpen it some.

Senator MILLIKIN. All right, you sharpen it up.

Senator DOWNEY. I understand you intend to fix a charge of \$4.50 an acre-foot?

Mr. LARSON. That is right.

Senator DOWNEY. That is fixed on the basis that is all the farmers can bear. Is that not correct?

Mr. LARSON. That is correct.

Senator DOWNEY. And is it not true that the operation and maintenance expenses allocated to irrigation as you are figuring in your plan, without the electrical pumping charges, would amount to 50 percent more than that or around \$6.50 or \$7 for operation and maintenance alone?

Mr. LARSON. On the basis of rate allocation to irrigation, the annual cost would exceed the return from the farmers.

Senator DOWNEY. By about 50 percent.

Mr. LARSON. I do not recall what that percentage is.

Senator DOWNEY. Do you not know you estimate the operating and maintenance expenses at about \$6.50 an acre-foot?

Mr. LARSON. It may be approximately 50 percent.

Senator DOWNEY. May I ask you—

Senator MILLIKIN (interposing). Just a moment. What was the answer?

(Thereupon the reporter read the answer as above recorded.)

Senator DOWNEY. Is it not contemplated that the pumping of water from Parker Dam up a thousand-foot lift will take about one-third of the available power from Bridge Canyon power plant?

Mr. LARSON. That is right.

Senator DOWNEY. Now in your calculation what basis do you assume for the charges for electrical energy from Bridge Canyon for that pumping operation?

Mr. LARSON. One-third of the cost of Bridge Canyon, and that includes Coconino and Bluff as part of that development, so that one-third of the cost of Bridge Canyon, Coconino, and Bluff is allocated to that operation.

Senator DOWNEY. Do you charge any interest in reaching that result?

Mr. LARSON. No interest charge to that one-third allocated to irrigation.

Senator DOWNEY. And of course the commercial users have to pay a 3 percent interest charge?

Mr. LARSON. Under the provisions of the reclamation law it is 3 percent. Under the provisions of S. 433 it would be 2 percent.

Senator DOWNEY. You contemplate the sale of the other two-thirds of the power in southern California, southern Nevada, and Arizona?

Is the only difference you expect to make in your charges, between the commercial users in that area and the irrigation users, that you do not charge the irrigation pumping power with the 2 percent interest and you do charge the commercial power with 2 percent interest charge?

Mr. LARSON. That is correct, with this exception, under the provisions of the reclamation law, allocation to irrigation would be repaid in 50 years, 40 years plus a 10-year development period.

Under S. 433, allocation to irrigation would be paid in 80 years.

Senator MILLIKIN. Will the reporter read the answer?

(The reporter thereupon read the answer as above recorded.)

Senator DOWNEY. If the charges that are to be made to farmers on the basis of all they can bear are not even sufficient to pay operation and maintenance, how much of a subsidy is going to be required directly out of the Treasury of the United States to construct this project?

Mr. LARSON. The studies that we have made indicate that, by applying the interest component, under provisions of the reclamation law, there would be no subsidy. In other words, the interest component would provide the difference. We would not be subsidizing it.

Senator DOWNEY. You first come to the irrigationist. His benefit is relief from the 2 percent interest which is chargeable against the commercial user.

Mr. LARSON. In these studies we have applied the interest component in both cases.

Senator DOWNEY. I thought you said you were not applying the interest component to the irrigation and pumping.

Mr. LARSON. We apply the interest component. That is interest derived from power allocations.

Senator DOWNEY. Let me again clarify it.

In fixing the rate you will charge the Arizona water users for the electrical energy required to pump their water; you do not charge any interest on the part of power costs allocated to irrigation?

Mr. LARSON. That is right.

Senator DOWNEY. That interest is a subsidy to whatever extent the Government has to pay interest on the money. Is that correct?

Mr. LARSON. That is under the provision of the reclamation law—

Senator DOWNEY. You do charge commercial users 2 percent on the capital cost of power features allocated to be repaid by power?

Mr. LARSON. That is right.

Senator DOWNEY. That interest does not go back to the Treasury, but is allocated for the benefit of the Arizona farmers?

Mr. LARSON. That is correct.

Senator DOWNEY. Do you say when that is done no further subsidy will be required from the Federal Government?

Mr. LARSON. Under the reclamation law that will be true.

Senator DOWNEY. You will not have enough money to maintain this project, will you? Will not the Government be involved in a large subsidy beyond allowing the power interest component?

Mr. LARSON. The returns from the project would be adequate to pay the annual cost on the basis by applying the interest component.

Senator DOWNEY. And no additional subsidy is required?

Mr. LARSON. That is correct if it is assumed that application of the interest component is a subsidy.

Senator DOWNEY. The total cost of the irrigation end of this is about \$300,000,000?

Mr. LARSON. That is right.

Senator DOWNEY. You will have a benefit equivalent to the irrigation of 150,000 acres?

Mr. LARSON. There would be a benefit to the entire acreage, but 152,000 acres would go out of production if the project is not constructed.

Senator DOWNEY. How much is 150,000 divided into \$300,000,000?

Mr. LARSON. About \$2,000.

Senator DOWNEY. \$2,000 an acre, and what is that land worth? Do you know, irrigated?

Mr. LARSON. Sale value?

Senator DOWNEY. Well, buying and sales value. Is it worth about \$300 an acre, land that has water and being cultivated?

Mr. LARSON. That is about right.

Senator DOWNEY. So the total worth of that land would be about \$45,000,000.

Now, are you, a member of the Bureau, recommending that this project should be constructed, at a cost of \$2,000 an acre, to provide water for that 150,000 acres?

Mr. LARSON. At this time the Bureau has not made a recommendation.

Senator DOWNEY. All right; thank you very much.

Senator McFARLAND. I would suggest, Mr. Chairman, that with a firm water supply you could get a much higher value on the land in Arizona than that suggested by the Senator.

Senator DOWNEY. I do not want to suggest anything to the witness.

Senator McFARLAND. You suggested the value.

Senator DOWNEY. I just wanted to hurry him along.

I understand good land with good water is now being sold in central Arizona at \$300 an acre. If that is not correct, I will be corrected by your witness.

Senator MILLIKIN. I would like to ask Senator McFarland as to that part of the cost allocated to irrigation and which will be reimbursable.

Are the landowners, generally speaking, willing to assume the cost?

Senator McFARLAND. They are willing to pay this price per acre for water, and assume that part of it; and they are willing to take a large portion of this power; and if the other States are not willing to take it, I think we can use the majority of this power in Arizona, and assume our portion of the cost in that way.

In other words, we feel that the project is entirely feasible. We do not think that any project can stand on its own as far as irrigation

alone is concerned, that is, just build dams without power to help repay the cost.

Senator MILLIKIN. Let me get it straight.

How much money is allocated to irrigation under the whole project?

Mr. LARSON. It is a little different under the two provisions. Under the provisions of S. 433, \$311,672,000 is allocated to irrigation.

Senator MILLIKIN. That is the amount that would be reimbursable by the landowner?

Mr. LARSON. That is right. Under the provision of the reclamation law, \$328,547,000 would be allocated to irrigation.

Senator MILLIKIN. That also would be reimbursable by the landowners?

Mr. LARSON. That is right.

Senator MILLIKIN. And you say there are 150,000 acres involved?

Mr. LARSON. Beg pardon?

Senator MILLIKIN. You say there are 150,000 acres involved?

Mr. LARSON. No, the project here involved, it is a supplemental water supply and the water would not be confined to 150,000 acres. It would benefit the entire area. The total area would be 640,000 acres.

Senator MILLIKIN. That would be an acre-foot cost for water of how much?

Mr. LARSON. Under the provisions of the reclamation law it would be \$16.60 at the farm headgate.

Under the provisions of the bill S. 433, the cost at the farm headgate would be \$11.80.

Senator DOWNEY. An acre-foot, is that it?

Mr. LARSON. An acre-foot.

Senator MILLIKIN. An acre-foot, and how many acre-feet are necessary to do an irrigation job in that country?

Mr. LARSON. There is required a net of approximately 4 acre-feet at the farmer's headgate.

However, this would amount to 1 acre-foot per acre of supplemental water.

Senator MILLIKIN. What is the cost of that acre-foot under the project.

Mr. LARSON. Under the provisions of the reclamation law it would be \$16.60.

Senator MILLIKIN. The total over-all long period?

Mr. LARSON. That is right. Under the reclamation law it would be for 50 years.

Senator MILLIKIN. Yes.

Mr. LARSON. In other words, at the end of 50 years the project would be repaid. The cost of the water after that time would be less.

Senator MILLIKIN. How much would the farmer have to pay in the end? This bill operates on an 80-year basis.

Mr. LARSON. This bill would provide for an 80-year repayment period, and the cost at the farm headgate would be \$11.80.

Senator MILLIKIN. Over the 80-year period?

Mr. LARSON. That is right.

Senator MILLIKIN. Per acre-foot.

Mr. LARSON. Per acre-foot of supplemental water.

Senator DOWNEY. Mr. Chairman, may I ask some additional question?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. Now, Mr. Larson, you have just stated to the chairman that this project would be carried out by furnishing 1 acre-foot of supplemental water per acre to 600,000 or 700,000 acres?

Mr. LARSON. It will average that amount.

Senator DOWNEY. Oh, average that amount. Will not at least one-half of your land be totally new land that will require 4 or 5 acre-feet?

Mr. LARSON. No, it will not.

Senator DOWNEY. Let me read you what you say here:

It is estimated that this 419,000 acre-feet of water would furnish an adequate supply for 73,500 acres of land formerly irrigated but now idle for lack of water. Although the 73,500 acres does not represent all the lands in the area having an irrigation history but now idle because of lack of water, it does represent the apparent maximum that could be returned to cultivation with new water the project would make available.

What do you mean?

Mr. LARSON. The first thing you increase your recharge. Therefore, you are able to pump more water from the area, this land that is now idle. In the case of this kind, a man would have 130 acres and 30 acres of his land is lying idle here.

Senator DOWNEY. Mr. Lawson, do you not mean by this, it is estimated this 419,000 acre-feet will furnish an adequate supply for 73,500 acres of land formerly irrigated but now idle for lack of water, do you not mean by that statement you are allocating 419,000 acre-feet of water to develop the 73,500 acres of land now idle for lack of water?

Mr. LARSON. Not necessarily that way, for this reason, a man might elect to use his present water supply over the entire area of his land and need 1 acre-foot of supplemental water.

Senator DOWNEY. As a matter of fact, you are allocating about 51½ acre-feet of water for the needs of 1 acre of land, are you not?

Mr. LARSON. That is about right.

Senator DOWNEY. And you are only getting in enough water, according to your statement, and that of Mr. Moritz, to take care of the equivalent of 152,000 acres of land, however, you may spread it around?

Mr. LARSON. That is right.

Senator DOWNEY. So you are proposing to bring in enough water to irrigate approximately 150,000 acres in the irrigation unit, at a cost of \$300,000,000?

Mr. LARSON. You are bringing in enough water to supply an equivalent amount for 152,000 acres, but actually it will be spread over the entire area as supplemental water.

Senator DOWNEY. Will it be spread out over the 73,500 acres?

Mr. LARSON. It would be.

Senator DOWNEY. You speak of that area as being idle.

Senator McFARLAND. Maybe if you could explain the situation that prevails in Pinal County in the San Carlos project, which comprises 100,000 acres, where the farmers only irrigate the number of acres which they actually have water for a year, and where this particular year there is less than half of that land irrigated, and the other land lying idle—

Senator MILLIKIN. I do not regard this as a determinative inquiry, but it gives perspective to what we are doing here.

Is Senator Downey correct in saying if all this water was supplied as new water to new land, 150,000 acres could be irrigated?

Mr. LARSON. That is right, theoretically.

Senator MILLIKIN. And if that were done, the water would be \$2,000 an acre.

Mr. LARSON. Assuming it on that basis.

Senator MILLIKIN. Assuming it on that basis.

(Supplemental data by Mr. Larson:)

In the discussion on June 24 (pages 58 to 60 and 78 to 81 of this record) there seems to have been a little confusion regarding the area to be irrigated under the central Arizona project. To clarify the record I desire to submit the following supplemental statement to my remarks of yesterday.

During the 5-year period 1940 to 1944, inclusive, the average irrigated area in central Arizona was 566,200 acres. During this period an average of 468,000 acre-feet was pumped annually in excess of the safe yield of the ground water basin. This overdraft did not provide a full supply as an average shortage existed of 113,000 acre-feet annually. In addition, no allowance was made to provide sufficient outflow from the area to maintain a proper salt balance.

In the absence of the central Arizona project, it will be necessary to reduce the acreage which can be irrigated with a full supply to 413,700 acres, a reduction of 152,500 acres from the average area irrigated in the 5-year period 1940-44, inclusive.

Construction of the central Arizona project will permit full irrigation of the 566,200 acres irrigated during the period 1940-44 and in addition, would furnish a water supply to bring back into production an additional 73,500 acres of land formerly irrigated but now idle for lack of water. This land is now idle because the available water supply is being concentrated on a lesser acreage. This potential development would permit the delivery of a full water supply to 640,000 acres (413,700 plus 152,500 plus 73,500).

The confusion in the discussion seemed to center around a hypothetical condition of comparing the total construction cost of the project that is allocated to irrigation, with the additional reduction of 152,500 acres of land that must go out of production if the central Arizona project is not constructed. Under this hypothetical comparison the cost would be about \$2,000 per acre. However, under such a comparison no consideration is given to the 73,500 acres that are now idle for lack of water but would be furnished a full supply under the potential project. Therefore, for a comparison of equivalent acreage a figure of 226,000 (152,500 plus 73,500) should be used. Under such a comparison the cost per equivalent acre furnished a full supply of water would be about \$1,380 and not \$2,000.

Such comparisons are hypothetical because they do not represent the value and cost of supplemental water. The supplemental water that is needed and would be supplied to the 640,000 acres would result in greater production and benefits than for water supplied to water-equivalent area of new lands.

Senator McFARLAND. We get more benefit than that, for the reason we have a reuse of water.

Senator MILLIKIN. I understand that, but I think that is one of the factors to give perspective in this picture. We are clear on that.

Senator DOWNEY. Then, Mr. Chairman, if I may proceed with another question of this kind, what will be the total amount of water, in acre-feet, for allowing for seepage and deductions, that will be available for use in this central Arizona project?

Mr. LARSON. I will have to look that up for you.

Senator MILLIKIN. Now may I digress just a moment?

Senator DOWNEY. Yes.

Senator MILLIKIN. Assuming a fellow has 160 acres of land and assuming he needs 1 acre-foot of supplemental water a year, what

will he have to pay to get it under this project over the 80-year term?

Mr. LARSON. \$4.50 per acre-foot.

Senator MILLIKIN. \$4.50 per acre-foot?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. So it would be 160 times that?

Mr. LARSON. That is right.

Senator MILLIKIN. He would pay \$720 over the complete life of the project for that acre-foot of water?

Mr. LARSON. That is right.

Senator MILLIKIN. What do they pay now, Senator McFarland, for water rights in Arizona?

Senator MCFARLAND. It does not run that much.

Mr. V. I. Corbell, member, board of governors, Salt River Valley Water Users, Denbe, Ariz. About \$7 an acre for the first 2 acre-feet of water.

Senator MCFARLAND. Has that changed in the Salt River Valley?

Mr. CORBELL. Our charge has averaged \$3.50 for the first 2 acre-feet and a dollar an acre-foot for each additional acre-foot.

Senator MILLIKIN. Let us take the same cost and follow through on 160 acres. A person down there would have to pay how much for 1 acre-foot of water over the 160?

Senator MCFARLAND. For the first 2 acre-feet he pays \$3.50. For the first acre-foot he pays \$1.75. For the second he pays \$1.75, and every additional acre-foot a dollar.

Senator MILLIKIN. That is his cost plus assessment for delivery charges and so forth.

Senator MCFARLAND. That is combined.

Senator DOWNEY. May I ask a few further questions, Mr. Chairman?

Senator MILLIKIN. Yes, sir.

Senator DOWNEY. You have just stated to the chairman a farmer would have to pay \$4.50 per acre-foot which you have heretofore stated considerably lacks even meeting operation and maintenance expenses.

I will ask you this, how many acre-feet of water will be delivered to the project, the works of which will cost \$300,000,000, so we can figure what the water is costing per acre-foot?

Mr. LARSON. The amount of water delivered to the farmer's head gate, which is based upon the average delivery for the first 50 years is 636,000 acre-feet.

Senator DOWNEY. That would be almost \$500 an acre-foot, would it not? Is that not correct?

Mr. LARSON. No, that is not correct. It is \$11.80 an acre-foot under the provisions of this bill.

Senator DOWNEY. How much do you figure will be the actual cost per acre-foot of that water, allowing for the different rates of power?

Mr. LARSON. Based upon the cost allocated to irrigation it would be \$11.80 delivered to the farmer's head gate.

Senator DOWNEY. For which he is paying \$4.50.

Senator MILLIKIN. I figure \$5.

Senator DOWNEY. Yes, that is the capital charge.

Senator MILLIKIN. Does that coincide with your notes?

Mr. LARSON. I was asked the cost per acre-foot, which would include in addition to capital cost, operation, and maintenance, and that would be \$11.80.

Senator MILLIKIN. Yes; I may have difficulty reconciling the \$11.80 with the \$500.

Mr. LARSON. The \$500 would be repaid over a period of 80 years.

Senator DOWNEY. I might intervene with a question that might perhaps clarify that.

Is not the \$11.80 annual cost that you speak of merely the capital cost, which does not include operation and maintenance?

Mr. LARSON. That includes operation and maintenance and capital cost.

Senator DOWNEY. The \$11.80?

Senator MILLIKIN. In other words you take \$500 and amortize it over 80 years and you get \$11.80?

Mr. LARSON. No, it includes the operation and maintenance.

Senator MILLIKIN. It would be a lesser sum than \$11.80?

Mr. LARSON. That is right.

Senator MILLIKIN. Offhand can you say how much of a lesser sum?

Mr. LARSON. It would be about \$6.

Senator DOWNEY. Mr. Larson, I want to be sure that I understand you correctly on one thing.

I understood you to say that after the power is sold at the rate that is to be fixed, including this 2 percent interest component, and after the water users pay \$4.50 an acre-foot, no subsidy will be required from the Government on this whole project?

Mr. LARSON. No subsidy will be required for irrigation if the interest component is applied.

Senator DOWNEY. Mr. Larson, that is not my question. This whole project cost something over \$600,000,000.

Mr. LARSON. That is right.

Senator DOWNEY. We are going to take in certain power revenues and going to take in certain water revenues on it. In turn we calculate this rate for water and hope the Government will not have to provide a subsidy of maybe \$250,000,000—

Mr. LARSON (interposing). Well, what do you mean, subsidy, and how would it be charged, for example?

Senator DOWNEY. Mr. Larson, I may be entirely wrong, and if I am I want to be corrected, but I understand that if the \$4.50 per acre is collected, and you collect the rate for power, and you work out the interest component and so on, that this project still lacks enough money to pay out the \$607,000,000 by something in the neighborhood of \$200,000,000 or \$250,000,000.

Mr. LARSON. That is not correct.

Senator DOWNEY. That is not correct?

Mr. LARSON. No, sir.

Senator DOWNEY. And the way you are arranging your water charges and power charges it would amortize out the complete investment?

Mr. LARSON. In 80 years.

Senator McFARLAND. Mr. Chairman, we will not go into it now, but later on our witnesses will fully explain the price that is being charged for the waters in the various projects and how this project will pay out, and so forth.

Senator MILLIKIN. All right.

Senator McFARLAND. I do not want to take the time of the chairman and the committee at this point.

Senator MILLIKIN. All right, Mr. Larson.

Mr. LARSON. At that time total power and municipal water costs would be repaid. To this total was added the revenue from the sale of irrigation water and power for the remaining 30 years of the project repayment period. In this 30-year period the average annual return from the sale of irrigation water would differ from that of the first 50 years in that a uniform rate of water delivery to the project would obtain throughout the 30-year period, while the rate of delivery in the first 50 years would increase with project development. Power revenues would be lower in the 30-year period because of the lesser amount of water available for power production due to increased upstream depletions.

Under the terms of existing reclamation law the estimated average annual returns would be \$14,810,300 over a 50-year project repayment period.

In computing these returns, in both instances it was assumed that available power revenues were applied to aid in the repayment of irrigation obligations.

IRRIGATION WATER

A charge of the farmer of \$4.50 per acre-foot of water at the farm head gate was used as the basis for computing annual returns from the sale of irrigation water. This price is predicated upon repayment ability studies of the project area, based on 1939 to 1944 average values of crops at the farm.

POWER

A rate of 4 mills per kilowatt-hour was used as the revenue factor for this function. This rate is believed to be a conservative estimate of the value of Colorado River power at the time the project would be constructed. Studies were also made to determine the power rate needed to effect a 1:1 return-to-cost ratio under provisions of either Senate bill 433 or the present reclamation law.

MUNICIPAL WATER

A study of the 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 \$0.15 per 1,000 gallons at the intake of its distribution system. Therefore, returns from the sale of 10,800 acre-feet of water delivered to Tucson have been evaluated on that basis.

Senator MILLIKIN. We will recess until 10 o'clock tomorrow morning.

(Whereupon, at 12:30 p. m., the subcommittee adjourned until 10 a. m., Wednesday, June 25, 1947.)

BRIDGE CANYON PROJECT

WEDNESDAY, JUNE 25, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
(OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin, presiding.

Present: Senators Millikin (presiding) and Ecton.

Present also: Senators McFarland and Downey.

Senator MILLIKIN. The committee will come to order, please. Mr. Larson.

**FURTHER STATEMENT OF V. E. LARSON, ASSISTANT REGIONAL
PLANNING ENGINEER FOR REGION III, BUREAU OF RECLAMA-
TION**

Mr. LARSON. May I proceed?

Senator MILLIKIN. Yes, sir.

Senator McFARLAND. Before you start on that, Mr. Larson, there was one subject that was brought up here yesterday, and that was as to power paying for part of the cost of irrigation.

I understand that in the Central Valley, in California, the same thing is being done, as will be done in several other projects, and I would appreciate your going over the reclamation records and preparing a statement showing that the outline of this bill is not different from a number of other projects in that respect.

Will you get up something of that kind?

Mr. LARSON. I will prepare that statement.

Senator MILLIKIN. All right, proceed, Mr. Larson.

Mr. LARSON. In all studies, the interest component of the payments made on the power investment is considered as being applicable in aiding the retirement of the irrigation obligation during the power repayment period. In addition, under provisions of Senate bill 433, where retirement of the irrigation investment within an 80-year period is provided for, all net power revenues accruing after the power investment is repaid are applied to the repayment of the irrigation obligation until full repayment of the irrigation construction costs is accomplished.

The estimated average annual costs repayable from project operations, based on April 1946 price levels, would be \$13,952,000 under the terms of Senate bill 433. Average annual returns would be \$14,070,000.

Senator MILLIKIN. Now, this has reference back to S. 433. Is there

any difference between that and what is contemplated under S. 1175?

Mr. LARSEN. There is this difference—S. 1175 provides for allocation to irrigation to be repaid over the useful life of the project.

As I brought out in the statement earlier, if that provision is assumed to be 80 years, the net result would be the same.

Senator MILLIKIN. So if that were changed to a lesser period or a greater period, there would be some modification in the figure?

Mr. LARSEN. That is right.

Senator MILLIKIN. All right, go ahead.

Senator McFARLAND. As I understand, Mr. Larson, your figures are based upon the 80-year period?

Mr. LARSEN. That is correct.

Senator McFARLAND. Thank you.

Senator MILLIKIN. Very well, proceed.

Mr. LARSEN. This results in a return-to-cost ratio of 1.01:1. A power rate of \$.00396 per kilowatt-hour would provide a return-to-cost ratio of 1:1.

Under the terms of existing reclamation law the estimated average annual costs would be \$19,059,400.

Senator MILLIKIN. What is the power rate at Hoover Dam?

Senator McFARLAND. That is based on the falling water.

Mr. MORITZ. The total rate and amortization cost averages about 2 mills at the dam.

Senator MILLIKIN. Is this figure of .00396 at the dam?

Mr. LARSEN. Not the dam, Senator. At the load center.

Senator MILLIKIN. Which means what?

Mr. LARSEN. In the vicinity of Phoenix and Los Angeles.

Senator MILLIKIN. That is partially delivered power?

Mr. LARSEN. That is partially delivered power.

Senator McFARLAND. Mr. Moritz, is that for sale of falling water or taking into consideration the cost of equipment?

Mr. MORITZ. That includes everything.

Senator DOWNEY. Mr. Chairman, I do not think that is exactly clear, and I think the correct viewpoint is more favorable to the other position.

As I understand, the rate here fixed is 4 mills to the commercial user.

Is that right, Mr. Larson?

Mr. LARSEN. That is at the load center.

Senator DOWNEY. That is at the load center. In Los Angeles we pay about 4 mills. It is a wholly different situation at Hoover, because they do have a rate fixed for falling water, and the California interests provide generators, and it is wholly different.

It would be about what the cost is in Los Angeles. Is that not about right, Mr. Moritz?

Mr. MORITZ. I do not know what those costs are, but I would not be surprised if you are right.

Senator MILLIKIN. All right.

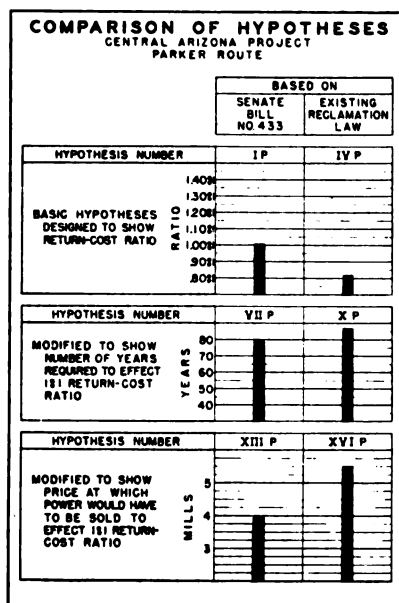
Mr. LARSEN. Average annual returns would be \$14,810,300. The return-to-cost ratio would be 0.78:1. In order to effect a return-to-cost ratio of 1:1 under the terms of existing reclamation law, it would be necessary to sell the power at the rate of \$.0055 per kilowatt-hour.

Senator MILLIKIN. Is that at the dam or at the market?

Mr. LARSEN. At the market—the load center.

Senator MILLIKIN. All right.

Mr. LARSON. The results of the foregoing financial studies are graphically shown on the chart titled "Comparison of Hypotheses." (The chart referred to follows:)



The comparison of this project is shown on that chart under three conditions, the first showing the ratio of return to cost under Senate bill 433, and the existing reclamation law which shows the return-to-cost rate.

Under Senate bill 433 it is 1.01 to 1 and under the Reclamation Act 0.78 to 1.

Studies were also made to show the number of years that would be required for the project to fully repay cost under the repayment provisions as provided in these two conditions.

Under Senate bill 433 it would require 79 years. Under existing reclamation law it would require 87 years.

The third division of comparison would show the power rate that would be required to fully pay all costs within the specified number of years, as set up in the two conditions.

Senator MILLIKIN. Is there any competing private power that would have bearing on these rates, reaching the same consumption area?

Mr. LARSON. I could not answer that.

Senator MILLIKIN. Does anyone know what private power costs are delivered in Nevada and the southern California area?

Senator DOWNEY. Well, Senator, they are based on a figure of about 4 mills, and part of the water is taken up—

Senator MILLIKIN. Perhaps I should back up and ask whether privately produced power as distinguished from power produced at Hoover Dam is sold in the Los Angeles area?

Senator DOWNEY. Oh, yes; a large amount.

Senator MILLIKIN. Do you know anything about those costs?

Senator DOWNEY. I think those costs are about comparable. We have other units in California, steam plants, and gas plants.

Senator MCFARLAND. We expect to have some other evidence on this power situation, Mr. Chairman.

Senator MILLIKIN. All right.

BENEFITS AND COSTS

Mr. LARSON. General—in the preceding analysis a comparison was made of the annual returns or revenues and annual costs of the project based upon the provisions of Senate bill 433 and the reclamation law.

The annual returns are associated only with the benefits accruing to the initial purchasers of irrigation water, municipal water, and electric energy who are the direct beneficiaries. Benefits are not limited to direct beneficiaries, however. There are innumerable indirect beneficiaries whose income and livelihood are dependent upon or substantially affected by the production of electric energy and the creation of raw materials on the irrigated lands. Nor are the benefits limited to those arising from electric energy, and irrigation and municipal water.

The central Arizona project would be a multiple-purpose development which would also furnish public benefits from flood control, silt control, fish and wildlife, 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 because of the time involved.

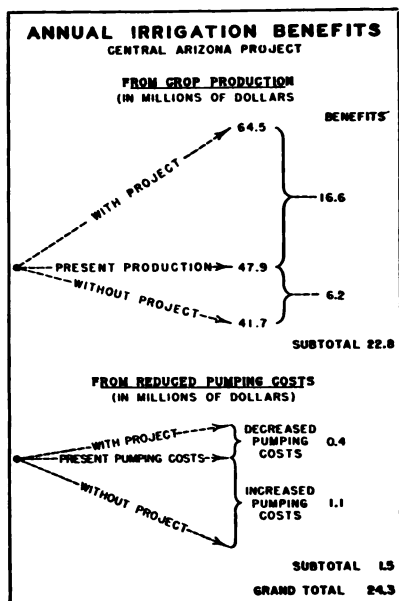
TANGIBLE, EVALUATED BENEFITS

Irrigation benefits are estimated to have an average annual value of \$24,300,000. 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 \$22,800,000 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 during the years 1939 to 1944. The benefits from savings in the cost of pumping irrigation water will average \$1,500,000 annually. Both of these types of benefits are calculated as 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. Annual irrigation benefits are the same under Senate

bill 433 and reclamation law. These benefits are indicated on the chart titled "Annual irrigation benefits."

(The chart referred to follows:)



Senator MILLIKIN. I do not quite understand the statement the annual irrigation benefits are the same under S. 433 and the reclamation law. Does it mean the benefits as you have calculated them are in conformity with the reclamation law?

Mr. LARSON. The benefits as I have calculated them are on an annual basis.

Senator MILLIKIN. Would be in accord?

Mr. LARSON. They are the same.

Senator MILLIKIN. Proceed.

Mr. LARSON. The \$24,300,000 of annual irrigation benefits measures the net effects of producing, processing, and handling in commercial channels the greater volume of agricultural products emanating from the project area. It, therefore, measures 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 improves. 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 bene-

fits of this type are included in the \$24,300,000 of irrigation benefits which are used in the benefit-cost ratio.

On the other hand, "gross benefits" from the project might be estimated as including the total additional income to individuals as well as businesses associated directly and indirectly with handling the additional agricultural products. Computed in this manner, "gross benefits" would greatly exceed the farm value of the products. Preliminary investigation suggests such "gross benefits" to be about three times the net benefits included in the benefit-cost ratio.

Power benefits resulting from consummation of the central Arizona project would pyramid into a value far above the sale value of the actual energy produced. The nature of the full effect is so devious as to be incapable of measurement. For this reason the computed sales value of the power has been used as representing the minimum benefit.

Average annual power returns are measured by the sale of electrical energy at a unit price of 4 mills per kilowatt-hour. Under Senate bill 433, the annual return would aggregate \$10,700,000 and under reclamation law, \$11,400,000. The difference in these amounts results from using dissimilar production periods. The smaller sum represents the average annual return over an 80-year period, while the larger sum is the average annual return for a 50-year period.

In computing these returns, it has been assumed that the accumulative effect of upstream depletions will cause a corresponding gradual reduction in power output. Consequently, the average annual return from energy produced will be less for an 80-year period than for a 50-year period as reflected in the amounts stated above.

Silt control benefits are estimated as \$1,900,000 annually under either Senate bill 433 or existing reclamation law. This total includes the value of protecting the Boulder Canyon project, the value of this protection being based on the replacement cost of Lake Mead shorage.

Senator MILLIKIN. Just a moment, Mr. Larson.

In calculating your upstream depletion, are you making allowance for any projected project in addition to the one under consideration?

Mr. LARSON. In the upper basin?

Senator MILLIKIN. No, in the lower basin. The upper basin is obligated to deliver a fixed minimum to the lower basin.

Mr. LARSON. At the present time the upper basin is using approximately 2,500,000 acre-feet of water and in this 50-year period that we are contemplating we have made allowances which would in turn reduce the water available at Bridge Canyon.

Senator MILLIKIN. Proceed.

Mr. LARSON. It also includes the benefits associated with Buttes and Hooker Reservoirs. These benefits were derived from data furnished by the United States engineer office, Los Angeles, Calif.

Recreation benefits of \$650,000 annually were developed from estimates made by the National Park Service. These benefits would be the same under either Senate bill 433 or the reclamation law.

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.

Municipal water supply returns are computed at \$530,000 annually. This amount was derived from the application of a unit sales price of \$0.15 per 1,000 gallons to 10,800 acre-feet of water delivered an-

nually to the municipal distribution system of Tucson. Since this operation is assumed to be one of undiminished continuity irrespective of time, the above amount is considered to be applicable under the provisions of either Senate bill 433 or reclamation law.

Fish and wildlife benefits total \$430,000 annually as computed from basic data supplied by the Arizona Game and Fish Commission. These benefits would be the same under either Senate bill 433 or existing reclamation law.

Flood-control benefits are computed at \$310,000 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 price 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.

ANNUAL COSTS—NATIONAL BASIS

Above, in developing the cost-return ratios, the annual costs were limited to those "repayable from project operations." As a part of the benefit-cost picture, however, all construction costs are amortized with interest as a measure of the actual national cost, regardless of the legal aspects of reimbursability or interest-free allocations.

Senator MILLIKIN. Just one moment, please. I am not quite so sure I understand that paragraph. Would you mind putting it in a little different groove?

Mr. LARSON. For example, under the provisions of our existing reclamation law allocations to irrigation are repaid without interest. Allocations to power are paid with interest at 3 percent.

Allocations to fish and wildlife and flood control are nonreimbursable.

In making a comparison to show the national benefits, we have assumed the entire amount would draw interest at 2 percent.

In other words, it actually would be a cost.

Senator MILLIKIN. I understand it.

Mr. LARSON. Amortization of all construction costs has been computed on the basis of an assumed national interest cost of 2 percent on unpaid balances. Under Senate bill 433, which provides for an 80-year repayment period, the annual applications to principal would be less than under reclamation law; therefore, the annual costs would be less. Under reclamation law the amortization costs were based on a 50-year period.

Operation and maintenance costs have been estimated for each of the various features included in the potential project development.

Reserve for replacement is provided in accordance with the estimated requirements for the various features of the project development.

Senator MILLIKIN. Let me probe that a little further.

In getting at the national cost you are including interest on the reclamation figures, even though that interest is not reimbursable from the landowners. Is that correct?

Mr. LARSON. That is correct ; yes, sir. And also on nonreimbursable features. It is 2 percent on the total capital cost in other words.

Senator MILLIKIN. All right.

Mr. LARSON. The results are shown in table 13, page 60.

Under Senate bill 433 the annual benefits are listed :

Irrigation-----	\$24, 300, 000
Power-----	10, 700, 000
Silt control-----	1, 900, 000
Recreation-----	650, 000
Municipal water-----	530, 000
Fish and wildlife-----	430, 000
Flood control-----	310, 000

or a total of \$38,820,000, while under the reclamation law the total would be \$39,520,000.

Senator MILLIKIN. What is your population in Arizona, Senator?

Senator McFARLAND. Approximately 700,000 at this time.

Mr. LARSON. The average annual costs as shown by the table are:

Operation and maintenance-----	\$5, 130, 000
Reserve for replacement-----	1, 985, 700
Amortization of all project construction costs-----	15, 215, 100

or a total of \$22,331,400 under Senate bill 433, and under the reclamation law it would be \$26,360,300.

The ratios are as follows:

Under Senate bill 433, the benefits to costs is 1.74 to 1, and under the reclamation law 1.50 to 1.

Intangible and unevaluated benefits.

In addition to the benefits just indicated, there are many others of an intangible nature and some 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 to more substantial places of livelihood 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 electrical 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 electrical energy for domestic use would improve living standards. Such benefits and many similar ones add to the desirability of the development. In addition the strengthening of a weak unit of our national economy will add to the strength of the whole both in normal times and in emergencies.

Senator MILLIKIN. Any questions?

Senator DOWNEY. Yes, Mr. Chairman ; I have a few questions.

I will endeavor to keep them as brief as possible.

Then I would like to ask the permission of the chairman to present certain interrogatories to the Bureau on the more technical aspects, and after they are filed to place them in the record. In that way I think I could very much shorten the hearing.

Senator McFARLAND. I would like to have the interrogatories presented promptly and at or before submission to the Bureau. We would like to know what they are, just as I presented them.

Senator MILLIKIN. I think, Senator Downey, the interrogatories should be submitted to Senator McFarland, so Arizona will know what

is being worked on, and they may want to present cross-interrogatories.

Senator DOWNEY. Yes, sir.

Senator MILLIKIN. Is that agreeable?

Senator MCFARLAND. That is agreeable.

(Interrogatories and replies carried in appendix.)

Senator DOWNEY. Mr. Larson, I understand this is a statement or report from you, as a member of the Bureau of Reclamation, on the pending Senate bill, S. 1175?

Mr. LARSON. That is correct.

Senator DOWNEY. But this statement that you are making is in no way in lieu of the usual formal report and recommendation by the Department of the Interior, is it?

Mr. LARSON. I am unable to answer that, Senator.

Senator DOWNEY. I think it is admitted. Mr. Chairman, the Department of the Interior has not yet filed the usual report on the bill.

Is that correct, Senator?

Senator MCFARLAND. No written report has been filed. We hope it will be before the conclusion of the hearings.

Senator DOWNEY. Was this report of yours submitted to the Bureau of the Budget for its examination?

Mr. LARSON. No; it has not been.

Senator DOWNEY. Do you know whether any report on this bill from the Interior Department or any of its units has been submitted to the Bureau of the Budget?

Mr. LARSON. Not to my knowledge.

Senator DOWNEY. Mr. Larson, probably I misunderstood you, but I did understand you to say to the chairman that the conclusions that you were presenting here are based upon the provisions of S. 1175, except as to the time period. As to the existing reclamation law, you said, except as to the time period of amortization on agricultural costs.

Mr. LARSON. I do not quite get your question, Senator.

Senator DOWNEY. I will ask it in a different way, then.

In your calculations you are here using a figure of 2-percent interest upon the power investment. Is that not correct?

Mr. LARSON. Based upon the provisions of Senate bill 433.

Senator MCFARLAND. That is not the same as S. 1175?

Senator DOWNEY. No; I think it is not, Senator.

As I understand it, the existing bill S. 1175 leaves in effect the existing reclamation law which provides for a 3-percent interest charge upon the power investment. Is that not correct?

Mr. LARSON. That is correct, but when the interest component is applied, the end result with respect to feasibility remains the same.

Senator DOWNEY. Mr. Larson, that, to me, is somewhat argumentative.

I just want to get out certain facts.

Under S. 1175, as drafted, the interest component on the power investment would be 3 percent. Is that correct?

Mr. LARSON. That is correct.

Senator DOWNEY. Instead of 3 percent, you have substituted a power interest charge of 2 percent.

Mr. LARSON. That is not correct.

Senator DOWNEY. And in your calculations, using that interest component of 2 percent, you conclude that the power investment will be amortized out within 50 years, do you not?

Mr. LARSON. In 50 years.

Senator DOWNEY. Now if you use the 3 percent, it would take over 100 years to amortize it out, would it not?

Mr. LARSON. No; that is not correct.

Senator DOWNEY. How long do you think it would take, Mr. Larson?

Mr. LARSON. The project can be amortized under the reclamation law in 87 years.

Senator DOWNEY. On the basis of 3 percent?

Mr. LARSON. On the basis of 3 percent.

Senator DOWNEY. All right. Then it is your statement that if we would use the interest component that is applicable under this bill, instead of amortizing out the power investment in 50 years it would take 87 years. Is that correct?

Mr. LARSON. The entire project would be amortized in 87 years, including both power and irrigation.

Senator McFARLAND. That is, under the present reclamation law?

Mr. LARSON. Under existing reclamation law.

Senator DOWNEY. I am talking about S. 1175. I do not know which the hearing is on, S. 1175 or another bill.

Senator MILLIKIN. I should like to say the hearing is on S. 1175.

Senator McFARLAND. S. 1175.

Senator MILLIKIN. S. 1175, and from time to time I have sought to make that clear by at least developing the difference in the testimony as applied to the other bill, and as it applies to this bill.

Senator DOWNEY. Senator, I again want to emphasize that the present bill under the existing reclamation law would provide for an interest component of 3 percent rather than 2, and that it would take 87 years to amortize the power investment instead of 50.

Now, Mr. Larson, have you not assumed in your calculations an amortization period of 50 years, and thereafter applied all of the profits upon the irrigation investment, making no allowance for interest?

Mr. LARSON. After the power has been amortized, all revenue was used in aid to irrigation.

Senator DOWNEY. All revenue after 50 years?

Mr. LARSON. That is right.

Senator DOWNEY. But under this bill it could not be amortized until after 87 years?

Senator MILLIKIN. You mean all net revenue after maintenance?

Mr. LARSON. That is right, net revenue as applied to aiding irrigation after the power investment had been amortized.

Senator MILLIKIN. You figure how long on the power investment?

Mr. LARSON. In 50 years.

Senator MILLIKIN. 50 years?

Mr. LARSON. And the balance being 87 years to repay the irrigation cost.

Senator MILLIKIN. Let me ask you again, is that theory supported by S. 1175, or would it require an amendment to S. 1175?

Mr. LARSON. That is under the provisions of the reclamation law. Under S. 1175 there is provision made for nonreimbursable features that are not included in the present reclamation law, such as silt control and recreation.

Senator DOWNEY. Mr. Larson, to make a point under the present bill we are talking about there, I am willing to talk about the other—

Senator MILLIKIN (interposing). I do not want any talk about the other.

Senator DOWNEY. Very well. They escape from the frying pan into the fire, but I am willing to stick to this.

This bill, as presently drafted, would require 87 years to amortize out the power investment, would it not?

Mr. LARSON. Under the provisions of this bill it would require 79 years.

Senator DOWNEY. I thought you said 87.

Mr. LARSON. That is under the provisions of the reclamation law.

Senator DOWNEY. I am talking about the power investment. How long, using an interest component of 3 percent, would power investment be amortized, how long do you say it would take to amortize out the power investment?

Mr. LARSON. I do not have that figure available, but I will furnish it for the record.

Senator DOWNEY. Does it not approach 100 years?

Mr. LARSON. I do not think so.

Senator DOWNEY. It does not approach it?

Mr. LARSON. I do not think so, but I will furnish it.

(See reply to Senator Downey's interrogatories carried in appendix I.)

Senator DOWNEY. You have taken all the revenues at the end of 50 years, including what will have to be used to amortize out the principal after 50 years, and applied them upon the irrigation investment, have you not?

Mr. LARSON. The power revenue was used first to repay the allocation to power.

After the allocation to power had been repaid, the net revenues available were used to aid irrigation.

Senator DOWNEY. In your calculations have you not taken all the net return from power after 50 years and applied it upon the irrigation charges?

Mr. LARSON. The net revenues; yes.

Senator DOWNEY. All right; you do this without any allowance for amortization after the 50-year period, because, using a 2-percent interest rate, you are going to amortize out the power investment in 50 years under your calculations?

Senator MILLIKIN. Mr. Larson, state affirmatively what you are doing in regard to power in terms of repayment of investment and what you are doing after the investment has been repaid and give us the time period involved.

Mr. LARSON. The returns from power are used to reimburse the allocation of power. The interest component of 2 percent is applied in assisting irrigation.

Senator MILLIKIN. From the beginning?

Mr. LARSON. From the beginning.

Senator MILLIKIN. That continues on how long?

Mr. LARSON. Fifty years.

Senator MILLIKIN. Fifty years?

Mr. LARSON. After the power allocation has been repaid.

Senator MILLIKIN. Is that 50 years?

Mr. LARSON. That is 50 years.

Senator MILLIKIN. All right.

Mr. LARSON. Then the total net revenue from power is used to aid irrigation.

Senator DOWNEY. Yes, Mr. Chairman, but now, Mr. Larson, that statement you made to the chairman involved a 2 percent power rate. Under this bill it would be 3 percent?

Mr. LARSON. That is right.

Senator DOWNEY. If you had 3 percent interest it would take far longer to amortize out your principal than if you had 2 percent?

Mr. LARSON. That is right in some cases.

Senator DOWNEY. To explain my position, this bill would require, under the existing reclamation law, a 3 percent charge upon the investment for power, which we would assume would take 80 years to amortize. Call that x years. You have used a figure of 50 years. After the 50 years, you take all the net revenue from the power without allowing for any amortization charge in calculating how long it would take to amortize out the irrigation investment.

Now, is that not correct?

Mr. LARSON. I do not see that it would make any difference because you would have a certain revenue from your power regardless of whether 3 percent or 2 percent were used.

Under 2 percent you would have a lesser amount available of the interest component to apply on irrigation, than for 3 percent.

Senator DOWNEY. If you charge a 3 percent interest component, you have the heavier charge to your commercial users than if you charge 2 percent.

Mr. LARSON. Not if you confine the rate to an amount sufficient to pay the power and 2 percent interest.

The rate may exceed what is required for that. So that during your repayment period your revenue would amortize your power investment. In addition you would pay your 2 percent on your power allocation and, in addition to that, any net revenue available could also be used in aiding irrigation.

Senator MILLIKIN. Mr. Larson, could that be set out in comparative columns so that we could see the effect on irrigation and also of amortization under the 2 percent? And also the 3 percent interest rate?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. Would you prepare a table so we can see that?

Mr. LARSON. Yes, sir.

(See reply to Senator Downey's interrogatories carried in appendix.)

Senator MILLIKIN. This clarification I would like to see, Senator, if the proponents accept the theory of the Bureau, and if S. 1175 does not accord with those theories, there should be an amendment to the bill.

I am not prepared to say whether it does or does not, but so we can avoid confusion, I am assuming if Mr. Larson's theories do not agree with the bill, the bill will be amended accordingly.

Senator McFARLAND. May I just make this clarifying statement, Mr. Chairman?

As I understand the difference in the bills, the 50-year period of payment, as far as the power is concerned, remains the same, because that is existing law now in regard to power.

The difference in the interest rate of 2 percent and 3 percent under the present law, is that this bill S. 1175 leaves out 2 percent and goes back to 3 percent.

As I understand Mr. Larson, as far as paying the project out, it does not make any difference when you use the interest component because the interest is applied toward the repayment of cost, so in figuring it out, it figures out the same.

Senator MILLIKIN. Obviously there is a time element that is involved. If you have a 3-percent interest rate which goes to the benefit of irrigation as distinguished from a 2 percent which goes to irrigation from the beginning, obviously irrigation is getting the benefit of 1 percent more than it would otherwise, but that is offset, as I see it, or partially offset, or to some extent offset by the fact that under 2 percent, you get all the net revenues at the end of a certain period as opposed to the other theory, and it seems to me that is a mathematical matter.

Am I correct?

Mr. LARSON. Yes, sir. We will prepare that table.

Senator MILLIKIN. But, from the standpoint of the bill we are having the hearing on, if the bill does not conform to Mr. Larson's theory of the case and if Arizona wishes to follow that theory, then, of course, the bill should be conformed accordingly.

Senator McFARLAND. I think it will, Mr. Chairman.

Senator MILLIKIN. I am not saying it does not, but to save confusion, from my standpoint the bill will have to conform to the theory of Arizona, and if it does not now conform to the theory of Arizona an appropriate amendment should be offered.

Senator McFARLAND. Of course. I might say this, that pending legislation in regard to this interest matter caused us to eliminate that 2-percent provision, and we felt that there probably would be legislation on this matter before we got through.

Senator MILLIKIN. At the present time the law requires 3 percent.

Mr. LARSON. That is correct.

Senator MILLIKIN. So it will take an amendment to the law either by general legislation or in this bill to make it 2 percent?

Mr. LARSON. Right.

Senator MILLIKIN. If you have 2 percent interest, how long will it take the power features to pay out?

Mr. LARSON. I cannot give that figure offhand.

SENATOR MILLIKIN. If you have 3 percent, how long will it take to pay out?

Mr. LARSON. It could be exactly the same.

SENATOR MILLIKIN. It could be exactly the same?

Mr. LARSON. It could be exactly the same for this reason. For example, in either case, you would have a capital investment to repay.

SENATOR MILLIKIN. That would be constant?

Mr. LARSON. That would be constant. In one case you would have 2 percent. In the other 3 percent, but the difference in the interest rate could leave a net revenue in either case.

SENATOR MILLIKIN. You mean through the whole life of the thing?

Mr. LARSON. Under the repayment period.

SENATOR MILLIKIN. I must have enlightenment on that because if you start putting 3 percent into the benefit of irrigation from the first year of the project as opposed to 2 percent, I must say my mathematics are not equal to considering this the same.

Mr. LARSON. First, you would have capital investment to repay and then you would have a certain amount taken from your revenue for interest rate and that, we will assume, the interest rate is 3 percent. Your net revenue from power may exceed the annual capital charge and interest and you would still have a balance that could be used in adding irrigation.

Now the difference between the 2 and the 3 percent would appear in that balance. In other words, under 3 percent there would be a lesser balance than under the 2 percent.

SENATOR MILLIKIN. Take another shot at it. That still is not clear to me.

Mr. LARSON. Well, maybe we can use some figures.

SENATOR DOWNEY. May I intervene with just one question?

Under your viewpoint it would not make any difference whether it is 2 percent, 3 percent, or 7 percent.

Mr. LARSON. If you will apply the interest component and the annual revenues exceed the amount required for capital investment and interest, it would not make any difference.

SENATOR DOWNEY. Why are the Western States so anxious to cut it down then?

Mr. LARSON. As long as you apply the interest component.

SENATOR DOWNEY. It is totally immaterial, you say, whether you have an interest component at 2 percent or 3 percent.

SENATOR MILLIKIN. I can see, Senator Downey, under the whole picture depending upon your period of amortization, your net result would be about the same or it might not.

Mr. LARSON. Jumping off into the blue on my mathematical speculation, what I want to have cleared up is why 3 percent during the first year of contribution to irrigation can be the same as 2 percent contribution during the first year.

SENATOR DOWNEY. As I understand Mr. Larson, what he is intending to convey is if the net revenue equaled this 1 percent then it would be the same. Is that what you have in mind, Mr. Larson?

Mr. LARSON. Yes; somewhat like that. These are assumed figures.

We will assume that revenue from power was \$6,000,000. We will assume an annual repayment of \$3,000,000 would be required to repay the capital investment and \$2,000,000 would be required for interest at 3 percent.

That would leave \$1,000,000 available that could be used in aid of irrigation.

Now, under 2 percent, the capital investment would remain \$3,000,000; but the interest which would be reduced, for example, say it was \$1,000,000, that would leave \$2,000,000 available that could be used in aid to irrigation.

Mr. Chairman, in applying the interest component, \$3,000,000 would represent the interest component plus the net revenue—\$2,000,000 + \$1,000,000—or balance left over using 3 percent, but at 2 percent the interest component would be less—\$1,000,000—but the surplus revenue would equal \$2,000,000; and this, added to the interest component of \$1,000,000, would equal \$3,000,000.

As long as both the interest component and surplus revenue are applied to aid irrigation, it would not make any difference.

Senator MILLIKIN. What you are saying is that your surplus after the payment of interest on the power angle also goes in aid of irrigation?

Mr. LARSON. That is right.

Senator MILLIKIN. So, to the extent you decrease your interest, you simply increase your surplus or vice versa?

Mr. LARSON. That is right.

Senator MILLIKIN. And do your other calculations support a constant surplus?

Mr. LARSON. I think there is a surplus. I will have to check.

Senator MILLIKIN. That is the key to your theory?

Mr. LARSON. Yes.

Senator MILLIKIN. Unless you have a constant surplus, your theory is no good.

Mr. LARSON. There is a surplus. It is not exactly constant.

Senator MILLIKIN. There has to be enough of a surplus to make good that assumption?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. Give us some tables on it in parallel columns.

Mr. LARSON. All right.

(See reply to Senator Downey's interrogatories.)

Senator McFARLAND. In order to clarify the position, let me say that the difference in this bill and S. 433, which Mr. Larson has been talking about, is in the provisions for repayment. S. 433 states 80 years, and this (S. 1175) provides the repayment period for the cost allocated to irrigation shall be a reasonable period of years not to exceed the useful life of the project. We place that at "reasonable" years, because of fluctuation of the cost of these projects, and we hope that before the contracts are let on this project the prices would go down, as everyone hopes, of course; but in figuring it, Mr. Larson has used the 80 years as the reasonable number of years.

This bill is sufficiently flexible to use that period.

Senator MILLIKIN. It will be your responsibility to decide whether you want the committee to consider the flexible formula or fixed formula. That will be your decision in the last analysis.

Senator DOWNEY. Mr. Larson, in your computation on this you will prepare a table in which you assume 3 percent interest charge instead of 2?

Mr. LARSON. That is right.

Senator DOWNEY. And again I say to you it will be much more than 50 years before you amortize that power investment.

Mr. LARSON. I will also take that into consideration.

Senator DOWNEY. Mr. Larson, do I understand from your testimony that you believe that firm contracts could be signed with responsible parties over the lifetime of this repayment period, 50 years, if you please, to take this power at 4 mills per kilowatt, or whatever is required?

Mr. LARSON. Well, in my opinion they could, and I base that on a recent study by the Federal Power Commission.

Senator DOWNEY. Before we go into the explanation, could I ask some additional questions?

Senator MILLIKIN. You asked the question, and he said he believed firm contracts could be signed.

Senator DOWNEY. He answered it.

Senator MILLIKIN. All right. You can give your documentation later on.

Senator DOWNEY. Would you, therefore, think it is reasonable and proper for the Government, when this bill is passed, to require that power contracts which would assure the working out of this formula should be signed up, as was done by California in connection with the Boulder project?

Mr. LARSON. After repayment?

Senator DOWNEY. As to the purchase of commercial power.

You say you have no doubt that this power can be sold, that those contracts can be made, that this power can be sold in Arizona, Nevada, and California at 4 mills per kilowatt-hour.

You say you have no doubt firm contracts can be signed up here, guaranteeing that purchase over a reasonable period of time.

I am asking you would you consider it reasonable to place in this bill a clause providing that, as was done in the Boulder Canyon project, the action of the Federal Government is dependent upon execution of contract at firm prices?

Mr. LARSON. I do not know that it would be necessary to provide repayment contracts under this development exactly the same as under the Boulder Canyon project.

Senator DOWNEY. Would you not think there would be a much greater reason? It is anticipated in 10 or 15 years we might have a much cheaper source of power in atomic energy or something else.

Would you not think the Government should be more careful than they were with us in California?

Mr. LARSON. Well, my personal opinion is that I do not think that cheaper power will be available, that soon.

Senator DOWNEY. And would you be willing to have the Government require that?

Mr. LARSON. I think that is a point that will certainly have to be decided by the Government.

Senator DOWNEY. Do you know there were several years in which the public agencies that had signed up to take Boulder project power incurred losses of several million dollars because they could not utilize the power? Do you know that is a fact?

Mr. LARSON. That may be true.

Senator DOWNEY. Have you any reason to believe that, in view of the atomic power situation, the large interests in California would sign up to buy Bridge Canyon power at 4 mills per kilowatt-hour? Have you any reason to think that? Have you made any investigation?

Mr. LARSON. At the present cost of power developed by oil in southern California, I am of the opinion they would buy that power.

Senator DOWNEY. I am asking you whether you think they would enter into firm contracts over a period of 25, 50, or 75 years?

Mr. LARSON. That undoubtedly could be answered by the power representatives better than I could.

Senator MILLIKIN. There seems to be a surface contradiction in several of your questions.

I get the impression that all the Hoover Dam power was contracted for in advance of construction.

Senator DOWNEY. All that was taken by California, we had to execute firm and satisfactory contracts with responsible agencies.

Senator MILLIKIN. Does that cover all the power?

Senator DOWNEY. Covered all that went to California. I do not know what is the obligation of Nevada and Arizona on its 18 percent, but—

Senator MILLIKIN (interposing). It would be correct to say that a portion of the power was contracted for?

Senator DOWNEY. Yes; and I am not familiar with the obligations of Nevada and Arizona.

Senator MILLIKIN. I asked the question because later you pointed out there was a period of loss until the power was completely contracted for.

Senator DOWNEY. No; not until it was contracted for, but after our agencies had contracted for it. Before the war we could not utilize all the power, and I think the Metropolitan Water District took a loss of \$3,000,000 or \$4,000,000, because it could not utilize it.

Senator MILLIKIN. The Government did not stand a loss?

Senator DOWNEY. Oh, no. It was our agencies in California.

Senator McFARLAND. I would like to call attention to the fact that the only difference in the provisions of the Boulder Canyon Project Act and the present law is that in that instance they required the contracts for sale of power to be entered into before the contracts for construction were let; and in this instance we provide, before any construction work is done or contracted for, the Secretary of the Interior shall have determined that the cost allocated to power, municipal water supply, irrigation, and other miscellaneous purposes

will probably return to the United States within the period prescribed by the Federal reclamation law——

Senator MILLIKIN (interposing). Your theory being the Secretary, before letting the contract, would assure himself along the lines suggested by Senator Downey?

Senator MCFARLAND. That is correct; that the Secretary make such a determination before the contract can be entered into.

I will state this briefly: The difficulty with requiring contracts beforehand for the sale of power, is that it precludes a lot of people—including many little people—from getting power who will need the power when the dam is completed; and this provision of the Boulder Canyon Project Act gives California and her large interests one of the best contracts ever entered into, because they were able to, and did, enter into it ahead of time.

Personally, I do not believe that Congress should make such a provision, because it cuts out many a good user, who should have the privilege of contracting after the dam is built, people who have need, new industries, and so forth, and it leaves them at the mercy of the big power companies.

Senator DOWNEY. I might say that I understood Mr. James H. Howard, attorney for the Metropolitan Water District, who will testify, to say that the California agencies also had to guarantee to pay for the power allocated to California, Arizona, and Nevada, but we will have testimony on that.

Senator MILLIKIN. The salability of power is relevant for the consideration of the committee?

Senator DOWNEY. Yes.

Senator MILLIKIN. And I assume both sides will develop it?

Senator DOWNEY. I might make this point clear. From discussion with leaders of hydroelectric power in southern California, I know that they are already disturbed at losses they may have if atomic power were developed in the next 20 years, so as to undersell hydropower.

Now, Mr. Larson, one-third of the power generated from Bridge Canyon waters will be set over for the benefit of the Arizona farmers to pump water from Parker Lake up a distance of about 1,000 feet; will it not?

Mr. LARSON. That is about correct; 985 feet.

Mr. Chairman, before I answer that question, may I add to the record?

Senator MILLIKIN. Yes.

Mr. LARSON. In connection with the 4-mill rate, I indicated in my testimony that this rate is considered to be a conservative estimate based on the value of the Colorado River power.

That is based upon a special report of the Federal Power Commission. The preliminary report was dated May 1947; and as a result of their survey, it indicates the cost of power produced by oil is 5.75 mills.

Senator MILLIKIN. What does that say about gas?

Mr. LARSON. They do not show it for gas, but I can furnish it.

Senator MILLIKIN. It might be a good idea to show gas and get the report itself, in order to file it as part of the record.

(The matter referred to is as follows:)

*Comparative costs for supplying power to southern California (Los Angeles area)
from fuel-burning plants*

[Power from fuel generation: Based on 5,000 hours use annually on a load factor of 57 percent and a 100,000-kilowatt steam electric station]

	Dollars per kilowatt			
	Oil, \$1.28 per barrel	Oil, \$1.45 per barrel	Oil, \$1.85 per barrel	Gas, 11.4 cents per million B. t. u.
A. Unit investment:				
1. Generating station.....	115	115	115	110
	Dollars per kilowatt-year			
B. Annual capacity cost:				
1. Fixed charges (9.55 percent).....	10.98	10.98	10.98	10.51
2. Fixed operating costs:				
a. Fuel:				
5,400,000 B. t. u.	1.10	1.24	1.50	
5,200,000 B. t. u.				0.59
b. Operation and maintenance.....	3.20	3.20	3.20	3.20
c. Administrative and general (15 per- cent).....	.48	.48	.48	.48
Total fixed operating costs.....	4.78	4.92	5.27	4.27
Total capacity cost.....	15.76	15.90	16.25	14.78
	Mills per kilowatt-hour			
C. Energy cost:				
1. Variable operating costs:				
a. Energy fuel:				
10,920 B. t. u. per kilowatt-hour....	2.23	2.51	3.21	
11,960 B. t. u. per kilowatt-hour....				1.36
b. Operation and maintenance.....	.25	.25	.25	.22
Total energy cost.....	2.48	2.75	3.46	1.58
	Mills per kilowatt-hour			
D. Summary:				
Capacity costs equal.....	3.15	3.18	3.25	2.96
Energy costs equal.....	2.48	2.75	3.46	1.58
Total cost equals.....	5.63	5.93	6.71	4.54

NOTE: One barrel of oil equals 6,300,000 B. t. u.

With a load factor of 65 percent (5,700 hours) the total costs per kilowatt-hour are as follows:

	Mills per kilowatt-hour		
	Oil, \$1.28 per barrel	Oil, \$1.45 per barrel	Gas
Capacity costs.....	2.80	2.82	2.61
Energy costs.....	2.48	2.75	1.58
Total cost.....	5.28	5.57	4.19

Additional increases in the cost of oil would result in the following costs of electric energy at 65 percent load factor.

	Fuel oil per barrel		
	\$1.75	\$2.00	\$2.20
Capacity costs.....	\$2.87	\$2.92	\$2.95
Energy costs.....	3.29	3.63	4.06
Total cost.....	6.16	6.55	7.01

Senator DOWNEY. I might say there is one obvious solution to this. There is no doubt about the financial stability of the State of Arizona. If it wants to guarantee the purchase of this much power over 50 or 100 years—

Senator MCFARLAND (interposing). If we take it, we will make a profit out of California. You can rest assured of that.

Senator MILLIKIN. Let us not get started on the across-the-table stuff.

Senator MCFARLAND. I beg your pardon.

Senator MILLIKIN. The committee will give careful consideration to the testimony.

Senator DOWNEY. My remark was not made in a spirit of levity.

If the State of Arizona would undertake the financial guaranty, there would be no doubt about it.

On page 50 appears this short paragraph:

A charge to the farmer of \$4.50 per acre-foot of water 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 of the project area, based on 1939 to 1944 average values of crops at the farm.

Why did you not calculate the repayment ability of the Arizona farmers on the average price received over some longer period of time?

Mr. LARSON. Because in this same study we included present-day construction costs, 1946 costs, which are 160 percent of 1940 costs.

In other words, we have used the construction cost of the project based upon this higher inflated cost and in turn adopted the period 1939 to 1944 to reflect the same repayment as we have represented in our construction costs.

Senator DOWNEY. As I understand your legal theory, you thought you were justified in predicating your findings upon the farm prices of the last few years because, perhaps, over 3 or 4 years or 5 years or 7 or 8 years there would be higher construction costs.

Mr. LARSON. That was based upon relation of a 20 percent increase over a long time average on the gross crop income and a 60 percent increase on construction costs.

In other words we were considering the construction costs at the peak.

Senator DOWNEY. You do not mean to say you predicated these figures upon a 20 percent increase in price of farm products over some long period of time?

Mr. LARSON. In comparing the feasibility of cost of construction based on a 60 percent increase.

Senator DOWNEY. I do not entirely understand that, Mr. Larson.

Your statement, is, that you fixed the full per acre-foot cost that the farmer could stand upon the basis of the average value of the crop at the farm from 1939 to 1944.

Do you have figures there showing the average, or the gross of the acreage return from this area from the sale of their crops over this 1939 to 1944 period?

Mr. LARSON. Yes, I can supply that for the record.

Senator DOWNEY. About what does that run?

Mr. LARSON. I do not remember.

Senator DOWNEY. Is it \$150 or \$175 per acre?

Mr. LARSON. I will furnish that.

Senator McFARLAND. I might state we will go into detail on that with other witnesses.

Senator MILLIKIN. Senator Downey, do you mind if I interrupt?

Senator DOWNEY. No, indeed.

Senator MILLIKIN. You take a period of crop prices from what year to what year?

Mr. LARSEN. From 1939 to 1944.

Senator MILLIKIN. From 1939 to 1944. Did you use that as your figure or make an addition to it?

Mr. LARSON. That is a period which shows a 20-percent increase over a long-time average.

Senator MILLIKIN. And you used the present prices of materials and labor in calculating your construction costs, which is the 60-percent increase over the long-time past history?

Mr. LARSON. Over the 1940 base period.

Senator DOWNEY. Mr. Chairman, I regret that I do not understand the meaning of the witness' last answer.

In this written statement he states that the per acre-foot repayment cost the farmer could afford to pay was based on the crop returns from 1939 to 1944.

I do not understand what you mean by this other expression it was fixed upon a crop return of 20 percent.

Mr. LARSON. The return from the crops during the period 1939 to 1944 is approximately 20 percent more than the return from crops over a long-time period.

Senator DOWNEY. Over what period?

Mr. LARSON. From 1923 to 1941.

Senator DOWNEY. From 1923 to 1941 or 1923 to 1939?

Mr. LARSON. 1923 to 1941.

Senator DOWNEY. Are you talking about net or gross?

Mr. LARSON. Gross crop income.

Senator DOWNEY. Have you authorities and tabulations for that?

Mr. LARSON. Yes, sir.

Senator DOWNEY. Is that one of the important foundations for your finding that the 1939-44 period shows an acreage return only 20 percent greater than that over the length of time you mention?

Mr. LARSON. Yes; I will supply those.

(The matter referred to is as follows:)

Request by Senator Downey for:

Information showing gross crop values based on (1) long-time average prices of agricultural prices, and (2) 1939-44 average prices for comparison.

The accompanying table shows estimated gross crop values of the crops anticipated for the central Arizona project calculated on the basis of the two periods

requested. The table also indicates that gross crop value based on 1939-44 prices is 20.36 percent higher than values based on the long-time (1923-41) average prices.

Gross crop value, central Arizona project—1939-44 average and long-time average (1923-41)

Crop	1939-44 average	Long-time average	Crop	1939-44 average	Long-time average
Sorghums.....	\$2,357,172	\$1,869,787	Lettuce:		
Wheat.....	1,102,896	1,026,562	Fall.....	\$2,303,183	\$1,000,000
Oats.....	189,696	153,342	Spring.....	3,923,065	3,000,000
Barley.....	2,313,145	1,900,874	Miscellaneous truck crops.	8,167,282	4,000,000
Alfalfa:			Fodder (corn and sorghum).....	122,632	
Hay.....	7,760,560	6,781,590	Sugar beet seed.....	1,971,743	1,000,000
Seed.....	320,232	202,337	Miscellaneous pasture.....	474,140	
Grain and alfalfa hay.....	5,200,729	4,384,012	Other miscellaneous crops (excluding truck).....	1,206,779	
Alfalfa hay after grain hay.....		3,156,831	Fruits and nuts (excluding citrus).....	1,784,563	1,000,000
Cotton:			Crops partially pastured.....	2,302,542	1,000,000
Short staple.....	6,366,668	5,528,949	Gardens.....	811,232	
Long staple.....	4,114,015	3,216,749	Total.....	63,324,758	52,000,000
Seed.....	1,922,932	1,380,710	Percent.....	120.36	
Citrus fruits.....	3,492,999	4,657,168			
Cantaloups.....	2,678,665	1,994,773			
Potatoes:					
Irish.....	1,828,930	1,654,705			
Sweet.....	606,928	465,650			

As the question which apparently prompted the request seemed to call for the validity of the use of an agricultural price level based on the 6-year period 1939 through 1944, the following explanation is presented.

To assure uniformity of figures derived from agricultural income in its report the Bureau of Reclamation decided, approximately a year ago, that price of agricultural products used in its calculations should be based on a constant price level. Such a price level was to represent, as nearly as possible, the anticipated level of prices to be received by farmers for their farm products during the repayment period or during the next 40 or 50 years. Estimating the agricultural price level 40 to 50 years in the future is most difficult and considerable time was spent on this study.

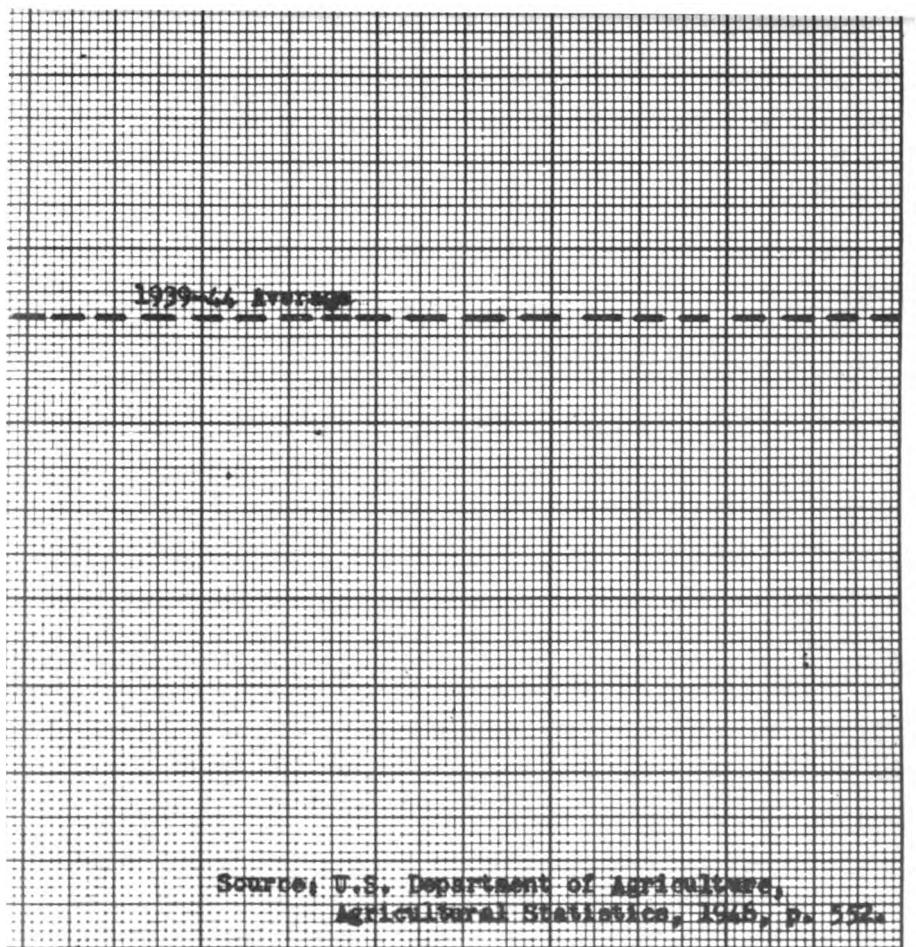
It was decided that the most satisfactory method to use would be to make a judgment based on the future outlook for factors strongly influencing the general level of agricultural prices. Accordingly, the Bureau of Reclamation requested and obtained judgments of agricultural outlook and statistical experts of the Departments of Agriculture and Commerce and of the Bureau of Budget. The consensus of these experts and those of the Bureau of Reclamation was that agricultural prices for the next 40 or 50 years in the future would probably average between 140 and 150 percent of the 1910-14 average.

It was found that during the 6-year period, 1939-44, prices received by farmers averaged 144 percent of the average for 1910-14. It was also found that during this period prices of commodities farmers buy for use in production and farm living, including interest and taxes, likewise averaged 144 percent of the 1910-14 average. The relation between prices received and paid by farmers, therefore, was approximately the same as during the period 1910-14, the period generally used in determining agricultural parity. As the relationship between factors of income and costs, as well as the general agricultural price level, has a significant effect on irrigation payments, the 1939-44 period appeared to be a satisfactory base. The base period 1939-44, therefore, was adopted by the Bureau in August 1946 as representing the general level of agricultural prices. Since September 1946 this price base has been used in computing estimates of irrigation repayment ability and irrigation benefits in Bureau reports.

The anticipated price level of 144 is 44 points above 1910-14, and 12 points higher than the 36-year (1910-45) average of 132. Several factors appear to indicate an agricultural price level higher than this long-time average. They include:

(1) It is the declared policy of the Congress to obtain parity prices for agricultural products and parity income for farmers.

(2) The large national debt can be more readily carried and financed with a high rate of industrial activity and relatively high prices.



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(2) The possible increased industrial use of certain agricultural products may have a stimulating effect.

Senator DOWNEY. You include the years 1930, 1931, 1932, and 1933?

Mr. LARSON. Yes, sir.

Senator MILLIKIN. Any further questions?

Senator DOWNEY. Yes, I did have one, a different sort of question here, Mr. Chairman.

Senator MILLIKIN. All right.

Senator DOWNEY. I do not believe, Mr. Larson, you told me how much the Arizona water users would be charged for the one-third of the power from Bridge Canyon Dam to be used for the pumping of water out of the Parker Lake?

Mr. LARSON. That is part of the irrigation cost. For example, as I explained the other day, Bridge Canyon, Coconino and Bluff Dam are considered as a unit of the project development.

At Bridge Canyon 31 percent is required for pumping. Thirty-one percent was allocated to irrigation and 31 percent of the annual operation and maintenance is allocated to irrigation.

Senator DOWNEY. What charge per kilowatt-hour will be made against the farmers for the power used in that operation mentioned?

Mr. LARSON. If I understand your question correctly on that basis you would like the cost per kilowatt hour?

Senator DOWNEY. Exactly, Mr. Larson.

Mr. LARSON. I will furnish that.

(See reply to Senator Downey's interrogatories.)

Senator DOWNEY. Is it about 2½ or 275 mills?

Mr. LARSON. I do not have that figure at this time but I will furnish that.

Senator DOWNEY. Do you not think it is of importance here?

Mr. LARSON. If you would like to have it.

Senator DOWNEY. Mr. Larson, in your statement, you state in effect that 419,000 acre-feet of this water, something over two-thirds of the amount that is going to be available, will be utilized on 73,000 acres of land now totally idle for lack of water.

Is it not true that in the preliminary report sent by the Bureau to Governors of the States you stated that figure that was to be wholly irrigated at about 50,000 acres?

Mr. LARSON. That land was all included in this project.

Senator DOWNEY. I understand that, but you refer to a particular parcel of 73,000 acres which is now totally idle by reason of lack of water, and it will be irrigated by 400,000 acre feet or approximately that.

I am asking you if the figure in your preliminary report, instead of being 73,000, was not 50,000.

Mr. LARSON. I will have to check that.

Senator DOWNEY. You have been doing work since the preliminary report?

Mr. LARSON. That is right.

Senator DOWNEY. If you have increased that figure, as I believe you will find you have, from 50,000 to 73,000 acres of land totally idle that probably is the better figure?

Mr. LARSON. The more recent figure would be the better figure if there is a difference.

Senator DOWNEY. Mr. Larson, just one further question, Mr. Chairman, and I am through.

I understand, Mr. Larson, that there are individual years or series of years in which there is an ample water supply for these lands because of large rainfall. That is correct, is it not?

Mr. LARSON. I would say because of the high run-off in the streams, not high rainfall.

Senator DOWNEY. I am glad you corrected me. Does not that come from greater precipitation as snow and rainfall?

Mr. LARSON. Yes; that is usually in the watershed.

Senator DOWNEY. Are you contemplating any years when the farmers in the Gila and Salt River Valleys will not require any water, but that, nevertheless, they shall pay for it?

Mr. LARSON. This is based upon an additional diversion of 1,200,000 acre-feet.

In years of high rainfall, if there was excess water, it could be stored in the reservoirs, or possibly it could be added to the ground-water basin. For example, for the past several years their ground-water basin has been depleted, and this excess water could be used for recharging the ground-water basin.

Senator DOWNEY. Is it not an admitted fact, after those matters are taken care of, there will be years—a period of years—when there will be no use for this water, either for irrigation or storage?

Mr. LARSON. No; I question that statement.

Senator DOWNEY. Very well, Mr. Chairman, with your permission to file written interrogatories, I have no further questions.

Senator McFARLAND. Mr. Chairman, I just have two or three questions.

In regard to the idle land Senator Downey spoke of, this land varies from year to year?

Mr. LARSON. Yes; and that referenced acreage of 73,000 is the average for 1940 to 1944.

Senator McFARLAND. In the San Carlos project a little over half the land is lying idle this year because the reservoir at Coolidge Dam is dry?

Mr. LARSON. Yes, sir.

Senator McFARLAND. And other years practically all the land has been in cultivation. Is that not right?

Mr. LARSON. That is correct.

Senator McFARLAND. But the point that you make, as I understand it, is that while you might have enough water to irrigate 1 year, some of that water should be left in the reservoir in order to insure a steady supply—or regulated supply, I should state—of water from year to year.

Mr. LARSON. That is correct, Senator.

Senator McFARLAND. You cannot run your reservoir dry every year and expect to have a regulated supply; so that would explain the variation in your figures, if there is any?

Mr. LARSON. Yes, sir.

Senator McFARLAND. In regard to these power contracts and requiring contracts for power before dams are constructed, I will ask you if such a requirement was made of the Central Valley project in central California?

Mr. LARSON. I could not answer that, Senator.

Senator McFARLAND. Will you supply that data as to any other projects where such a requirement is made?

Mr. LARSON. Yes; I will supply that.

Senator McFARLAND. And whether the language used here is a general requirement for the finding of the Secretary of the Interior before starting construction on these reclamation projects?

Mr. LARSON. Yes, sir.

(The data requested is as follows:)

POWER CONTRACTS AS A CONDITION PRECEDENT TO CONSTRUCTION OF RECLAMATION PROJECTS

Except for Hoover Dam, the signing of contracts for electric power to insure repayment of the cost of the power installation or to insure the marketability of the power has never been made a condition precedent to construction of a project by the Bureau of Reclamation. Many large power-producing projects (among them the Central Valley project, California; the Colorado-Big Thompson project, Colorado; Davis Dam, Ariz.; the Hungry Horse project, Montana; and Grand Coulee Dam, Wash.) have been undertaken without such requirements being written into the law.

The requirement of S. 1175 that "Before any construction work is done or contracted for, the Secretary of the Interior shall have determined that costs allocated to power, municipal water supply, irrigation, or other miscellaneous purposes * * * will probably be returned to the United States is quite similar to the provision of section 9 (a) of the Reclamation Project Act of 1939 that—

"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—

- * * * * *
- "(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."

The reauthorization of the Central Valley project in the act of August 26, 1937 (50 Stat. 850), was without any provision similar to this. The same is true of the other projects mentioned above which were authorized by special act of Congress. The authorization of Parker Dam by the act of August 30, 1935 (49 Stat. 1028, 1039), had been preceded by a contract between the United States and the metropolitan water district whereby the district had agreed to advance to the United States the cost of building the dam in an amount not to exceed \$13,000,000.

Senator McFARLAND. Mr. Chairman, there was just one other question in regard to your inquiry. I wanted to have it answered by someone who is really an expert in that field rather than to give the offhand opinion of myself which would not be worth anything, of course.

Senator MILLIKIN. I do not think you ought to add the "of course." The Senator's opinions are highly esteemed by the chairman.

Senator McFARLAND. Well, thank you. I do not think the Congress would want to rely on my opinion in regard to power. I would not want to rely on it myself.

In regard to power furnished by independent companies, we want to supply full and detailed answers to the questions asked by the chairman. Did the chairman mean to state, by "power," power used supplementally to hydroelectric power?

Senator MILLIKIN. Which question of the chairman is the Senator referring to?

Senator McFARLAND. Oh, some way back, where you asked whether there were independent companies which would compete with this source of power.

Senator MILLIKIN. Yes, I am trying to find out what the cost of private power and the wholesale price of private power may be in the California region. I do not care what the source of it is.

Senator McFARLAND. I was just wondering whether you wanted to know whether there was any company or companies which sold power independent of power generated by hydro?

Senator MILLIKIN. I would like to know which it is, but I do not care which it is. All I want to do is get away from Boulder Canyon as to source of power, and know the source in private hands so we can see what the competitive factor is between publicly originated power and privately originated power in that general sales area.

Senator McFARLAND. We will try to supply that data. I do not know. Maybe we should take judicial knowledge of the laws I asked Mr. Larson about.

I understand such requirements are not part of the Central Valley project in California and are not part of their project, but I am sure they can tell what the law is.

Senator MILLIKIN. The court would like to have its memory refreshed.

Senator McFARLAND. That is all.

Senator DOWNEY. Mr. Chairman, I might say it is quite a struggle in the State of California to get the Department to give us power. It wanted to operate it itself. So I think it is a rather unique and complicated situation, and I think wholly different.

Mr. Chairman, I have one further question I would like to ask Mr. Larson.

Mr. Larson, you stated that, while there would be sporadic flows of surface water available for farmers in certain periods, during those periods the water available under this contract would be used for underground storage or surface storage, if you please. Would the farmers be expected to pay \$4.50 an acre-foot for that water, if such a plan is worked out?

Mr. LARSON. That is probably the way it would have to be worked out, but it in turn would give the farmer an assured water supply during a dry period.

Senator DOWNEY. Suppose there was a 5-year period during which many of the water users did not need water at all, but during that 5-year period that water was turned into the underground storage, would the farmer still want to pay the \$4.50?

Mr. LARSON. I could not answer that until the contracts are worked out, but in my opinion the contract would provide for payment of so much annually.

Senator DOWNEY. And the farmers who did not get any water because it was going underground would have to pay that much each year?

Mr. LARSON. That might be true.

Senator DOWNEY. Would that not create a lot of complications in connection with the Gila and Salt River water rights, some of which are sufficient and some inadequate?

Mr. LARSON. It would undoubtedly cause complications, but I do not see why they should be so great that they could not be worked out.

Senator DOWNEY. No further questions.

Senator MILLIKIN. Have you any further questions?

Senator McFARLAND. I just wanted to say I do not believe there is any question but what we can work out firm contracts. We will be glad to take it.

Mr. LARSON. May I add a statement in connection with the prices we used?

Senator MILLIKIN. Yes.

Mr. LARSON. Prices we used in connection with gross crop values are based on the period 1939 to 1944, which period has been adopted by the Bureau of Reclamation as representing the prices which are likely to result during repayment. It represents 145 percent of parity. The period has been worked out by economists of the Bureau of Reclamation and the Bureau of the Budget of the Department of Agriculture.

Senator DOWNEY. That does not mean you are not going to file this table?

Mr. LARSON. No; we will file the table.

Senator DOWNEY. I mean in reference to the 20 percent.

Mr. LARSON. That is right. We will file the table.

Senator MILLIKIN. We will take a 5-minute recess.

(Whereupon, a short recess was taken.)

Senator MILLIKIN. The committee will come to order.

The next witness is Mr. Wayne M. Akin, of Phoenix, Ariz.

**STATEMENT OF WAYNE M. AKIN, PRESIDENT, WESTERN FARM
MANAGEMENT CO., PHOENIX, ARIZ.**

Senator MILLIKIN. Take a seat please and state your full name, residence, and business.

Mr. AKIN. My name is Wayne M. Akin. I am a resident of Phoenix, Ariz. I own a farm in the Salt River Valley, and I am president of the Western Farm Management Co.

The Western Farm Management Co. is engaged in farming land owned by various individuals. These farms are located in the Salt River Valley, Arlington irrigation district, lower Gila Valley, and in the Eloy district.

Farming in these areas is entirely dependent on irrigation, as the climate is so arid that little or no value comes from direct rainfall. The farms near Phoenix are supplied with water by the Salt River Valley Water Users' Association. The Arlington irrigation district derives its water by diverting water which has returned by drainage from upper areas on the Gila and Salt Rivers.

Senator MILLIKIN. When do you have whatever rains you do have in that part of the State?

Mr. AKIN. There are roughly two seasons. They are very erratic. In the summer, sporadic showers; and the bulk of the rainfall is in the winter—the usable rainfall.

The lower Gila Valley area and the Eloy district are supplied entirely from irrigation wells.

In order to be specific I will discuss each of the areas separately.

The Salt River Valley Water Users' Association secures its water by gravity flow from dams on the Salt and Verde Rivers. This was one of the first major irrigation projects to be constructed by the Bureau of Reclamation, and it is generally recognized as one of the best of the larger reclamation projects. Nevertheless, the supply of surface water has proved inadequate and the water users' association is compelled to pump large amounts of water. This has resulted in the lowering of the underground water table to a dangerous extent and despite this underground supply we find ourselves facing a shortage of water so great that this season it is necessary to reduce crop acreage drastically. Our growing season is year long and normally we would plant crops in the fall and again in the spring, with many crops growing around the calendar.

Senator MILLIKIN. Which of your crops mature in the winter?

Mr. AKIN. Vegetables, notably, and we raise large amounts of pasture grain which is interplanted in alfalfa and used exclusively for pasture, and alfalfa is harvested late in the fall and early in the spring. Much of that is being dehydrated.

The making of hay is not particularly satisfactory in winter. However, dehydrated alfalfa meal is becoming more and more important.

The winter-harvested crops are largely in the vegetable field.

Senator MILLIKIN. What fruits do you grow?

Mr. AKIN. Citrus fruits primarily. There are some plums and apricots and that type of fruit, but most of the fruit is citrus, unless you include melons and that kind of thing.

Senator MILLIKIN. Very well; go ahead.

Mr. AKIN. Under the water shortage which now faces us we are confronted with the necessity of reducing the number of cuttings of alfalfa hay, and our spring and summer crops must be eliminated. This loss of production means lowering the normal livestock feeding operations. Incidentally, it may be worth calling your attention to the fact that most of the livestock feed produced in Arizona is fed locally. In fact, Arizona imports concentrates for livestock fattening and the finished livestock moves entirely to the West so that our production of this nature does not compete with that produced in the Middle West and the East.

The proposed central Arizona project will allocate a portion of its Colorado River water to the Salt River Valley Water Users' Association. This additional supply will make it possible to draw more slowly on the reservoir reserves as well as the underground water, and thus stabilize the supply of the association and place it on a firm basis.

Another very important angle which must be given consideration is the accumulation of salt in the lower regions of the Salt River Valley. As the irrigation water is applied, it dissolves the ground salt, carrying it into the underground water. By pumping this water is used over again at a lower point. In this way the accumulating salt in the water is slowly moved down the valley and under conditions of adequate water supply this excess salt would go back into the river drainage in sufficient volume to carry it completely away. The addition of the supplementary water under discussion will maintain the salt balance

in the lower end of the valley, and the Salt River Valley must have Colorado River water if the lower farms of the valley are to be permanently maintained.

Senator MILLIKIN. Do you operate all over that general region or do you operate in some particular part?

Mr. AKIN. We operate in Salt River Valley and farther down the river in the Arlington district and below Gila Bend and also in the Eloy area.

This problem of increasing salinity is facing the land which our company operates in the Arlington irrigation district. This is a gravity irrigation system approximately 50 miles west of Phoenix. It diverts its water at a point about 35 miles below Phoenix on the Gila River below the confluence of the Gila and the Salt Rivers. This district is one of the oldest cultivated areas of Arizona. Its water rights are unquestioned insofar as volume is concerned, but the quality of the water is becoming progressively worse. We have been operating in this area for about 13 years, and during this time we have seen the salt content of our irrigation water materially increase. So much so, in fact, that it is necessary to use about 50 percent more water than we use in the Salt River Valley proper.

It should be borne in mind that the land in this area has water-right priorities which antedate most of the water rights of the larger area up the river in the Salt River and the Gila River Valleys, but despite these old water rights the farms of the Arlington district are faced with declining usefulness and ultimate ruin. The only answer for this tragedy is more water and that can only mean Colorado River water.

Senator MILLIKIN. Are your water rights measured by a definite quantity of water?

Mr. AKIN. Only insofar as the supply is concerned.

The Arlington district diverts its water by a rock and brush dam and is entitled to water in the river at that time.

Senator MILLIKIN. Let us assume I have 160 acres and I am in this first water area you spoke about.

Mr. AKIN. That is right.

Senator MILLIKIN. Do I have a definite amount of water which I am entitled to put on that 160 acres?

Mr. AKIN. No; that 160 acres has all the water there. There is no storage right. The water is prorated.

Senator MILLIKIN. I have my share of the district's share. Is that correct?

Mr. AKIN. Yes, sir.

Senator MILLIKIN. Does the district have a definite allocation of a definite amount of water, assuming the stream can make it?

Mr. AKIN. From a practical standpoint, it does not, Senator.

Senator McFARLAND. Those farmers, Senator, have adjudicated water rights, but the normal flow water rights is what Mr. Akin is trying to get at. I do not know how they work it between them. Some of them go back to an earlier date than others.

The difficulty, as I explained yesterday, with these people is that most of their water comes from return flow from the Buckeye Irrigation project and Salt River Valley water users above them. It has been used twice.

Senator MILLIKIN. Do you adjudicate a certain amount of water out of the stream for the benefit of a particular piece of land, or enough to

make a complete beneficial user, assuming the stream will deliver it? How does adjudication run?

Senator McFARLAND. The duty of water, I presume that is of what you speak?

Senator MILLIKIN. Yes.

Senator McFARLAND. The duty of water in the Salt River project is fixed at 4 acre-feet. The duty in Arlington may be more. It is 6 acre-feet in Buckeye. But, after all, the water has to be there. You have got to take it according to priority. A lot of people have priorities above them, and they may have to take it from the return flow.

Senator MILLIKIN. Do the lower districts which have heavy salinity make any claim to the right for an additional amount of water to compensate for salinity?

Senator McFARLAND. Well, Senator, I tried to illustrate that on pumped water. Of course, there have been claims made. In the Buckeye district the duty of water was increased to 6 acre-feet on account of salinity. That is kind of a long story in regard to salinity.

Senator MILLIKIN. Well, we will pass it for the time being. Go ahead, Mr. Akin.

Mr. AKIN. The situation farther west in the Gila Valley is much the same as in the Arlington district, except that the supply comes from pumping. The prevention of excessive salt accumulation by virtue of the increased volume of water used, as indicated above, would stabilize this agricultural community. In this connection it may be in order to again point out that the plan for which we are asking authorization does not contemplate the irrigation of new lands. We have a desperate need for additional water to prevent the loss of lands now in cultivation.

The lands in Santa Cruz Basin face a different situation. This area is entirely supplied by water pumped from underground, and the problem is one of exhaustion of the supply. Twelve years ago our company started farming in this area on land that had been reclaimed from the desert many years earlier. In fact, this particular farm was one of the first to be established in the Eloy district. As the years have gone by, the water table has progressively receded, and as the water must be lifted from a greater depth, the cost of operation has advanced. This decline in depth has varied from 1 to 4 feet per year and the water table has dropped from 80 to 135 feet.

This particular farm is roughly in the center of this great farming area and is in a favored spot from the standpoint of the water level. Many wells in the basin have receded more rapidly and the pumping depth is much greater. The important fact is that the point at which farming in the Santa Cruz Basin must be discontinued is definitely in sight.

Of course, by careful management, the return of this land to desert can be deferred somewhat, and if we can be assured that a supplementary supply will be available at some time in the predictable future, we can so plan our farming program that we can go ahead until the water comes in to save this area, which means hundreds of farms and three sizable towns with all of the enterprises that go to make a large, prosperous community.

I have tried to convey to you the vital nature of the problem facing the whole irrigated farming community of central Arizona. This empire, which we have created from the desert, is in grave danger.

The situation is desperate. I want to emphasize that this is not a condition occasioned by the present drought which has merely accentuated the already serious condition. What we need is permanent relief which can only be had by getting the additional supply of surface water which the proposed project will provide. Nobody is to blame for the situation, which has been occasioned by perhaps overoptimistic calculations as to the amount of water available for irrigation. Whatever the reason, the fact remains that we just do not have enough water over a period of years to do the job.

Central Arizona constitutes a very important unit in the producing agricultural plant of the United States. Its major production does not compete with agricultural products of the colder areas of our country. Its growing season is continuous, thus providing a steady volume of labor and a buying power much larger than would normally be expected from the acreage involved. If it goes back to desert, the loss in crops will be important in the national picture, but, more important, the dislocation of people and the loss of market for manufactured goods will be distinctly felt throughout the manufacturing East.

I am not a lawyer and make no pretense of discussing the legal aspects of the water rights involved, but I do know that while we are talking about this problem, each year over 9,000,000 acre-feet of water is going into the Gulf of California and upward of another million acre-feet of usable water is being wasted into the Salton Sea. The bill now before this committee, S. 1175, authorizes the construction of the project that will enable us in central Arizona to utilize approximately 1,000,000 acre-feet of that water per year.

Careful study of the whole complex picture will, I am sure, lead to the conclusion that this economic unit under discussion is well worth saving. It is worth while in cold dollars to the United States Treasury, not only because it is a loan which will be directly repaid, and not only because the business generated by its prosperity affects the whole national economy, but, as will be presented specifically elsewhere in this hearing, the income taxes generated within this social structure will repay the United States Treasury in full within a comparatively short period of time and will continue to pour money into the Treasury year after year.

I am primarily presenting the case for myself and the farm owners who employ me but I am also interested in my friend and neighbors who are facing the loss of their homes and the fruit of their life efforts. The exhaustive studies of the Government and private experts have proved that the project is feasible both from the economic and the engineering standpoint. However, even more important are the social and human values which the construction of this project will preserve, both for the State of Arizona and the United States as a whole.

Senator MILLIKIN. Any questions?

Senator DOWNEY. I have a few, Mr. Chairman.

Senator MILLIKIN. All right.

Senator DOWNEY. Mr. Akin, what is the size of the parcel that you personally own?

Mr. AKIN. I have an undivided twelfth interest in a section of land.

Senator DOWNEY. What is raised on that section?

Mr. AKIN. Grain, alfalfa, cattle feeding.

Senator DOWNEY. What is the fair present value of that land per acre?

Mr. AKIN. I would say \$300 an acre.

Senator DOWNEY. And how many acres are operated by the corporation that you mentioned in your statement?

Mr. AKIN. You mean of this particular farm or all together?

Senator DOWNEY. No; I mean all together.

Mr. AKIN. Approximately 4,000 acres.

Senator DOWNEY. That is operated on some sort of lease?

Mr. AKIN. No; on direct contract for the owners.

Senator DOWNEY. Operated for them and some sort of division of crops?

Mr. AKIN. Yes.

Senator DOWNEY. I do not want to inquire particularly.

What kind of crops are raised on that land?

Mr. AKIN. Primarily our operation is hay, grain, and cattle-feeding operations.

Senator DOWNEY. What is the value of that land with water?

Mr. AKIN. That land will vary from \$150 or \$175 an acre to \$425, depending on various factors.

Senator DOWNEY. You have had very successful farming returns there I suppose in the last 2 years?

Mr. AKIN. Yes, sir.

Senator DOWNEY. Have there been a large number of companies go in there who have bought new land and put new land into the growing of vegetable crops?

Mr. AKIN. Yes; there is a considerable acreage in vegetables.

Senator DOWNEY. I mean that has gone in there during the war period?

Mr. AKIN. Yes, sir.

Senator DOWNEY. I understand some of those companies have made profits per acre equal to the price they paid for that acre in a single year.

Mr. AKIN. I think that is a fair assumption.

Senator DOWNEY. Do you think it would be possible to work out your difficulties there without an adequate ground-water law?

Mr. AKIN. I am not sure that I understand your question.

Senator DOWNEY. You have been discussing for several years in Arizona the enactment of a ground-water law.

Mr. AKIN. That is right.

Senator DOWNEY. Do you think it would be possible to work out this project successfully without it?

Mr. AKIN. Are you talking about central Arizona?

Senator DOWNEY. Yes; the project.

Mr. AKIN. The whole project?

Senator DOWNEY. Without the enactment of the ground-water law?

Mr. AKIN. Yes; I think it is possible.

Senator DOWNEY. Do you favor a ground-water law.

Mr. AKIN. I favor a ground-water law.

Senator DOWNEY. A great many people do not favor it.

Mr. AKIN. That is correct.

Senator DOWNEY. When will that ground-water law be passed on by the legislature?

Mr. AKIN. I understand at the special session which is now in session. The Governor has placed the ground-water matter on the agenda.

Senator DOWNEY. Are there certain years in which this land that you have your personal interest in, or your corporation is operating, has an ample supply of water when there is a large run-off from the streams?

Mr. AKIN. The land in the Salt River Valley has an adequate supply when or if it were released.

Of course, under the operation of the association it is retained in the reservoirs in order to string it out, and as such we would need additional water.

I do not know whether I answered it.

Senator DOWNEY. I think you probably answered my question one way, but not wholly.

Are there certain landowners that would have no need of additional water in years of higher run-off?

Mr. AKIN. There is very limited acreage that, in my opinion, does not need additional water. The acreage, particularly in the Salt River project, which has the old original priorities, has sufficient water under any circumstances in my opinion.

Senator DOWNEY. And you mean does not need water at all or does not need it in periods of high run-off?

Mr. AKIN. I mean they do not need additional supplemental water. That is a matter of 10 or 15 thousand acres out of 700 thousand acres of land.

Senator DOWNEY. Do you think there would be any difficulty in securing the payment of \$4.50 a year in certain years of high run-offs?

Mr. AKIN. No.

Senator DOWNEY. Do you think \$4.50 an acre-foot is all your land can afford to pay for this water, Mr. Akin?

Mr. AKIN. My opinion, I think would not be adequate as to the general economy. It is something for an economist to figure out which I am not.

Senator DOWNEY. Frankly, your opinion would be of more value to me than that of an economist.

Mr. AKIN. As far as my particular land is concerned I would be very glad to take the contract to buy more, to pay something more on my particular land for that 4 or even 5 acre-feet of water, and much more than that, have three as against two. Do you see what I mean?

Senator DOWNEY. You understand that in the plan here contemplated the price of water has been calculated at \$4.50 an acre-foot.

Mr. AKIN. Yes. I understand that.

Senator DOWNEY. How many acre-feet of water would the ordinary farm in central Arizona have to utilize? I do not mean this particular water, but all the water?

Mr. AKIN. That is something that is quite difficult to answer specifically.

I think this is rather a fair yardstick. Very roughly you can produce a ton of hay with an acre-foot of water.

You have got a fundamental basis of overhead. If you only have 2 acre-feet of water you still have to have your machinery, your farms,

your fences, your housing, your labor, and everything that goes with it. You have got that whole overhead. If you only get 2 acre-feet of water you produce 2 or 2½ tons of hay, and the next acre-foot of water will give you the income without increasing overhead.

Senator DOWNEY. What would be a full adequate supply, in acre-feet, to raise the maximum crop, 4 or 5 acre-feet?

Mr. AKIN. I just suggested that if I could have what I want—is that what you are asking?

Senator DOWNEY. Yes.

Mr. AKIN. I would state 5 acre-feet on a farm in the Salt River Valley. I could use 5 acre-feet advantageously. Does that answer your question?

Senator DOWNEY. Yes.

Senator MILLIKIN. May I interrupt and ask whether that is based on specialized crops in the area?

Mr. AKIN. That is based on the crop we would raise. I could take 7 acre-feet on alfalfa and make it pay.

Senator MILLIKIN. Your 5 acre-feet would contemplate what kind of farming?

Mr. AKIN. General farming with perhaps 25 percent in vegetables, 40 percent in alfalfa, because we have to have alfalfa in our crop rotation in order to maintain soil fertility and the physical condition of our soils, and the balance of the land in miscellaneous crops, grain or feed, or what have you.

Senator DOWNEY. Do you think \$22.50 an acre is the full amount that such land as you have been describing could bear for a water charge over a long period of time?

Mr. AKIN. \$22.50?

Senator DOWNEY. I reach \$22.50 by taking 5 acre-feet and multiplying by \$4.50.

Mr. AKIN. No; that is not what I said.

Senator DOWNEY. I am asking you that question, Do you think \$22.50 an acre would be the full amount that a farmer in general farming could afford to pay for his water charge over a long period of time in the future?

Mr. AKIN. I think that is more than he can afford to pay.

Senator DOWNEY. As you judge the future of farm prices, how much do you think would be the full amount that could be paid on a general farm for 5 acre-feet of water applied to an acre?

Mr. AKIN. On a long average it would be my opinion it would be \$15 or \$16.

Senator DOWNEY. So you think that this \$4.50 an acre can only be justified on the basis of a supplemental water supply?

Mr. AKIN. Yes, sir.

Senator DOWNEY. In this whole area, generally, about how much of the land is in citrus fruit?

Mr. AKIN. I cannot answer that, Senator. We have plenty of people here that can.

Senator DOWNEY. What, if any, other orchard crops do you have?

Mr. AKIN. There is none of any economical consequence. There are plums and apricots.

Senator DOWNEY. They are a very small acreage?

Mr. AKIN. Yes.

Senator DOWNEY. Except for whatever citrus you may have, it is general farming?

Mr. AKIN. Yes, sir.

Senator DOWNEY. Would it be fair to say a top value is \$300 an acre?

Mr. AKIN. No.

Senator DOWNEY. General farming, I am talking about.

Mr. AKIN. No. I think a top value of \$450 or \$500 would be top value.

Senator DOWNEY. Is that the present figure?

Mr. AKIN. Yes, sir.

Senator DOWNEY. I think that is all, Mr. Chairman.

Senator MILLIKIN. What is the going price for raw land that has no water on it out there?

Mr. AKIN. That is primarily a matter of presuming water supply that might be developed for it, location, the quality of the soil, the topography of the land. There are many factors, but it will run anywhere from a dollar an acre to \$40 an acre.

There is much of it sold at higher prices but not primarily for farming. You begin to run into residential values when you get above that figure.

Senator MILLIKIN. Do you have unwatered range land in Arizona, grassland?

Mr. AKIN. Oh, yes.

Senator MILLIKIN. What does that sell for?

Mr. AKIN. There again are many factors. Anywhere from 10 to 15 cents an acre to \$15 an acre, depending. In a State such as ours where you have extreme desert conditions and areas of rather high rainfall your fluctuation is very large.

Senator MILLIKIN. What would be the top price on land which is not irrigated and which does not have some special value because of proximity to possible city development?

Mr. AKIN. Are you speaking of any particular place?

Senator MILLIKIN. Any place.

Mr. AKIN. I would say up to \$50 an acre.

Senator MILLIKIN. That would have grass on it?

Mr. AKIN. No; that would be used for dry farming.

Senator MILLIKIN. There would be enough rainfall to mature some kind of crop?

Mr. AKIN. Yes, beans.

Senator MILLIKIN. If you were to ask me in eastern Colorado what is the normal prewar price for dry land, I would say at once it would range from \$4 to \$15 an acre.

Can you give me a comparable range?

Mr. AKIN. For dry farming I would say it would range pretty well from \$4 to \$15 an acre.

Senator MILLIKIN. About the same.

Mr. AKIN. For grazing purposes I think from 10 to 15 cents an acre to \$15 an acre is reasonable, too.

Senator DOWNEY. Mr. Akin, I understand that in the last 2 years corporations developing large amounts of vegetable or crop land have come into this area and have purchased the raw desert land and have developed pumping for it.

I think you said that to me, or something like that.

Mr. AKIN. I do not know what you mean by large corporations.

Senator DOWNEY. Very well, individuals or companies.

Mr. AKIN. There have been considerable acreages, if you take it as a sum total.

Individuals and individuals forming companies have not developed what I would call large acreages. Maybe that again is a comparative statement.

Senator DOWNEY. We have found that in the Central Valley project.

What did these individuals or farm operators pay for this undeveloped land they purchased, on an average?

Mr. AKIN. That has gone into vegetables?

Senator DOWNEY. Yes, in the war period, since 1940.

Mr. AKIN. Insofar as my experience would give me an idea, I would say between \$40 to \$50 an acre in the raw desert.

Senator DOWNEY. And these men who paid that price are now among those who need to replenish the water supply?

Mr. AKIN. Yes; although that again is a comparatively unimportant fraction.

This project is by no means intending to pull out this land.

Senator DOWNEY. How many of those acres would fall in that category, say it has been developed since 1939?

Mr. AKIN. There are people who can give accurate figures.

Senator DOWNEY. Who may that be?

Senator McFARLAND. I might say we have carefully prepared our presentation. We have witnesses to cover each phase.

Now we are limited to 8 hours in our evidence in chief.

Senator MILLIKIN. That is right.

Senator McFARLAND. This witness' statement was reduced to about 8 minutes, and he has now been on the stand about 35 minutes, and most of the time has been occupied by cross-examination.

If your questions could be deferred until we get in our case in chief, that would be better.

Senator MILLIKIN. If you have a witness that will deal with this thing, we will not go into it further.

Senator DOWNEY. I want to follow the suggestion of the witness. I just asked him the question. Perhaps you could answer it, Senator.

Senator McFARLAND. I would not want to say offhand.

Senator MILLIKIN. Are there any figures available showing the amount of absentee farming in this area we are concerned with?

As I take it you are operating farms for absentees?

Mr. AKIN. It depends on what you call absentees. Half of our clients live in Arizona and the other half live in California.

Senator MILLIKIN. Let me make it a little sharper. Are there any percentages available that would indicate how many people that are off their land and having their land farmed for them as distinguished from people on the farms?

Mr. AKIN. I cannot answer.

Senator MILLIKIN. That is all.

Have you a short witness?

Senator McFARLAND. Yes; all the witnesses are short.

I believe I can answer the chairman's question in regard to the salinity of water in a few words.

The only case that I know of that involved the salinity of water was the case I tried when I was on the bench. That case was to compel all Salt River Valley water users to deliver first their stored water and not substitute for it pumped water, which had a higher salinity, but which was usable water.

I held in that case that the pumped water was part of the water supply for the project and they could substitute, but I also found that it took a greater amount, a larger amount of pumped water to do the same irrigation with approximately the same results.

Senator MILLIKIN. What did the Supreme Court do to you?

Senator McFARLAND. The Supreme Court affirmed me. I said they should give a larger amount in water to do equity. That is it in a few words.

Senator MILLIKIN. Thank you very much.

Senator McFARLAND. That case, the report dealing with my decision, is in those Mexican water treaty hearings.

Senator MILLIKIN. At some stage in the proceedings will you have any testimony as to the contribution of the citizens of Arizona to the Federal revenues?

Senator McFARLAND. Yes; we will do that. We have that.

STATEMENT OF C. H. McKELLIPS, CITRUS GROWER, MESA, ARIZ.

Senator MILLIKIN. Mr. McKellips, will you state your full name, your residence, and your business?

Mr. McKELLIPS. My name is C. H. McKellips and I live on a ranch 7 miles northeast of Mesa, Ariz. I was born and raised in Beloit, Kans. When I was 21 I came West and have been in the State of Arizona 33 years. During the past 20 years I have been interested in farming, more particularly the citrus industry. I bought raw land 20 years ago, planted it to citrus, and still own and live on that grove. Fifteen years ago, I became interested in the marketing and processing of citrus and helped organize a mutual association. This mutual now owns and operates a citrus processing and packing plant in Mesa, Ariz., handling the fruits raised by its members.

The citrus grove which I own is located in the Roosevelt Water Conservation District, commonly referred to as RWCD, an irrigation district of 39,000 acres adjacent to the Salt River Valley project. At the present time and for the past 15 years, I have been a member of the board of directors of that district and therefore am thoroughly familiar with the affairs of said district.

The district water supply is obtained about one-third from gravity flow from the Salt River, and about two-thirds from 60 wells distributed over the district. These pumps are electrically operated by power purchased from the Salt River Valley Water Users' Association.

The RWCD is made up of 356 individual farms and has the farm population of approximately 1,850. On these farms the crops raised are very much diversified. Last year, which is typical of the last several years, the acreage was divided up about as follows:

Citrus, 3,200 acres, with an average age of 14 to 15 years; alfalfa, 20,000 acres; cotton, 729 acres; grains—wheat, oats, barley, and flax—6,700 acres; and prepared for crops about 7,400 acres which will probably be planted to cantaloupes, watermelons, and vegetables.

Senator MILLIKIN. How long does it take a citrus fruit tree to bear?

Mr. McKELLIPS. Grapefruit, you will get some production in about 5 years and oranges you will not get much production in less than 8 years.

Senator MILLIKIN. What is the peak of their production?

Mr. McKELLIPS. The peak of their production is about 25 years.

Senator MILLIKIN. And then?

Mr. McKELLIPS. They stay about that way. There are orange trees in California about 75 years old.

Senator MILLIKIN. And they keep right on?

Mr. McKELLIPS. They keep right on if properly cared for.

Senator MILLIKIN. All right, thank you very much.

Mr. McKELLIPS. The RWCD, which is a good, sound irrigation district, is now in excellent financial condition, debts paid, and so forth. The principal obligations of the district are held by the Reconstruction Finance Corporation with a bonded indebtedness of around \$35 per acre.

Our chief worry right now is the water problem. The underground water has constantly gone down for the last 8 or 10 years and has arrived at the point where something has to be done. We are constantly putting down new wells, but that does not answer the problem. It is not going to be long until we arrive at the point where the lift is going to be so great that the cost will be prohibitive. The situation in our district is no different than that in several other districts of Maricopa and Pinal Counties. They are all in the same boat.

To adequately irrigate that land and get the full benefit one should get out of it, it takes a minimum 4 acre-feet of water per year per acre. This year we are going to be very fortunate if we deliver 2½ acre-feet.

This results in hardship on the man with small acreage. If he is a citrus grower, he will get enough water to barely keep his grove alive. Some of the citrus growers who are financially able have put down wells to save their groves. The holders of small groves will not be able to do this with the result that they stand a chance of losing their entire investment. This investment has been built up over a period of 10 or 15 years, the time it takes to develop a citrus grove.

Senator MILLIKIN. How much does it cost to put down a well?

Mr. McKELLIPS. To put down a well in our district and fully equip it, it costs in the neighborhood of \$20,000.

Senator MILLIKIN. \$20,000?

Senator ECTON. How deep do you have to go?

Mr. McKELLIPS. In one end of the district we have to go from 300 to 400 feet and on up to 800 feet.

Senator MILLIKIN. What was the prewar cost of a well of that kind?

Mr. McKELLIPS. The prewar cost of a well of that kind, that is just about it. We are getting wells drilled now. It is costing about 25 percent more.

Senator MILLIKIN. How much water will an average well of that kind deliver?

Mr. McKELLIPS. In our district it will deliver about 300 inches.

Senator MILLIKIN. About 300 inches.

Mr. McKELLIPS. A good well.

Senator MILLIKIN. All right.

Mr. McKELLIPS. The only relief that we can expect is additional water. The only place we can get this additional water is from the Colorado River. Unless we get this relief, some of the land will go out of cultivation, and the taxes will not be paid on this land. The assessments to pay interest and principal to the Reconstruction Finance Corporation will not be paid. When part of the land carries the whole load, the district will then go to pot. Our situation is a desperate one.

The citrus industry is one of the major industries of the State of Arizona. I would briefly like to give you some statistics on the production in central Arizona. This covers the whole valley. I have been talking about my own district of 39,000 acres.

There is planted to grapefruit approximately 12,500 acres. To plant, take care of, and develop and carry a grapefruit orchard to maturity means the investment of \$1,000 per acre. Therefore, there is invested in this grapefruit acreage the amount of \$12,000,000. Most of the growers have built their homes on these orchards and otherwise improved their holdings, so naturally the present value of the total investment in grapefruit is at least twice the original investment cost.

From the 12,500 acres of grapefruit, there is produced annually around 4,000,000 boxes of grapefruit which are sold and distributed almost entirely in the States of Arizona, California, Oregon, Washington, Utah, and Idaho. Part of this grapefruit is processed and sold as canned juice, and this represents no small item of income.

There is also in central Arizona about 7,000 acres of oranges. This represents about 600 growers and at an annual production of over 1,200,000 boxes. These orange groves again represent an investment of about \$1,500 per acre and again the growers have built homes and live in their groves so that actually the wealth represented by this industry is over \$20,000,000. Our first crop of navel oranges is on the market before any other grown in the West.

In addition to the grapefruit and oranges, approximately 600 acres of lemons representing an approximate cost of \$1,500 per acre, or \$900,000. These orchards produce about 41,000 boxes of lemons annually.

This combined citrus operation represents an annual production of the approximate value of \$12,000,000 and represents an investment in which the growers have invested \$26,500,000.

The citrus industry in central Arizona is a small growers' operation. The average acreage for all varieties of citrus grown is 27½ acres per grower.

This industry spends approximately \$1,200,000 per year for boxes. Most of this material comes from Washington and Oregon. It also purchases approximately \$400,000 worth of tin cans per year, approximately one-half of them from Texas and the other one-half from California.

More than \$50,000 per year is spent for paper cartons which come from California, and \$100,000 per year for labels for box ends and wraps; \$1,500,000 per year is spent in grove maintenance, for machinery, labor, and fertilizers. Most of the machinery is manufactured in the Midwest.

The majority of the commercial fertilizers are purchased in Kansas, Arkansas, Louisiana, and Texas—phosphates, nitrates, and so forth. We get some fertilizer, I might say, from California.

More than \$2,000,000 is spent for labor, picking, hauling, packing, and processing. This again involves the purchasing and use of machinery, trucks, and so forth, all of which are manufactured in the Midwest.

As I have heretofore pointed out, to successfully raise citrus, it requires at least 4 acre-feet of water per year. In the RWCD we hope to deliver $2\frac{1}{2}$ acre-feet this year.

The Salt River Valley Water Users' Association have set their limit at 2 acre-feet this year and other districts at about the same. The grower is getting only one-half of what he needs to produce his crop. In other words, he will do well if he can keep his grove alive on this water, much less raise a decent crop. This situation can't continue indefinitely, and many of these growers will go out of business with the result of a decrease in the taxable wealth of the State, a decrease in income taxes paid the United States Government, a decrease in the purchase of machinery and supplies that we are now buying, all of which will affect not only the local businessman, but will affect the whole national economy.

The only answer to this is a supplemental supply of water. If the growers are now assured that we will ultimately get this water, we can make our plans accordingly. We realize, of course, that after the project is authorized, it will take several years to construct. But if we know we are going to get it, we will do our best to get along and keep our groves alive and look forward to the time when we can again do the job properly.

The passage of Senate bill 1175 will answer our problems.

Senator MILLIKIN. Are there any questions?

Senator DOWNEY. A few questions, Mr. Chairman; I will be very brief.

Senator McFARLAND. Before you start, I might add to the statement that by adding those figures up, Mr. Chairman, if I added them accurately, there are about 20,000 acres of citrus.

Mr. McKELLIPS. That is right.

Senator DOWNEY. Mr. McKellips, how much per acre would your land have been able to pay for its water charges, say from 1930 to 1935?

Mr. McKELLIPS. In our district?

Senator DOWNEY. Yes; if you wish, please, in your district.

Mr. McKELLIPS. How much per acre?

Senator DOWNEY. Per acre-foot?

Mr. McKELLIPS. Well, I would say it is costing about \$3, about the same.

Senator DOWNEY. I am asking how much you would have been able to pay for water per acre-foot for the 6 years from 1930 to 1935?

Mr. McKELLIPS. On groves?

Senator DOWNEY. On your citrus groves, yes.

Mr. McKELLIPS. You can pay more on groves than you can on ordinary farm land. You have a bigger investment. You have to feed it water 6 or 7 years before you get anything.

Senator DOWNEY. As a matter of fact did not your district go into municipal bankruptcy?

Mr. McKELLIPS. We refunded our bonds with the Reconstruction Finance Corporation.

Senator DOWNEY. At 40 cents on the dollar?

Mr. McKELLIPS. I think $37\frac{1}{2}$.

Senator DOWNEY. Thirty-seven and one-half. Do you think there is any assurance the farmers there will be able to pay this \$4.50 an acre-foot when we are going to have what we believe will be normal farm prices?

Mr. McKELLIPS. Yes, I do, because the district is in much better shape than when we had all that trouble.

Senator DOWNEY. Do you think \$4.50 an acre-foot is all the land-owners can afford to pay?

Mr. McKELLIPS. I think that is high over a period of years.

Senator DOWNEY. For general farming?

Mr. McKELLIPS. For general farming, not for citrus.

Senator DOWNEY. For general farming would you consider \$4.50 an acre-foot would be an excessive cost?

Mr. McKELLIPS. Yes; because that means the difference between going broke and having a profit.

Senator DOWNEY. And assuming that any acreage will be supplied water at \$4.50 an acre-foot for general farming, would you consider that would probably be more than the land could bear?

Mr. McKELLIPS. Yes; general farming. That is higher than we have been used to.

Senator DOWNEY. You know that \$4.50 would lack about 50 percent of the payment of the operation and maintenance expense.

Mr. McKELLIPS. I think that was brought out here yesterday.

Senator DOWNEY. Do you think it is necessary for Arizona to pass an adequate ground-water law before this project can be successfully worked out?

Mr. McKELLIPS. I think it would be advisable. I do not think it would have anything to do with working the problem out.

The whole district needs it. You are talking about our little district or any other district. We are asking for 700,000 acres of land in desperate need, that will either go bankrupt if we do not get it. We are trying to save the economical situation of the whole valley.

Senator DOWNEY. I am just asking about the ground water.

Mr. McKELLIPS. Yes.

Senator DOWNEY. Do you yourself favor a ground-water law?

Mr. McKELLIPS. Yes, I do. I do. I favor it.

Senator DOWNEY. You think it is necessary, then?

Mr. McKELLIPS. I do not know enough about the water proposition to say.

Senator DOWNEY. That is all.

Senator McFARLAND. You rebonded in what year, Mr. McKellips?

Mr. McKELLIPS. I do not know.

Mr. J. H. MOEUR. In 1932 or 1933.

Senator McFARLAND. That was in the depression and at a time when the best of bonds were not any good?

Mr. MOEUR. If you remember, when they were all selling for 50 cents on the dollar.

Senator McFARLAND. And they are selling above par now?

Mr. MOEUR. And they are selling above par now.

Senator MILLIKIN. That is all, thank you, Mr. McKellips.

We will recess until 10 o'clock tomorrow morning.

(Whereupon, at 12:30 p. m., the subcommittee adjourned until 10 a. m., Thursday, June 26, 1947.)

BRIDGE CANYON PROJECT

THURSDAY, JUNE 26, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin presiding.

Present: Senator Millikin (presiding) and Ecton.

Also present: Senaors McFarland and Downey.

Senator MILLIKIN. The committee will come to order.

Senator MCFARLAND. Mr. Chairman, I would like for us to call several witnesses this morning who will touch upon various phases of this central Arizona project in order to try to give the committee the full picture.

Most matters they will testify to, I think, will be noncontroversial.

If I might suggest it, I would request that these witnesses not be cross-examined except as to matters they have in their statements, or if California would wait until four or five have testified and then ask any question, we may make a little better time that way.

Senator MILLIKIN. We will see how we get along.

I would like to say we will meet tomorrow afternoon at 3 o'clock instead of tomorrow morning at 10, as I have another committee meeting which I have to attend in the morning.

Senator MCFARLAND. I will call Mr. Corbell.

STATEMENT OF VICTOR I. CORBELL, TEMPE, ARIZ.

Senator MILLIKIN. Will you state your name, your business, and your residence?

Mr. CORBELL. My name is Victor I. Corbell. I am 52 years of age and have resided in the Salt River Valley in the vicinity of Tempe, Ariz., all of my life. I have been engaged in farming continuously for the past 28 years, and have resided on the same place, which I own and operate, for the past 28 years. In addition to my farming operations, I also operated a cotton gin for a number of years. At the present time my family and myself own and operate 400 acres of land. All of the land is in a high state of cultivation and receives its water supply from the Salt River Valley Water Users' Association, a Federal reclamation project, one of the oldest in the United States.

Senator MILLIKIN. May I interrupt to ask where do you produce your main cotton supplies?

Mr. CORBELL. The main cotton supplies are raised in Pinal County.

Senator MILLIKIN. That is where on the map?

Senator McFARLAND. Right here, Senator [indicating].

Mr. CORBELL. Very little cotton is grown at the present time in the Salt River project.

Senator MILLIKIN. What is the trouble?

Mr. CORBELL. Crops of vegetables are more profitable and we have had an infestation of insects.

Senator MILLIKIN. Have you had excessive importations of some kind of cotton?

Mr. CORBELL. Long staple.

Senator MILLIKIN. All right, proceed.

Mr. CORBELL. The Salt River Valley Water Users' Association was organized in February 1903 at the suggestion of the then Secretary of the Interior 1 year after the passage of the National Reclamation Act. It is a quasi-public corporation, having certain powers and functions not ordinarily possessed by private corporations, such as the levying of assessments upon the lands of the shareholders of the project. The owners of the land within the boundaries of the project subscribed to the stock of the association at the rate of one share of stock for each acre of land. The total number of shares outstanding is approximately 242,000, representing 242,000 acres of land.

The stock of the association and the rights thereunder are appurtenant to the land. Any conveyance of the land automatically transfers the stock of the association to which it is appurtenant to the new owner, whether expressed in the grant or not. Only natural persons, who are owners of the land, are entitled to vote, and the amount of votes any 1 shareholder may cast is 1 vote for each acre of land owned, not to exceed 160 votes.

WORKS OF THE SALT RIVER VALLEY WATER USERS' ASSOCIATION

The project works of the Salt River Valley Water Users' Association, the title of which is in the United States, consists of six storage dams and reservoirs, two diversion dams, one flood-control dam, eight hydroelectric plants having a generating capacity of 81,710 kilovolt-amperes, one steam generating plant of a rated capacity of 28,000 kilovolt-amperes, two Diesel units of the rated capacity of 12,500 kilovolt-amperes.

It also has under lease from the United States Government a mobile steam unit of a rated capacity of 10,000 kilovolt-amperes. By contract it also has the use of a 16,000 kilovolt-ampere steam generating plant of the Consolidated Inspiration Copper Co., and has a contract with the United States of America for 30,000 kilovolt-amperes of power from Parker Dam in the Colorado River.

Senator MILLIKIN. When will the Salt River Valley Water Users' Association secure title to these works which you have described, and which you say are now in the United States?

Mr. CORBELL. My understanding is when it is paid out and Congress turns it over to them.

Senator MILLIKIN. I was wondering when it would be paid out?

Mr. CORBELL. That will be quite a considerable length of time. We owe quite a considerable amount of money.

Senator MILLIKIN. It is not in the near future?

Mr. CORBELL. It is not in the near future.

Senator MILLIKIN. All right, go ahead.

Mr. CORBELL. The association also has approximately 2,000 miles of transmission lines and 1,500 miles of canals and laterals. The association, through its various plants, distributes electrical energy both at wholesale and retail, and the amount of such distribution is a little over one-half of all of the public utility power in the State of Arizona. Its electric lines extend throughout the project within reach of every farmer within the boundaries of the project, and also extend throughout central Arizona. To a large extent it serves power to the greater part of the area covered by the proposed central Arizona project. The works of the project develop and distribute in excess of a million and a quarter acre-feet of water each year.

COST OF THE SALT RIVER PROJECT

The present works of the Salt River project represent a total outlay of \$48,702,000. Of that amount \$16,716,000 was contributed by the Federal Government, and the balance was privately financed. It is not in default in any of its payments to the Federal Government, and, in fact, is paid up in advance for 5 years. The total project debt remaining unpaid, including the amount owing the United States, is \$21,888,000.

WATER SUPPLY OF THE SALT RIVER PROJECT

The sources of water supply of the Salt River project are from the Salt and Verde Rivers, upon which there are a total of six storage reservoirs with a combined capacity of approximately 2,000,000 acre-feet, and also from approximately 220 deep wells within the project. Daily records have been kept of the flow of the Salt and Verde Rivers since January 1, 1889.

Senator MILLIKIN. Yesterday I asked a witness for a figure as to the cost of those deep wells. As I recall it he said about \$20,000. Does that coincide with your idea?

Mr. CORBELL. Yes; and a great deal of that, of course, Senator, depends upon the depth you go.

Senator MILLIKIN. All right, proceed.

Mr. CORBELL. Based on those records, it is estimated that the amount of stored and developed water that will be available in the future for the lands of the Salt River project will not exceed 3 acre-feet per annum. This does not include certain lands which have decreed rights, which have an additional supply of a varying degree, depending upon the year of their priority.

As the majority of the lands within the project are without decreed rights of any value, for the purpose of this statement only the water supply for those lands without decreed rights is considered. The records of the past 20 years, which can be considered as a fair average for the entire period for which records have been kept, disclose that on an average there has been delivered to the lands of the project 2.8 acre-feet of stored and developed water per acre per annum; 19 per cent of that water has been pump water.

During a part of that time there was no storage on the Verde River. Had there been full storage on the Verde River during all of the 20-year period, it would have increased the average amount of water

available to each acre of land to approximately 3.1 acre-feet per acre per annum.

The amount of pump water that has been developed in the last decade within the boundaries of the Salt River project has been much heavier than theretofore. The records of the association conclusively show that more water is being pumped from the underground within the project area than is being replaced. If pumping is limited to the safe yield of the underground supply, the average amount of water available for each acre of the land within the project will in the future not exceed 3 acre-feet per annum.

All of the water capable of being developed, both from the streams and the underground, for the Salt River project, except for some insignificant amounts on the Verde River, has already been developed. Any additional supply therefore has to come from the Colorado River. Three acre-feet per acre per annum is an insufficient amount of water for full production. In the Salt River Valley most crops require more than that amount.

AVAILABILITY OF WATER SUPPLY

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 last 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.

AMOUNT OF WATER NECESSARY TO GIVE LANDS OF THE ASSOCIATION ADEQUATE SUPPLY

The per-acre use of water in the Salt River Valley project has increased over the past 25 years. This has been due in part to a change in the type of crops grown and in part on account of more intensive cultivation. In the early days of the project about the only type of crops grown was grain and alfalfa. It is only in recent years that vegetables have been grown. It is now the principal crop. Acreage in citrus has greatly increased. Double-crop raising is now the common practice. The land is too valuable to permit the same to lie idle. All of this means an increased use and need for water. The amount of water necessary to give the lands of the association a fairly adequate supply is approximately 4 acre-feet per acre per year delivered at the land. This is equal to one-third more than the present available supply. Four acre-feet per acre per year is what I figure to be the average amount necessary. Some crops use less. The majority of the crops use that much or more.

MEASUREMENT OF WATER

The association for years and at the present time measures the water at the source and at the delivery points. It is measured at Granite Reef Dam at the head of the Canal system and at the pumps where it

passes into the canal and lateral system. The total of those two measurements is the gross supply. It is also measured where it is turned into the private ditches of the landowners.

THE AMOUNT DELIVERED INTO THE PRIVATE DITCHES OF THE LANDOWNERS

The amount delivered to the landowners is approximately two-thirds of the gross supply. The rest is consumed in evaporation, canal and lateral losses, and to some extent in overdeliveries. To supply the association with 242,000 acre-feet of additional water at the land would require approximately 363,000 acre-feet at Granite Reef Dam or approximately 400,000 acre-feet where the same is diverted from the Colorado River, if additional water is obtained from that source.

SALT BALANCE

All western streams contain a large amount of harmful salt. The amount of salt in the Salt and Verde Rivers depends upon the stage of the river. In times of flood the parts per million are low. In times of low water the parts per million are high. The average parts per million of salt in the Salt and Verde Rivers is in the neighborhood of 500. The parts per million of salt in the Colorado River is in the neighborhood of 800. With upstream development the percentage will increase. In the not-far-distant future it can be expected to increase.

Irrigation, evaporation, and plant growth absorb very little of the harmful salt, and the remaining water that flows into the underground contains a very much higher proportion of salt. Unless a sufficient quantity is allowed to drain from the project by what is generally referred to as return flow, the underground water will in time become unfit for beneficial use for irrigation purposes. Some small parts of the Salt River project already have that character of underground water. Overdevelopment of the underground water to the extent that there is no longer a return flow will cause such waters to become in time unfit for beneficial use. Extensive pumping in the Salt River Valley has in some places caused the underground water to reverse its flow and there are now in some sections no return flow waters draining into either the Salt or Gila Rivers.

Senator MILLIKIN. I do not quite understand your figure of reverse flow. Give me a picture of that.

Mr. CORBELL. For instance, on the east of our project there is some project pumping and on the west, and some projects in the center. Actually the water that comes from the river is draining back to the basin. The water is lower than the river. The heavy pumping on the east has caused it to reverse back.

Senator MILLIKIN. All right.

Mr. CORBELL. In order to maintain the salt balance in the underground water it is necessary that additional quantities of water be allowed to go into the underground supply so that the return-flow water will carry from the project substantially the same amount of salt each year as that entering the project. This can only be accomplished in one or two manners: first, to greatly curtail pumping and allow the underground water to rise, second, to bring additional quantities of gravity water into the area. To greatly curtail pumping means the abandonment of large tracts of land, which leaves the second

alternative—namely, bringing additional water into the area—as the only practical solution.

CHARACTER AND VALUE OF THE CROPS AND INDUSTRIES IN THE SALT RIVER PROJECT

The gross value of crops grown in the Salt River project for the year 1946 was \$41,043,385, or \$179.62 per acre. In some ways it can be considered as more than that, for the crop report does not take into consideration the profit made by dairymen or in the feeding of livestock—only the value of the feed is considered. Not enough wheat is grown to supply the local demand. Barley and alfalfa are grown for feed only. Insufficient butter and eggs are produced to supply the local markets. Attached to this statement is the crop report of the Salt River project for the year 1946, which shows in detail the various crops grown on the project.

Senator MILLIKIN. Is that a good wheat country?

Mr. CORBELL. We grow a soft wheat which is not very good for the bread bakers to use.

It grows a very good amount of wheat, however.

Not all of the crops grown are listed on the crop report, as many are classified in groups. There is a direct relation between the value of the crops grown and the amount of water available. Land of itself has little or no value in the State of Arizona in the Central Valley. It is only the application of water that brings about a value to the land, and the amount that you can grow is not dependent upon the number of acres but upon the number of acre-feet of water that you have available.

Senator MILLIKIN. Will you give us your estimate of the selling price of land which does not have water on it in Arizona?

Mr. CORBELL. Some of this land is located in areas where they have been pumping from underground and sells from \$5 to \$40 unimproved. Other areas where there is nothing, where there is known not to be water underneath, you pay about \$1 an acre.

Senator MILLIKIN. Do you raise any crops at all on land which does not have irrigation water?

Mr. CORBELL. No, sir. The only crops raised are probably when we have a tremendous amount of rain in the fall and spring and they bring cattle to graze.

Senator MILLIKIN. I was thinking of dry land area of my own State. We have had phenomenal results during the war and since the war through unexpected rainfall. In normal times there is practically nothing. It is an unexpected proposition. A man will put in wheat, for example, but it is extremely doubtful if he will get a crop.

I am talking about dry land where there is no irrigation at all.

Do you have anything like that in Arizona?

Mr. CORBELL. No, sir. I have been in your State, Senator, and I know.

Senator MILLIKIN. Why would people buy that land?

Mr. CORBELL. That is the only reason.

Senator McFARLAND. I might explain that the land Mr. Akin was talking about yesterday was in the northern part of the State. Mr.

Corbell is talking about the southern part of the State. Up around Prescott it is a mile high, and near Flagstaff it is 7,000 feet high.

Senator MILLIKIN. So in the southern part of the State, roughly speaking, if there is not water or precipitation of water, the land has no purchase value. Is that correct?

Senator McFARLAND. All this is in the region where you could not dry farm at all.

Senator DOWNEY. May I ask a question there?

Senator MILLIKIN. Yes.

Senator DOWNEY. Referring to this land which is totally arid and only worth a dollar an acre or some nominal sum, is that absolutely arid, or does it carry the usual desert growth of mesquite and cactus?

Mr. CORBELL. Yes; it carries mesquite and cactus.

Senator MILLIKIN. Go ahead, Mr. Corbell.

CENTRAL ARIZONA PROJECT

The Salt River Valley project lies in the approximate center of the great Central Valley in Arizona. In the Central Valley there is something over 700,000 acres of land in cultivation. Roughly, one-third of it comprises the Salt River project. The balance includes such projects as the Roosevelt Irrigation District, Roosevelt Water-Conservation District, Maricopa County Municipal Water District No. 1, Buckeye Irrigation District, Arlington Irrigation District, Gillespie Land and Irrigation District, San Carlos project, the Safford Valley, and a large amount of land that is served with pump water extending from the neighborhood of Eloy, Ariz., in a northwesterly direction through the Casa Grande Valley and the Salt River Valley to a point some 25 miles northwest of Phoenix. Roughly, that is the land embraced in the proposed central Arizona project.

All of the land in question is practically without exception extremely fertile and has for the past several years been producing bountiful crops.

Senator MILLIKIN. Would you mind bounding the Central Valley for us?

(The witness identified the boundaries of the valley on the map.)

Senator MILLIKIN. All right, go ahead.

Mr. CORBELL. Cities, towns, schools, roads, and other things that go with agricultural economy have been built within the area based upon the production of the land in question. It is safe to say that the population in the area involved is in the neighborhood of 400,000 people. The amount of water being pumped in the area to serve these lands, independent of the gravity supply, probably exceeds 2,000,000 acre-feet per annum. The recharge of these underground waters probably does not exceed 750,000 acre-feet per annum. The result has been a progressive lowering of the underground water plane. Sooner or later a considerable part of the land must go out of cultivation unless a supplemental supply of water is obtained to replenish the underground supply and at the same time furnish a supplemental supply to those lands receiving gravity water.

In general, all the agricultural land throughout central Arizona is highly productive wherever water is available, and there is no reason why with an adequate supply of water all of the land in the entire

area would not be able to produce crops having an acre value as great as that of the Salt River project. The crops that are grown on the land are only a small part of the productive wealth of the area.

Government records from the Department of Agriculture disclose that during the past year more than 50,000 cars of fruits and vegetables were shipped from Arizona, by far the greater part of which came from the Salt River Valley and the adjacent area embraced within the Central Valley project. The amount of freight paid to the railroads for shipping those fruits and vegetables was approximately \$20,000,000.

The picking and packing costs involved an expenditure of nearly as much. The amount of money spent in growing the crops would be a like amount. Thousands of carloads of lumber are necessary to make crates in which the fruits and vegetables are shipped. Thousands upon thousands of tons of ice are manufactured to cool the cars in transit. You have an expenditure in a single year, in the fruit and vegetable industry in Arizona, in the growing, harvesting, packing, and shipping of same, an amount that is 50 percent in excess of the total cost of the works of the Salt River project. I have only pointed out one of the industries, but you will find the same thing going on in other agricultural lines, though probably on a lesser scale.

You cannot always look at an irrigation project on the basis of whether the land values will be equal to or greater than the costs of the work of the project after it is built. The wealth incident to such a project is many times the value of the land within the project.

The millions of dollars worth of products which are shipped from central Arizona each year are practically all noncompetitive with crops grown in other parts of the United States. The money received from those crops is largely spent in the Middle West and the East. I had occasion the other day to examine the personal property in our home and on our farm. All of the machinery and fencing were produced and manufactured in the East and Middle West. All of the furniture had been manufactured in the States east of the Mississippi River. All the clothing, bedding, linens, and the like had on them the stamp of an eastern manufacturer. The automobiles came from Detroit. Even the food had an eastern and middle-eastern origin. The hams came from Chicago, the flour from Minneapolis. About the only things in the cupboard and refrigerator that I could find that were grown or raised in the State of Arizona were the fruit, meats, and vegetables.

Unless a supplemental water supply is found for the area, a large part of the land must go out of cultivation. Whenever that happens, the allied industries of necessity will have to wither and die. People in such communities try to hang on. They are unable to pay their taxes or to support the community; in fact, the community has to support them. It means the raising of taxes, the closing of schools, empty stores and houses, and everything else that goes with a decadent condition. The only things that increase under such conditions are poverty and crime. If that happens which must happen, namely, to permit a large part of the cultivated area to revert to desert in central Arizona, the loss to the United States Government each year in taxes would, in my opinion, be more than sufficient to service the debt on the cost of the central Arizona project.

This country of ours is growing. We have to find places for the people to live. The average holding in our project is relatively small; the number of ownerships in our project has increased from approximately 4,000 at the time of its organization in 1902 to over 16,000 at the present time, with no increase in the number of acres. The gross value of the returns from the land has increased even more than that in that period, and I look for further increases in the future, and it is my honest and sincere belief that this project should be authorized.

If anyone had told me as a young man that today approximately 50 million would be invested in works of the Salt River project, I would not have believed it. The original Government estimate of expenditures was only $3\frac{1}{2}$ million. Many farmers at that time thought it was more than the land could afford to pay, and I do not mean by that that the cost of the project exceeded the estimates by over 40 million. Works were later built that were never thought of. Only one storage dam was contemplated at the beginning, and now there are six. Hydro-electric power was only advocated by what were then called the dreamers.

The cost of the central Arizona project is too great for any one man or group of men to undertake privately. That was true of the Salt River project when they commenced building it over 40 years ago. But if you will take the long-range picture for the years that the Salt River project has been in existence, there are many more reasons, as of today, why the central Arizona project should be built than there were reasons in 1903 for commencing to build the Salt River project.

Senator MILLIKIN. Are you a native son of Arizona?

Mr. CORBELL. Yes, sir.

Senator MILLIKIN. Born and raised in Salt River Valley?

Mr. CORBELL. Yes; farming the land I was born on.

We hope the members of this committee will see their way clear to recommend the passage of the act to Congress, and that if any of them have any doubt in their minds as to the wisdom of the bill, that they come out to Arizona and pay the Salt River Valley a visit, and the Salt River Valley Water Users' Association will be only too glad to be their host.

Senator MILLIKIN. Any questions?

Senator DOWNEY. Mr. Chairman, I have just one question.

First I will ask permission of the chairman to compliment Mr. Corbell on a very fine and intelligent statement of the facts involved.

I would like to ask Mr. Corbell if he knows under whose supervision the pamphlet that I have here entitled "Presenting the Central Arizona Project to You," containing the picture of a very beautiful young lady and a very beautiful grapefruit on the outside, was prepared?

Senator MILLIKIN. Is the Senator from California presenting this as part of the evidence?

Senator DOWNEY. I think it will be presented, Mr. Chairman, and I think it is being circulated among Congressional Representatives on behalf of this bill, and I do not criticize that.

Mr. CORBELL. I think under the supervision of Mr. Byran Akers and a group of people around the valley who are interested.

Senator DOWNEY. Will there be any witnesses here who will be prepared to give data on that pamphlet?

Mr. CORBELL. I could not say, sir.

Senator DOWNEY. There are certain alleged data in that pamphlet I want to question the Arizona witnesses about.

Senator MILLIKIN. Has this been offered in evidence?

Senator McFARLAND. No, sir.

Senator MILLIKIN. Will it be offered?

Senator McFARLAND. No, sir.

Senator MILLIKIN. We will not run any inquisition on it then.

Senator DOWNEY. It is such a beautiful pamphlet I am offering it on my own behalf.

Senator MILLIKIN. Do you mean to imply Senator, this could teach the California people how to get out a pamphlet?

Senator DOWNEY. We have never gotten out a brochure of that kind. It is a very handsome job, and they had very good material in the central Arizona valley to base it upon.

Senator MILLIKIN. Do you think the Chair has now been contaminated by this to the point where we ought to hold a hearing on it?

Senator DOWNEY. Mr. Chairman, I know of nothing that can contaminate the chairman, even the association with Democrats.

Senator MILLIKIN. The word "contaminated" is certainly the wrong word. But there certainly is beguilement from what appears on the front page.

Senator DOWNEY. You are speaking of the grapefruit?

Senator MILLIKIN. That smile is certainly to be considered also. All right.

Senator McFARLAND. Mr. Chairman, may the tabulations be placed in the record that are contained in Mr. Corbell's statement?

Senator MILLIKIN. Yes, sir.

(The tabulations referred to are as follows:)

Crop report, Salt River project, year 1946

Item No.	Kind and crop	Acreage	Unit of yield	Total yield	Yield per acre	Value per unit	Total value	Value per acre
Cereals:								
1	Barley.....	32,159	Hundredweight.....	836,134	26	\$2.81	\$2,349,537	\$73.06
2	Oats.....	2,646	do.....	55,566	21	2.85	158,393	59.85
3	Wheat.....	8,210	do.....	180,620	22	3.40	614,108	74.80
4	Grain sorghum.....	29,582	do.....	798,714	27	2.65	2,116,592	71.55
	Subtotal.....	72,597					5,238,600	72.16
Seed:								
5	Alfalfa.....	4,116	Pound.....	823,200	200	.36	296,352	72.00
6	Guar.....	186	Pound.....	186,000	1,000	.085	15,810	85.00
7	Sugar beets.....	2,498	do.....	6,994,400	2,800	.14	979,216	392.00
8	Flax.....	293	do.....	351,600	1,200	.065	22,854	78.00
	Subtotal.....	7,083					1,314,232	185.28
Hay and forage:								
10	Alfalfa.....	60,015	Ton.....	270,068	4.5	26.00	7,021,708	117.00
11	Alfalfa-grain.....	30,713	do.....	76,783	2.5	22.00	1,689,226	55.00
12	Alfalfa (after grain).....	30,713	do.....	92,139	3	26.00	2,395,614	78.00
Pasture:								
13	Grain, alfalfa, etc.....	133,743	Acre.....			14.00	1,872,402	14.00
14	Bermuda, sudan.....	35,384	do.....			19.00	672,296	19.00
15	Corn fodder, ensilage.....	786	Ton.....	14,148	18	18.00	254,664	324.00
	Subtotal.....	291,354					13,905,970	47.73
Vegetables and truck:								
16	Cantaloupes.....	10,251	Crate.....	1,383,885	135	11.80	2,490,993	243.00
17	Gardens.....	2,768	Acre.....			500.00	1,384,000	500.00
Lettuces:								
18	Fall.....	13,712	Crate.....	1,782,560	130	11.75	3,119,480	297.50
19	Spring.....	18,317	do.....	2,282,625	125	11.45	3,548,919	196.75
20	Onions dry.....	566	Bushel.....	202,400	400	1.25	253,000	500.00
Potatoes:								
21	White.....	166	do.....	46,480	280	2.75	197,820	770.00
22	Sweet.....	653	do.....	118,846	182	3.30	392,192	600.60
23	Truck, miscellaneous ¹	6,074	Pound.....	105,641,620	17,392	.0269	2,847,596	468.82
	Subtotal.....	52,447					14,164,000	270.06

See footnotes at end of table.

Crop report, Salt River project, year 1946—Continued

Item No.	Kind and crop	Acreage	Unit of yield	Total yield	Yield per acre	Value per unit	Total value	Value per acre
Fruits and nuts:								
24	Citrus	11, 370	Pound	197, 255, 146	17, 335	\$0. 01983	\$3, 912, 145	\$343. 80
25	Peaches	24	do	60, 000	2, 500	. 12	7, 200	300. 00
26	Pears	27	do	189, 000	7, 000	. 06	17, 010	630. 00
27	Fruit, small ¹	1, 013	do	6, 654, 500	6, 569	. 1786	1, 155, 220	1, 140. 39
28	Pecans	279	do	1, 395, 000	5, 000	. 35	488, 250	1, 750. 00
	Subtotal	12, 722					5, 679, 825	438. 60
Miscellaneous:								
29	Broomcorn	47	Pound	32, 900	700	. 15	4, 935	105. 00
30	Cotton:							
31	Lint:							
32	Short	3, 080	Bale	2, 935, 50	0. 95	187. 50	550, 406	178. 13
33	Long	182	do	72, 80	0. 40	235. 00	17, 108	94. 00
34	Seed	3, 272	Ton	1, 243, 36	0. 38	67. 00	83, 305	25. 46
	Flowers	60	Acre	(²)	(²)	(²)	42, 000	700. 00
	Guayule	80	do				(³)	(³)
	Subtotal	6, 731					697, 754	103. 66
Soil building:								
35	Soil-building crops	200						
36	Fallow land	13, 122						
	Subtotal	13, 322						
	Total value						40, 900, 381	
	Additional revenue						143, 004	
	Total and average gross value per acre						41, 043, 385	179. 92

¹ Exclusive of pecking cost.² Harvested 1943.³ See following table.

No figures available on guayule.

Total acreage reported.....	\$456, 266
Less duplicate areas.....	227, 766
Net area in cultivation.....	228, 500
Less fallowed, not irrigated.....	13, 122
Total area irrigated.....	215, 378
Buildings, yards, highways, rights-of-way, etc.....	14, 625
Fallowed or idle.....	13, 122
Grand total irrigable of project.....	243, 125

Summary of additional revenue received

Purpose—conservation, year 1945:

Federal.....	\$143, 004
Value.....	143, 004

The item "Duplicate areas" appearing in the tabulation above is made up of the following:

Cottonseed.....	3, 272
Alfalfa:	
Grain pasture.....	133, 743
Grain.....	30, 713
Seed.....	4, 116
Corn-ensilage.....	786
Cotton, short.....	3, 090
Cover crop.....	200
Sweetpotatoes.....	233
Cantaloupes.....	10, 128
Barley.....	8, 755
Wheat.....	3, 150
Grain sorghum.....	29, 582
Total.....	227, 766

Itemized list of truck, miscellaneous

Kind	Area	Total yield	Yield per acre	Value per unit	Total value	Value per acre
	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>			
Asparagus.....	48	158, 400	3, 300	\$0. 17	\$26, 928	\$561. 00
Broccoli.....	273	682, 500	2, 500	. 075	51, 188	187. 50
Carrots.....	2, 651	46, 127, 400	17, 400	. 033	1, 522, 204	574. 20
Cabbage.....	597	14, 925, 000	25, 000	. 02	298, 500	500. 00
Cauliflower.....	498	5, 896, 320	11, 840	. 05	294, 816	592. 00
Celery.....	287	10, 332, 000	36, 000	. 03	309, 960	1, 080. 00
Watermelons.....	1, 720	27, 520, 000	16, 000	. 0125	344, 000	200. 00
Total.....	6, 074	105, 641, 620	17, 392	. 0269	2, 847, 596	468. 82

SMALL FRUITS

Apricots.....	210	1, 785, 000	8, 500	\$0. 10	\$178, 500	\$850. 00
Dates.....	267	667, 500	2, 500	. 20	133, 500	500. 00
Olives.....	77	231, 000	3, 000	. 07	16, 170	210. 00
Plums.....	80	500, 000	7, 000	. 11	61, 600	770. 00
Strawberries.....	205	1, 845, 000	9, 000	. 33	608, 850	2, 970. 00
Vineyard.....	174	1, 566, 000	9, 000	. 10	156, 600	900. 00
Total.....	1, 013	6, 654, 500	6, 569	. 1736	1, 156, 220	1, 140. 39

Stock report, Salt River project, year 1946

Item	Inventory, Jan. 1			Inventory, Dec. 31			Increased (+) or de- creased (-) total value
	Number	Value	Total value	Number	Value	Total value	
Horses and mules	3, 778	\$82. 00	\$309, 796	4, 079	\$82. 00	\$334, 478	+\$24, 682
Cattle:							
Beef.....	29, 370	113. 00	3, 318, 810	18, 341	143. 00	2, 622, 763	-696, 047
Dairy.....	26, 438	125. 00	3, 304, 750	26, 053	155. 00	4, 038, 215	+733, 465
Sheep, range feeders.....	12, 750	8. 40	107, 100	11, 422	9. 80	111, 936	+4, 836
Hogs.....	8, 626	21. 00	181, 146	5, 446	34. 00	185, 164	+4, 018
Turkeys.....	11, 204	6. 30	70, 585	10, 064	7. 00	70, 448	-137
Fowls.....	190, 636	1. 20	228, 763	185, 265	1. 25	231, 581	+2, 818
Other livestock or fowl.....			275, 252			285, 252	+10, 000
Bees, hives.....	5, 776	6. 00	34, 656	5, 166	9. 00	46, 494	+11, 838
Total.....			7, 830, 858			7, 926, 331	+95, 473
Motor vehicles.....			5, 584, 212			5, 984, 000	+399, 788
Farm equipment.....			780, 492			930, 900	+150, 408
Grand total.....			14, 195, 562			14, 841, 231	+645, 669

¹ Reduction in sheep due to early moving to range pasture.

Senator McFARLAND. I believe I will call Mr. Stapley next.

Senator MILLIKIN. I should say also, if it has not been announced, we will have a meeting Saturday morning at 10 o'clock unless there is something to the contrary.

Senator McFarland, when do you expect to finish with Arizona witnesses?

Senator McFARLAND. I hope we will get through this week. We are pushing them as fast as we can.

Senator MILLIKIN. Is there any question about getting through this week?

Senator McFARLAND. We want to get through with our main witnesses. We may want a little time for rebuttal. Maybe we can get through before that time.

I can tell the chairman a little more tomorrow afternoon when we find out how we get along.

Senator MILLIKIN. All right.

**STATEMENT OF D. L. STAPLEY, VICE PRESIDENT AND GENERAL
MANAGER, O. S. STAPLEY CO., PHOENIX, ARIZ.**

Senator MILLIKIN. Please be seated and state your name, business, and residence.

Mr. STAPLEY. Mr. Chairman and members of the committee: My name is D. L. Stapley. I am vice president and general manager of the O. S. Stapley Co., Phoenix, Ariz., dealers in hardware, steel products, farm implements, industrial equipment and supplies, and motor trucks. I hold the same positions with its wholesale subsidiary, the Arizona Hardware Co., which serves the entire State of Arizona. I am also an executive committee member of the Central Arizona Project Association and a citrus grower.

I am here in the interest of securing supplemental water from the Colorado River for Arizona cultivated farm lands. At the outset, may I inform you that I am a native of Arizona and it has been my privilege to witness the development of our agricultural economy from raw lands wrested from the desert when brush dams in the

river were used to divert water for irrigation purposes to the then existing cultivated areas.

My father and mother as children settled with their parents in the Salt River Valley at Mesa, Ariz., in the years 1882 and 1884, respectively. Frontier life with them was one of disappointments, hardships, and privations. Discouragements were on every hand. They worked hard to establish homes and make a bare living while developing the soil and finding markets for such produce as they could raise. My father, O. S. Stapley, was an untiring leader in all worth while developments and activities of our valley and State. He founded the business that bears his name and it stands as a monument to his industry and integrity. He saw farms develop from arid desert lands, and the rich soil brought into cultivation grow abundant crops through use of irrigation water. He worked with the farmers; knew and called them by their first names, extended them credit to get started and carried them when times were hard and difficult. He was in the foremost ranks when water storage dams were contemplated and built, also when roads had to be constructed and canals extended. He, with all other early settlers gave unselfishly of time and money to develop the vast resources about them. His business grew with the community. The business is carried on today by his six sons and three daughters as a united family corporation. Arizona is our home and the home of our children. It is an excellent place to live, but the future of our valleys is the future of farms, and the future of farms is an adequate supply of water. The life work of our parents and other pioneer settlers and the work and livelihood of present and future generations of these early pioneer families depend upon irrigation water stability for our farm lands.

A great and progressive commonwealth has been built upon the vision and hard work of these early pioneers. The record is one of far-sighted planning and outstanding development. The State's growth is primarily due to agriculture, which is basic to a successful economy. With ample water, the State has a great future and will continue to move forward rapidly. However, we do not have sufficient water, and unless immediate steps are taken to insure use of supplemental water from the Colorado River our picture for the future is dark, indeed.

Central Arizona has now harnessed practically every available internal water source. Supplemental water to firm up our present supply and stabilize our State's economy by utilizing the fullest production of our vast cultivated acreage can only come from the Colorado River.

Without additional water, Government money now invested in reclamation and irrigation projects will be undermined, as will other Federal loaning and insuring agencies, also Government investments based upon irrigation security.

Government moneys have helped build our economy, which in turn has produced millions in Government revenues. Unless these Government investments and sources of tax revenues are protected by making available supplemental water, the Government stands to lose heavily; so also will the people of our State suffer losses in income, value of property holdings, and commitments made. An idea of the extent

will be furnished by other testimony of a statistical nature to this committee.

Our own business, founded in 1895, that now consists of seven retail hardware and farm implement stores and a wholesale hardware division, located in the heart of central Arizona agricultural lands, has paralleled the development of its reclamation and irrigation projects. We increased the number of stores as additional water was made available by new dams, and use of underground water by pumping.

Having lived all my life in the central Arizona area which is now faced with this serious water condition, I see evidences of business decline and general undermining of the State's economy. Water reserves fast being depleted and farmers facing prospects of a 50-percent reduction of normal irrigation water requirements for 1947 presents two alternatives; either 50 percent of our farming lands laying idle or, if attempt is made to cultivate 100 percent of the land, harvests will be greatly reduced, inasmuch as 4 acre-feet of water for each acre of growing crops is the annual minimum irrigation safety factor.

At this time Coolidge Dam located on the Gila River with 100,000 acres in the San Carlos irrigation project depending upon it for irrigation water, is dry and the only water available for this vast acreage are waters taken from an already reduced underground supply.

Half of these 100,000 acres served by the Coolidge Dam storage waters are Indian lands and the balance white. There are approximately 150,000 additional cultivated acres in the Coolidge, Eloy, Casa Grande districts irrigated by pumping.

The water level in the wells from which this irrigation water is pumped is considerably lower than in former years and with the underground supply having to carry the load of the entire cultivated acreage, means further depletion of these reserves, bringing a critical water problem for the farmers of this area.

Because of this condition, my company has held up a planned building program to improve service to farmers at both Casa Grande and Coolidge.

Senator MILLIKIN. Do the Indians farm diversified crops?

Mr. STAPLEY. Fairly so but not as much as crops such as alfalfa and so forth.

Senator McFARLAND. We are going to have some of them testify.

Senator MILLIKIN. All right, go ahead.

Mr. STAPLEY. Declining farm prices and shortage of water does not justify further investments until water, the life blood of southwestern agriculture, is made available. The land of this valley is rich and productive with water, but without water it is valueless.

Without water behind the storage dams of the Salt, Gila, and Verde Rivers to generate hydroelectric power, sufficient electric power for pumping water will not be available and, where formerly electricity was used, gasoline or Diesel-powered motors must somehow be acquired at a considerable extra cost to the farmer whose prospects for profitable crops are unfavorable—to produce his irrigation-water needs.

Pumped irrigation water costs are high and with the lowering of wells, will be higher. This factor, along with declining farm prices,

will soon place farmers in an unprofitable position, and producing agricultural lands, unless supplemental water at reasonable prices can be obtained, will return to a desert status.

Senator MILLIKIN. What is the pumping cost of an acre-foot of water?

Mr. STAPLEY. I could not answer that, but we have men here that can.

Senator MILLIKIN. Is anyone here who can answer that question?

Senator McFARLAND. We will have a witness. I can guess at it, but I would rather not.

Senator MILLIKIN. All right, go ahead.

Mr. STAPLEY. Agriculture in central Arizona has been developed on a broad and diversified scale and if deprived of an adequate water supply, will seriously affect the economy of the State in that the agricultural districts will be unable to bear their proportionate share of the taxes necessary for the State's operating expenses and will thus throw upon other industries such a heavy burden of taxation that they will be handicapped in meeting competition in the production and sale of their products. The scope is broader than just our own State, the economy of all sections of the United States with whom our farmers, cattlemen and business concerns trade are also affected.

It further lessens Government tax revenues, not only from Arizona citizens, but also from those who buy and sell our produce and products.

Similarly it affects the profits and taxes of the many manufacturers and producers who now ship large quantities of machinery, equipment, farm implements, supplies, foodstuffs, and the thousand and one miscellaneous items necessary to sustain the commonwealth of our State.

These companies are located in the East, the South, the Midwest, and the Pacific coast area—our problem is the Nation's problem because our economy is wrapped up with the entire country and if anything happens to it, the country at large suffers.

Our company perhaps is a fair example of how extensively Arizona business concerns must look for merchandise, materials, and supplies. The combined operations of both our companies beginning with our fiscal year October 1, 1945, through March 31, 1947, disclose purchases in round figures of \$815,000 from the Eastern States. The industries in Connecticut contributing \$348,000; New York State, \$240,000; Pennsylvania, \$70,000; Massachusetts, \$56,000.

The Midwestern States supplied us with \$3,248,000 in merchandise. Industries in Illinois, except the International Harvester Co., as noted below, furnished in round figures \$500,000; Wisconsin, \$297,000; Ohio, \$221,000; Indiana, \$155,000; Missouri, \$177,000; Michigan, \$84,000; and Minnesota, \$31,000.

The Western States supplied us with \$2,265,000 in merchandise. California furnishing \$1,675,000; Arizona, \$512,000; Colorado, \$55,000; and Washington, \$14,000.

The difference between amounts furnished above for given grouping of States and the total amounts of the States listed are represented in purchases from other States than those named.

A few of the nationally known companies from whom we buy and the approximate value from each during this period are:

International Harvester Co. (approximately \$200,000 of this supplied from Pacific coast operations and the balance from the Midwest)---	\$1, 721, 000
Columbia Steel Co. (subsidiary of United States Steel Co.)-----	328, 000
Sherwin Williams Co., Cleveland, Ohio-----	120, 000
Peters Cartridge Co. (division of DuPont Co.), Bridgeport, Conn-----	-----
Williams Radiator Co. of Los Angeles, Calif-----	138, 000
Imperial Brass Manufacturing Co., Chicago, Ill-----	92, 000
Bucyrus-Erie Co., Milwaukee, Wis-----	78, 000
Corning Glass Works, Corning, N. Y-----	60, 000
J. D. Adams Co., Indianapolis, Ind-----	68, 000
American Fork & Hoe Co., Cleveland, Ohio-----	48, 000
The Stanley Works, New Britain, Conn-----	58, 000

In the past 5 years we have paid considerably in excess of a million dollars in taxes to both State and Federal agencies.

Our company's major volume of business, direct and indirect, is with farmers. We also sell extensively to cattle ranchers, contractors, industrial organizations, transportation concerns, all divisions of Government departments, and dealers in hardware and related items. While it may be argued we have presented the best period of our operations, it must be remembered we have been subject to restrictions in many of our lines either by directives or allocations or inability to furnish merchandise that has greatly limited potential sales. Our sales are still limited in many lines owing to lack of merchandise availability.

We employ approximately 300 people and most of these employees' total savings are invested in homes and small acreages and will be affected by the depressed conditions brought about by any water shortage. There have already been some sales of properties, the former owners moving away because of the serious water situation facing central Arizona.

Businessmen have curtailed buying of merchandise and are casting a watchful eye on the turn of events resulting from insufficient water. Extension of credit is more closely analyzed, looking to future ability of people to pay. The seriousness of our situation is apparent to every thinking individual and owner of Arizona investments or interests. We cannot overlook the interdependence of all State industries as they rest upon the basic industry—agriculture.

For example, cattle raising embraces feeding and finishing in the irrigated districts and the sheep industry bring their flocks to the valleys for winter feeding where a plentiful supply of pasture is available.

Our mining communities depend upon the valleys for produce and dairy products. Our farm produce for the most part is ahead of most other sections of the United States and is, therefore, vital, filling in at a time when most needed. However, in the central Arizona and Yuma Valley areas, we enjoy a 12-month growing season and crops of varying kinds are harvested every month of the year.

With a porous underground for movement of water our soil can be washed and kept sweet and with adequate water and proper care, can produce crops thousand of years from now, thus creating wealth year after year. This assures stability to investments, tax revenues, and the cultural and home life of our people.

Because of the pressing need of supplemental irrigation water for existing cultivated lands and to preserve our economic stability, the people of our State have united to secure the water benefits that belong to them from the Colorado River. We can be greatly aided by the passage of Senate bill 1175.

As an additional part of my testimony I am attaching hereto letters received by me from three Arizona companies which reflect the general feeling of all businessmen toward Arizona's water problem and its effect upon the State's economy.

Senator McFARLAND. May those be printed in the record, Mr. Chairman?

Senator MILLIKIN. It will be done.

(The letters referred to follow:)

ALLISON STEEL MANUFACTURING CO.,
Phoenix, Ariz., April 23, 1947.

Mr. D. L. STAPLEY,
O. S. Stapley Co., Phoenix, Ariz.

DEAR FRIEND: I understand that you are to testify before the Senate Subcommittee on Irrigation and Reclamation, and as the Allison Steel Co. is entirely Arizona owned and operated, I cannot emphasize enough the importance of the passage of Senate bill 433 to this company and to its approximately 800 employees.

We have spent many thousands of dollars in our industry, so that we may be able to meet any contingency presented by the continued growth of this area, which will be entirely lost if we do not receive supplemental water for our irrigated lands.

To emphasize the importance of this matter to us, we are setting forth our annual sales in central Arizona, directly or indirectly, dependent on the stability of agriculture in this section of the State.

Mines.....	\$700, 000
State, county, city, and Federal Government.....	525, 000
Contractors.....	1, 250, 000
Industrial.....	350, 000
Agriculture (produce procession equipment, lettuce sheds, etc.).....	700, 000

We have an annual pay roll of approximately \$1,500,000, with most of our employees being small landowners, making us even more vitally concerned.

To those in other States who do not realize the far-reaching seriousness of our impending plight, we present our larger annual purchases of raw material and manufactured goods in other sections of the country.

California.....	\$500, 000	Chicago area.....	\$300, 000
Utah.....	250, 000	Detroit area.....	90, 000
Colorado.....	425, 000	Ohio.....	55, 000
Pittsburg area.....	200, 000		

We hope these few points will be of some value to you in presenting our mutual problem to Congress.

Yours very truly,

W. L. ALLISON.

MARICOPA TRACTOR CO.,
Phoenix, Ariz., April 21, 1947.

Mr. D. L. STAPLEY,
O. S. Stapley Co.,
Phoenix, Ariz.

DEAR DEL: Answering your letter of April 17 wish to advise that our farm machinery sales during the year of 1946 was \$343,251.21.

The principal manufacturers that we represent are as follows: J. I. Case Co., Racine, Wis.; Jumbo Steel Products Co., Azusa, Calif.; Goble Disk Works, Fowler, Calif.; Wetmore Pulverizer & Machinery Co., Tonkawa, Okla.; W-W Grinder Corp., Wichita, Kans.; Laird Welding Works, Merced, Calif.; B. Hayman Co., Los Angeles, Calif.; Eversman Manufacturing Co., Denver, Colo.; R. J. Piper Manufacturing Co., Princeton, Ill.

As you know we sell practically all together to farmers and when they do not have sufficient water for irrigation they do not grow crops, and do not purchase farm machinery, and it indirectly hurts every merchant and every manufacturer in this country.

The water situation right ahead of us is the most critical in our history and we would hate to think of what would happen to this valley if this Colorado River water does not come some time in the near future.

Yours very truly,

MARICOPA TRACTOR Co.,
By M. J. VALENTINE, *Manager*.

PRATT-GILBERT HARDWARE Co.,
Phoenix, Ariz., May 1, 1947.

Mr. D. L. STAPLEY,
O. S. Stapley Co., Phoenix, Ariz.

DEAR DEL: In response to your letter of April 17, we have prepared the attached statement, which reflects our purchases of steel products and related items for the years 1942 to 1946, inclusive. Also included in this statement are the names of leading manufacturers from whom the purchases were made.

It might be contended that the figures presented are for an inflated period, inasmuch as the years for which they were compiled include the war years. However, it should be borne in mind that during the entire war period, and since to a lesser degree, we were restricted in the total tonnage of steel, and most items made from steel, which we were permitted to purchase, either by directives or by allocations established by the producers.

The nature of our business is that of providing consumable and small equipment merchandise to industrial users, including the mines, smelters, lumber mills, utilities, cotton gins and oil mills, heavy construction, municipalities, shops, et cetera. Although we do a substantial volume of business in the Phoenix and Salt River Valley area, perhaps the larger volume of our business stems from areas outside of Maricopa County. Our relationship with the farming trade is more on an indirect basis because we do not sell agricultural equipment, but do service shops which are repairing and building equipment for the agricultural industry.

Inadequate water supply for irrigation has already reflected in the volume of business we are doing currently in the agricultural areas. Industry in Arizona is interrelated—what seriously affects one industry very quickly reflects in other industries. For example, cattle raising embraces feeding and finishing in the irrigated districts, and the sheep industry depends largely upon winter feeding in agricultural areas where a plentiful supply of pasture is available.

If the irrigated districts of Arizona, and I am speaking more especially of the central area where agriculture has been developed on a broad and diversified scale, is deprived of an adequate water supply, it will seriously affect the economy of the State in that the agricultural districts will be unable to bear their proportionate share of the taxes necessary for the State's operating expenses, and will thus throw upon other industries such a heavy burden of taxation that they will be handicapped in meeting competition in the production and sale of their products.

I trust that the information furnished and the ideas expressed in this communication will be of assistance to you in the preparation of your paper in support of Senate bill 433, and wish to express appreciation to you for your willingness to undertake this public service.

Yours very truly,

PRATT-GILBERT HARDWARE Co.,
ED. GOLLWITZER,
Secretary and Manager.

1942-46, inclusive

	<i>Total</i>
Pipe, valves, fittings.....	\$155,000
Screw fasteners.....	105,000
Steel items (steel, wire products, wire rope, drill steel, etc.).....	1,350,000
Tools (precision, files, hacksaw blades, threading devices, abrasives, electric, wrenches, axes).....	253,000
Transmission.....	145,000
Welding equipment and supplies.....	300,000

Manufacturers:

Air Reduction Co., New York City.
 Smith Welding Equipment Corp., Minneapolis, Minn.
 Stooddy Co., Whittier, Calif.
 Stulz-Sickles Co., Newark, N. J.
 Bethlehem Steel Co., Bethlehem, Pa.
 Jones & Laughlin Steel Corp., Pittsburgh, Pa.
 A. Leschen & Sons Wire Rope Co., St. Louis, Mo.
 Timken Roller Bearing Co., Canton, Ohio.
 Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
 Allen Manufacturing Co., Hartford, Conn.
 Rockford Screw Products Co., Rockford, Ill.
 Republic Steel Corp., Cleveland, Ohio.
 The Lunkenheimer Co., Cincinnati, Ohio.
 Tube Turns, Inc., Louisville, Ky.
 Stockham Pipe Fittings Co., Birmingham, Ala.
 Browning Manufacturing Co., Maysville, Ky.
 Chain Belt Co., Milwaukee, Wis.
 Hewitt Rubber Corp., New York City and Buffalo, N. Y.
 The Lufkin Rule Co., Saginaw, Mich.
 Blackhawk Manufacturing Co., Milwaukee, Wis.
 Parker-Kalon Corp., New York City.
 Fayette R. Plumb, Inc., Philadelphia, Pa.
 Cleveland Twist Drill Co., Cleveland, Ohio.
 Van Dorn Electric Tool Co., Towson, Md.
 Toledo Pipe Threading Machine Co., Toledo, Ohio.
 Henry G. Thompson & Sons Co., New Haven, Conn.
 Delta File Works, Philadelphia, Pa.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 The Carborundum Co., Niagara Falls, N. Y.
 Ridge Tool Co., Elyria, Ohio.

Senator MILLIKIN. Any questions?

Senator DOWNEY. No questions, Mr. Chairman.

Senator MILLIKIN: Thank you very much for coming.

Senator McFARLAND. I will next call Mr. Bimson.

**STATEMENT OF WALTER R. BIMSON, PRESIDENT, VALLEY
 NATIONAL BANK, PHOENIX, ARIZ.**

Senator MILLIKIN. Will you state your full name and your residence?

Mr. BIMSON. My name is Walter R. Bimson. I live in Phoenix, and I am here to say a word or two in regard to S. 1175.

Senator MILLIKIN. Do you have a prepared statement?

Mr. BIMSON. Yes.

Senator MILLIKIN. Go ahead.

Mr. BIMSON. In order to save time I should like to paraphrase my statement.

Senator MILLIKIN. All right.

Mr. BIMSON. I am connected with the Valley National Bank of Phoenix, of which I am president. It has 26 banking offices located in 11 of the State's 14 counties.

I am chairman of the board of directors of Greater Arizona, Inc., a nonprofit, nonpartisan organization representing all 14 counties and devoted primarily to over-all economic development of the State.

Both of these organizations are vitally interested in Senate bill No. 1175, because of its economic importance to Arizona as a whole.

Arizona is the fifth largest State of the Union in land area, but a large part of such land consists of national forest and indian reserva-

tions. More than 80 percent of the State is owned or controlled by the Federal Government.

Arizona is still sparsely populated although it has been growing at about the same rate as California since the turn of the century. Population now totals about 700,000 as compared with 500,000 in 1940 and 123,000 in 1900. About 10 percent of our population consists of Indians.

Senator MILLIKIN. What war industries did you have in Arizona?

Mr. BIMSON. We had three aviation plants operating there and Air Research which was an air development company, which was all of the war industries we had.

Senator MILLIKIN. Does your population growth reflect your war industries only?

Mr. BIMSON. That doubtless encouraged it some, but we seem to have lost very few people that came in there, and there is still evidence of people coming into the State.

Senator MILLIKIN. The war industries are not operating any longer?

Mr. BIMSON. No; no longer in their same forms. The Aluminum Co. was purchased by the Reynolds Metal Co. and the other two are not being used.

Senator MILLIKIN. Go ahead.

Mr. BIMSON. Arizona ranks second or third among all the States in rate of growth since 1940. The 200,000 new residents acquired during the past 7 years are primarily of three kinds:

1. War veterans and their families: Approximately 30,000 veterans of World War II, previously residing in other States, have moved to Arizona since the end of the war. Together with their families and the newly acquired families of Arizona's own war veterans, close to 100,000, or 50 percent of our increased population, comes under this heading. Some of these veterans are disability cases, but a vast majority are not. More than 1,000,000 servicemen received part or all of their basic training in Arizona during the war. Many of these returned, apparently attracted by our climate or way of life.

2. Elderly people ready for retirement: Arizona is more and more becoming a Mecca for people in the retirement class, who generally prefer a warm climate, plenty of sunshine, leisurely living, and so forth.

3. Health seekers: Thousands of families have moved to Arizona in recent years in search of a climate beneficial to certain ailments. Very often only one member of a family may be suffering from arthritis, sinusitis, rheumatism, asthma, or various respiratory troubles, and has been advised to try Arizona. Hundreds of doctors throughout the country are sending people to Arizona in the hope that certain chronic conditions may be cured or relieved.

This influx of population, particularly of veterans, is creating an acute employment problem in Arizona.

We cannot look forward to any appreciable amount of industrialization because of our geographical isolation, transportation costs, shortage of power, and so forth.

Such manufacturing as we have is primarily contingent upon, or derived from, our agricultural activities. Outside of copper smelting and the operation of the Phoenix aluminum plant by Reynolds Metals

Co., most of our manufacturing consists of meat packing, dehydration, canning, quick-freeze, the preparation of fertilizers and animal feeds, and similar activities connected with agricultural output or agricultural requirements. A further expansion of this type of industrialization is logical and desirable.

Our tourist business is subject to considerable development but is handicapped by a shortage of hotel and resort facilities. We have, in the entire State of Arizona, only about 15,000 guest rooms in hotels, motor courts, and guest ranches.

Our mining industry reached its peak during World War I, and its relative importance is steadily declining. Only about 5 percent of our labor force is now engaged in mining. Furthermore, the large mines are owned largely by nonresident investors, with the result that the profits therefrom do not accrue to the Arizona economy.

Thus, the primary burden of employment and basic productivity in our State rests squarely on the back of agriculture.

At least 40 percent of the people gainfully employed in Arizona are directly or indirectly dependent upon agriculture. Direct employment accounts for 25 percent and an additional 15 or 20 percent arises from supplementary activities such as packing, processing, brokerage, distribution, and transportation, or from business or service enterprises that cater to farm operators or ranchers.

Five counties—Graham, Maricopa, Pima, Pinal, and Yuma—contain the bulk of Arizona's irrigated acreage and, as a direct result thereof, now contain 80 percent of the non-Indian population. Thirty years ago, when there was little irrigation, these counties had less than half of the State's total population.

When we consider that only 1 percent of Arizona's land area has been placed under irrigation, we marvel at the fact that so little has been able to produce so much. Equivalent to only one acre per capita, this would appear to be the minimum requirement for a nonindustrial economy supporting 700,000 people.

Retail sales in Arizona last year exceeded \$500,000,000 and tax payments, both Federal and local, totaled \$120,000,000. Approximately \$75,000,000 were paid to the Federal Government in taxes. Arizonans spent more than \$200,000,000 for food alone, based on its retail cost.

Approximately one-third of our agricultural output is now consumed locally, either by our own people or by our livestock. This leaves no more than \$100,000,000 worth of agricultural products to be traded for other food items or manufactured articles, even at present prices.

Since our productive capacity is limited, both in agriculture and other lines, Arizona constantly labors under the handicap of an adverse trade balance. For many years, our imports have been approximately double our exports in dollar value. In other words, we buy twice as much from other States as we sell to them.

As our population increases, this unfavorable balance of trade seems likely to become progressively worse, unless we can increase our basic production or utilize more profitably the production which we have.

As things stand, we make no apologies for endeavoring to become more prosperous and self-sustaining.

Certainly no other areas need feel that we will ever provide serious competition for them, either in agriculture or manufacturing.

We buy more from New England than we sell to it.

We buy more from New York, Pennsylvania, Michigan, Ohio, Indiana, and Illinois than we sell to these States.

The same is true of almost every State, particularly our neighbors to the west. We buy more from California than from any other State. The business people and manufacturers of California have a real stake in Arizona. We are their nearest and potentially their greatest outside market.

Senator MILLIKIN. What makes up the balance?

Mr. BIMSON. Largely from checks that come in to retired people and people who get their dividend checks, government benefits.

Senator MILLIKIN. Tourist business?

Mr. BIMSON. Tourist business would make up the balance.

To maintain our present level of agricultural production, we must have more water. This will assure the continuation of our present principal source of wealth. Based upon a stable supply of water, we shall then have a sound foundation for the expansion of those industries which depend upon agriculture for their raw materials. We may also, under these more favorable conditions attract capital for the expansion of our tourist facilities.

With an assured high level of agricultural production, with an expansion of agricultural processing industries and with enlarged tourist facilities, we may then raise the standard of living of our own people and contribute more generously to the support of the Nation.

Our agricultural lands are in the main provided with water through the instrumentality of either reclamation projects or irrigation districts. Most of the projects and districts have been financed by loans from the Government. These projects and the Government loans upon them will be further protected by the passage of Senate bill No. 1175.

In asking for the passage of this bill we are doing so as businessmen presenting a sound business proposal. An investment in Arizona is a sound investment. With our record of high productivity, we do not believe that any like investment anywhere can produce an equally large economic return to the Nation.

Senator MILLIKIN. What is the general nature of the bank loans in Arizona?

Mr. BIMSON. Well, I do not have a break-down from the other banks, but in our own case I can give you that.

We have \$87,000,000 loaned. About \$50,000,000 of that is directly to agriculture or the livestock industry.

I should guess another \$10,000,000, maybe more than that would be loaned to business and industry based upon agriculture, for instance, processing plants and so forth.

About \$16,000,000 of our loans are on homes.

About \$16,000,000 make up our installment loan business of all types of consumer credit.

Senator MILLIKIN. Is that in addition to the other \$16,000,000?

Mr. BIMSON. Yes, and the remainder would be what a banker would call strictly commercial industrial loans.

Senator MILLIKIN. Any questions?

Senator DOWNEY. No questions.

Senator McFARLAND. No questions. Oh, I would like to ask Mr. Bimson one question in regard to the statement of Mr. Leggett.

Will you explain what it is?

Mr. Bimson. I think this is a compilation of certain statistical figures which include some of the answers to questions which have been asked here from time to time, including tax payments, break-downs of tax payments, industry, population figures, total income, retail sales, a detail of Arizona's agriculture, a break-down of all types of agriculture by acreage and by amount, and also a break-down by counties.

Mr. Leggett is a statistician and economist, and he prepared this at the request of our group, so we might have it.

Senator MILLIKIN. Will you put it in the transcript, Mr. Reporter?

(The statement submitted by Mr. Herbert A. Leggett, vice president, Valley National Bank, Phoenix, Ariz., follows:)

STATEMENT OF HERBERT A. LEGGETT, VICE PRESIDENT, VALLEY NATIONAL BANK, PHOENIX, ARIZ.

My name is Herbert A. Leggett. I am a vice president of the Valley National Bank in Phoenix and State vice chairman of the Committee for Economic Development in Arizona.

My purpose in appearing here is to present a few charts and statistical tables which will serve as a general background for the specialized discussions to follow.

These exhibits are attached hereto and cover the following subjects:

1. Arizona's population growth by counties.
2. How irrigation affects population trends.
3. Income of individuals by years since 1929.
4. State income related to agricultural income.
5. Arizona retail sales by counties.
6. Federal, State, and local taxes collected in Arizona.
7. Agricultural income by years since 1911.
8. Six-year comparison of various crop values.
9. (a) Agricultural income by counties; (b) long-term chart of agricultural and mining output.
10. Operating results for years 1940 and 1945.
11. Arizona's private investment in agriculture.

State of Arizona, population growth

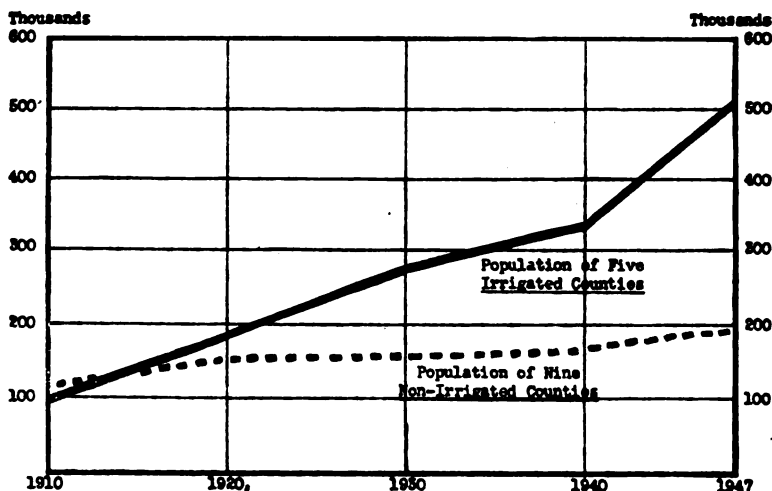
	1900	1910	1920	1930	1940	1947 ¹
The State.....	122,931	204,354	334,162	435,573	499,261	700,000
The counties:						
Apache.....	8,297	9,196	13,196	17,765	24,095	27,000
Cochise.....	9,251	34,591	46,465	40,998	34,627	38,000
Coconino.....	5,514	8,130	9,982	14,064	18,770	24,000
Gila.....	4,973	16,348	25,678	31,016	23,867	27,000
Graham.....	14,162	23,999	10,148	10,373	12,113	13,000
Greenlee.....			15,362	9,886	8,698	13,000
Maricopa.....	20,457	34,488	89,576	150,970	186,193	300,000
Mohave.....	3,426	3,773	5,259	5,572	8,591	15,000
Navajo.....	8,829	11,471	16,077	21,202	25,309	30,000
Pima.....	14,689	22,818	34,680	55,676	72,838	115,000
Pinal.....	7,779	9,045	16,130	22,031	28,841	32,000
Santa Cruz.....	4,545	6,766	12,689	9,684	9,482	10,000
Yavapai.....	13,799	15,996	24,016	28,470	26,511	26,000
Yuma.....	4,145	7,733	14,904	17,816	19,326	30,000
Leading cities:						
Phoenix.....	5,544	11,134	29,053	48,118	65,414	92,000
Tucson.....	7,531	13,193	20,292	32,506	36,818	57,000

¹ Estimated.

Population trends within Arizona—Population table showing difference in growth rate between irrigated and nonirrigated areas

	5 counties in irrigated area ¹	9 counties in nonirrigated area
1910	90,432	113,922
1920	180,968	153,194
1930	277,509	188,014
1940	331,065	168,196
1947	504,000	190,000

¹ Counties containing the bulk of Arizona's irrigated land are Graham, Maricopa, Pima, Pinal, and Yuma. The 9 remaining counties have little or no irrigated acreage although they do contain most of the grazing lands.



Income of individuals in Arizona, comprising all receipts and earnings of individuals as follows: (1) Salaries, wages, commissions, fees, bonuses, etc.; (2) net earnings of unincorporated businesses (including farmers); (3) property income (dividends, interest, rents, etc.); (4) pensions, relief payments, compensation insurance, etc.

Year	Total Arizona Income	Per capita	Year	Total Arizona Income	Per capita
1929	\$245,000,000	\$573	1938	\$213,000,000	\$436
1930	208,000,000	475	1939	227,000,000	461
1931	170,000,000	382	1940	237,000,000	473
1932	122,000,000	271	1941	287,000,000	562
1933	120,000,000	263	1942	433,000,000	787
1934	149,000,000	322	1943	588,000,000	865
1935	167,000,000	355	1944	566,000,000	890
1936	202,000,000	425	1945	581,000,000	918
1937	232,000,000	482			

Break-down of income for selected years

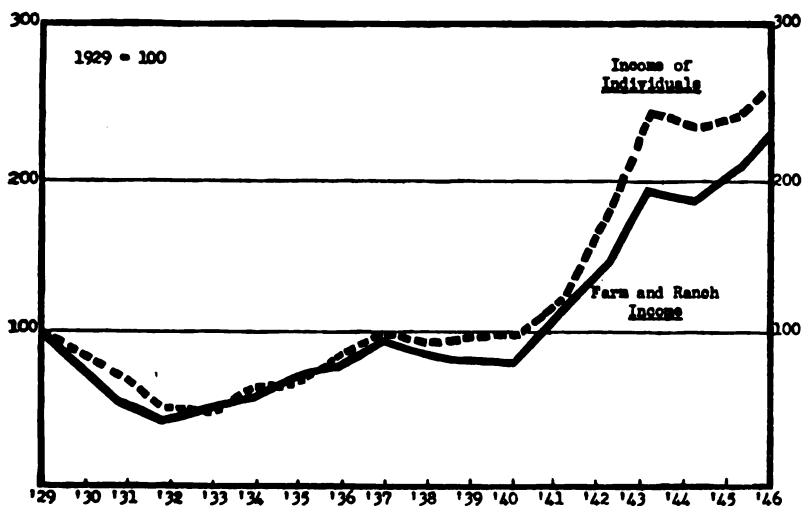
[In millions of dollars]

	Salaries and wages	Proprietors' income	Property income	Pensions and mis- cellaneous income	Total
1929-----	167	42	30	6	245
1933-----	77	17	14	12	120
1940-----	144	46	26	21	237
1941-----	175	58	32	22	287
1942-----	287	90	36	20	433
1943-----	410	117	35	26	588
1944-----	381	101	40	44	566
1945-----	365	114	42	60	581

Arizona prosperity governed by agricultural trends, showing how total income of State parallels ups and downs in agricultural income

Year	Farm and ranch income	Total income of individuals	Farm income as per- cent of total	Year	Farm and ranch income	Total income of individuals	Farm income as per- cent of total
1929-----	\$67,336,000	\$245,000,000	27.5	1938-----	\$55,507,000	\$213,000,000	26.1
1930-----	52,651,000	208,000,000	25.3	1939-----	53,999,000	227,000,000	23.8
1931-----	35,995,000	170,000,000	21.2	1940-----	53,115,000	237,000,000	22.4
1932-----	28,483,000	122,000,000	23.3	1941-----	75,375,000	287,000,000	26.3
1933-----	34,331,000	120,000,000	28.5	1942-----	97,187,000	433,000,000	22.4
1934-----	39,432,000	149,000,000	26.0	1943-----	130,866,000	588,000,000	22.3
1935-----	46,767,000	167,000,000	28.4	1944-----	124,990,000	566,000,000	22.1
1936-----	53,279,000	202,000,000	26.1	1945-----	138,943,000	581,000,000	23.9
1937-----	61,750,000	232,000,000	26.6	1946-----	158,933,000	650,000,000	24.5

¹Estimated.



BRIDGE CANYON PROJECT

Arizona retail sales (fiscal year totals by counties)

County	1936-37	1937-38	1938-39	1939-40	1940-41
Apache.....	\$1,299,913	\$1,573,317	\$1,452,785	\$1,603,471	\$1,522,070
Cochise.....	11,985,575	12,359,986	10,844,298	11,682,071	13,578,786
Coconino.....	5,642,580	6,447,764	6,229,594	6,848,770	6,981,228
Gila.....	7,918,906	7,977,014	6,483,272	7,446,874	7,861,016
Graham.....	3,355,257	3,238,381	3,025,387	3,212,111	3,448,245
Greenlee.....	1,206,576	2,073,145	2,017,261	2,725,431	3,275,659
Maricopa.....	65,809,707	68,125,637	66,288,436	71,919,904	77,317,458
Mohave.....	3,226,034	3,911,505	3,480,968	3,741,662	3,690,205
Navajo.....	4,140,905	4,788,496	4,334,762	5,052,094	5,440,565
Pima.....	28,170,473	28,109,732	27,109,746	30,698,882	33,815,135
Pinal.....	5,290,761	5,666,146	4,963,585	5,812,436	7,056,793
Santa Cruz.....	2,494,460	2,365,343	2,157,770	2,260,150	2,445,382
Yavapai.....	9,641,599	9,159,690	8,634,836	9,087,219	9,506,935
Yuma.....	7,600,758	7,801,774	7,135,285	7,204,720	8,261,368
Total.....	157,783,484	163,597,930	154,157,985	169,295,795	184,150,845

County	1941-42	1942-43	1943-44	1944-45	1945-46
Apache.....	\$2,077,908	\$1,903,861	\$2,433,889	\$2,599,319	\$3,314,799
Cochise.....	15,088,081	19,207,549	20,407,384	20,179,077	21,413,785
Coconino.....	7,817,658	11,540,505	8,900,906	9,814,830	14,151,089
Gila.....	9,318,171	11,511,109	10,758,895	10,751,684	12,515,862
Graham.....	3,964,310	4,338,241	4,864,284	5,284,784	7,125,221
Greenlee.....	4,637,188	5,961,388	5,642,953	4,357,245	4,936,525
Maricopa.....	97,833,547	116,665,465	141,286,497	162,213,265	209,615,798
Mohave.....	3,441,919	4,851,056	4,883,395	5,960,694	6,747,871
Navajo.....	5,995,037	6,472,558	7,399,179	8,867,895	12,067,174
Pima.....	38,191,726	48,024,877	57,516,133	64,184,291	80,307,973
Pinal.....	9,945,531	12,585,882	12,753,153	13,510,363	15,589,324
Santa Cruz.....	2,854,221	3,197,342	5,181,247	6,361,390	8,071,969
Yavapai.....	10,756,686	11,381,015	11,419,275	12,518,577	16,901,145
Yuma.....	10,124,996	14,319,765	17,603,938	18,188,895	20,391,205
Total.....	222,046,679	271,960,613	310,951,128	344,792,309	433,149,643

PERCENTAGE OF STATE SALES IN EACH COUNTY

County	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
Apache.....	0.8	1.0	1.0	1.0	0.8	0.9	0.7	0.8	0.8	0.8
Cochise.....	7.6	7.5	7.0	6.9	7.4	6.8	7.1	6.5	5.9	4.9
Coconino.....	3.6	3.9	4.0	4.0	3.8	3.5	4.2	2.8	2.9	3.3
Gila.....	5.0	4.9	4.2	4.4	4.3	4.2	4.2	3.5	3.1	2.9
Graham.....	2.1	2.0	2.0	1.9	1.9	1.8	1.6	1.5	1.5	1.6
Greenlee.....	0.8	1.3	1.3	1.6	1.8	2.1	2.2	1.8	1.3	1.1
Maricopa.....	41.7	41.6	43.0	42.5	42.0	44.1	42.9	45.4	47.0	48.4
Mohave.....	2.0	2.4	2.3	2.2	2.0	1.5	1.8	1.6	1.7	1.6
Navajo.....	2.6	2.9	2.8	3.0	2.9	2.7	2.4	2.4	2.6	2.8
Pima.....	17.9	17.2	17.6	18.1	18.3	17.2	17.6	18.5	18.6	18.5
Pinal.....	3.4	3.5	3.2	3.4	3.8	4.5	4.6	4.1	3.9	3.6
Santa Cruz.....	1.6	1.4	1.4	1.3	1.3	1.3	1.2	1.7	1.8	1.9
Yavapai.....	6.1	5.6	5.6	5.4	5.2	4.8	4.2	3.7	3.6	3.9
Yuma.....	4.8	4.8	4.6	4.3	4.5	4.6	5.3	5.7	5.3	4.7

Taxes collected in Arizona

Fiscal years	Federal taxes	State and local taxes	Total taxes	Arizona income ¹	Percent of income paid in taxes
1934-35	\$1,745,295	\$24,445,338	\$26,190,633	\$149,000,000	18
1935-36	1,914,239	25,805,297	27,719,536	167,000,000	17
1936-37	3,172,244	28,329,933	31,502,177	202,000,000	16
1937-38	4,513,075	30,724,040	35,237,115	232,000,000	15
1938-39	4,379,010	32,449,767	36,828,777	213,000,000	17
1939-40	5,061,747	31,537,855	36,599,602	227,000,000	16
1940-41	6,173,550	31,592,475	37,766,025	237,000,000	16
1941-42	13,538,623	32,083,203	45,621,826	287,000,000	16
1942-43	33,488,001	35,527,025	69,015,026	433,000,000	16
1943-44	68,362,112	35,441,131	103,803,243	588,000,000	18
1944-45	71,282,175	39,557,924	110,840,099	566,000,000	20
1945-46	75,612,648	46,098,189	121,710,837	581,000,000	21

¹ Income of individuals on calendar-year basis.*Summary of State and local taxes*

Fiscal years	Property taxes	General sales taxes	Motor-fuel taxes	Luxury taxes	Income taxes
1934-35	\$16,792,918	\$1,686,576	\$3,117,013	\$892,514	\$392,389
1935-36	15,698,725	2,928,824	3,565,757	1,147,870	762,240
1936-37	15,090,387	3,703,459	4,166,389	1,346,966	1,164,415
1937-38	15,536,391	3,898,419	4,337,431	1,335,554	1,519,580
1938-39	17,828,033	3,569,144	4,274,974	1,284,849	944,439
1939-40	15,643,841	4,033,142	4,619,852	1,482,884	1,363,268
1940-41	14,717,591	4,402,529	5,047,542	1,476,872	1,525,351
1941-42	12,172,932	5,343,118	5,416,038	1,724,123	1,996,488
1942-43	12,616,277	6,526,560	4,503,794	2,241,035	2,887,800
1943-44	10,893,650	7,353,166	4,289,128	2,181,568	3,514,687
1944-45	15,156,938	7,999,825	4,452,632	2,162,219	3,229,422
1945-46	16,172,252	9,673,406	6,635,582	2,681,460	3,874,145

Fiscal years	Licenses, fees, and permits	Inheritance taxes	Miscellaneous taxes	Unemployment insurance	Total State and local taxes
1934-35	\$1,409,386	\$71,358	\$84,184	-----	\$24,445,338
1935-36	1,582,788	36,868	82,225	-----	25,805,297
1936-37	1,769,916	52,459	90,942	\$945,000	28,329,933
1937-38	1,741,575	113,602	325,488	1,916,000	30,724,040
1938-39	1,680,435	406,164	322,729	2,139,000	32,449,767
1939-40	1,551,732	182,773	551,363	2,109,000	31,537,855
1940-41	1,648,068	73,825	554,697	2,146,000	31,592,475
1941-42	1,840,727	74,549	706,228	2,809,000	32,083,203
1942-43	1,777,769	54,841	777,949	4,141,000	35,527,025
1943-44	1,860,288	32,182	1,103,462	4,213,000	35,441,131
1944-45	1,826,401	57,019	1,048,468	3,625,000	39,557,924
1945-46	2,279,451	24,945	1,642,948	3,114,000	46,098,189

Agricultural production—Annual cash income from crops and livestock produced in Arizona

[In millions of dollars]

Year	Agricultural crops	Livestock and animal products	Total value	Year	Agricultural crops	Livestock and animal products	Total value
1911.....	11.000	9.000	20.000	1929.....	41.790	25.546	67.336
1912.....	10.000	10.000	20.000	1930.....	29.152	23.499	52.651
1913.....	12.000	11.000	23.000	1931.....	16.950	19.045	35.995
1914.....	11.000	11.000	22.000	1932.....	13.791	14.692	28.483
1915.....	12.000	11.000	23.000	1933.....	19.022	15.309	34.331
1916.....	21.000	13.000	34.000	1934.....	24.450	14.982	39.432
1917.....	33.000	18.000	51.000	1935.....	28.567	18.200	46.767
1918.....	47.000	22.000	69.000	1936.....	30.779	22.500	53.279
1919.....	50.000	23.000	73.000	1937.....	35.375	26.375	61.750
1920.....	44.000	21.000	65.000	1938.....	30.876	24.631	55.507
1921.....	25.000	17.000	42.000	1939.....	28.372	25.627	53.999
1922.....	30.000	16.000	46.000	1940.....	27.050	26.065	53.115
1923.....	38.000	17.000	55.000	1941.....	43.839	31.536	75.375
1924.....	35.000	21.000	56.000	1942.....	52.849	44.338	97.187
1925.....	36.000	19.000	55.000	1943.....	83.163	47.703	130.866
1926.....	32.000	21.000	53.000	1944.....	90.388	44.602	124.990
1927.....	40.000	23.000	63.000	1945.....	90.004	48.939	138.943
1928.....	49.000	23.000	72.000	1946.....	102.863	56.070	158.933

Source: U. S. Department of Agriculture.

Annual cash income from Arizona farm and ranch production (as compiled by Dr. George W. Barr, agricultural economist at University of Arizona)

[In millions of dollars]

	1941	1942	1943	1944	1945	1946
Cattle and calves.....	23.0	30.0	28.0	28.0	29.0	37.0
Cotton and cottonseed.....	21.0	28.0	21.0	18.0	17.0	31.0
Lettuce and other truck crops.....	11.8	18.6	31.0	29.0	38.0	38.0
Dairy products.....	3.8	5.5	7.5	8.0	8.0	8.0
Commercial hay and alfalfa.....	3.4	4.0	8.0	9.0	8.0	10.0
Sheep, lambs, and wool.....	3.6	4.0	4.0	3.5	3.0	4.0
Eggs, chickens, and turkeys.....	2.0	2.5	3.0	3.7	4.0	3.5
Citrus fruits.....	.9	2.0	3.8	7.4	8.5	7.0
Commercial feed grains.....	2.5	2.0	3.0	5.0	4.0	5.0
Seed crops.....	1.1	2.5	3.9	2.6	3.0	4.0
Miscellaneous crops.....	2.4	4.4	6.1	6.5	8.0	8.0
Miscellaneous livestock and products.....	1.0	1.7	3.0	2.0	2.0	1.5
Federal Government payments.....	3.5	1.8	1.7	1.3	1.5	3.0
Total cash income.....	80.0	107.0	124.0	124.0	134.0	160.0

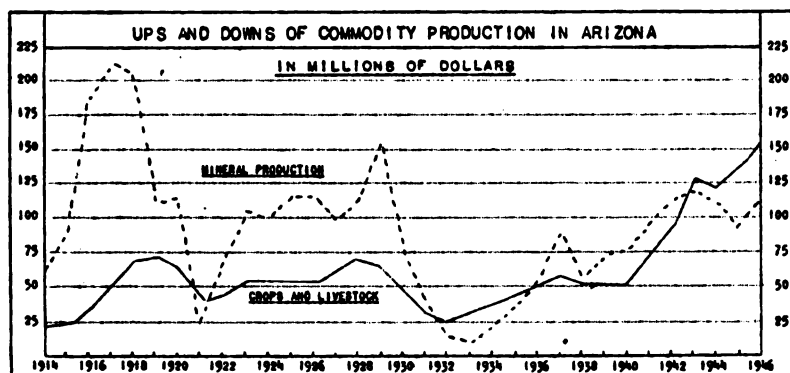
Source: Yearbook entitled "Arizona Agriculture."

Agricultural income by counties—estimates of farm and ranch income by counties for 1946

County:	1946 income	County—Continued	1946 income
Apache.....	\$3,195,000	Navajo.....	\$2,645,000
Cochise.....	4,588,000	Pima.....	7,430,000
Coconino.....	3,532,000	Pinal.....	22,383,000
Gila.....	1,813,000	Santa Cruz.....	1,493,000
Graham.....	6,384,000	Yavapai.....	4,023,000
Greenlee.....	981,000	Yuma.....	19,816,000
Maricopa.....	79,416,000		
Mohave.....	1,234,000	Total.....	158,933,000

AGRICULTURAL INCOME COMPARED WITH MINERAL PRODUCTION

The following comparison of Arizona's two basic industries indicates that agriculture is far more stable than mining:



OPERATING RESULTS OF ARIZONA AGRICULTURE

Complete operating figures are not yet available for the year 1946 but, based on the State figures by the Bureau of Agricultural Economics, the following tabulation represents a fair approximation of operating results in 1946 and for the prewar year 1940:

	1940	1945		1940	1945
INCOME			EXPENSES—continued		
Livestock sales.....	\$26,065,000	\$48,939,000	Livestock purchased.....	\$6,916,000	\$15,084,000
Crop income.....	27,050,000	90,004,000	Fertilizer and lime.....	275,000	1,412,000
Government payments.....	3,492,000	2,654,000	Vehicle operation.....	2,586,000	3,711,000
Miscellaneous income.....	5,558,000	7,512,000	Maintenance and depreciation.....	3,610,000	5,530,000
Total income.....	62,165,000	149,109,000	Property taxes.....	2,296,000	2,537,000
EXPENSES			Mortgage interest.....	1,663,000	1,443,000
Labor.....	7,926,000	21,575,000	Rents and miscellaneous.....	14,842,000	25,432,000
Feed purchased.....	2,916,000	6,227,000	Total expense.....	43,030,000	82,951,000
			Net income.....	19,135,000	66,158,000

NOTE.—The foregoing net income figures are before income taxes, which must be deducted to give a true picture of the net profit.

Wage payments and taxes exceed \$20,000,000 each.—Wage payments in 1945 amounted to \$21,575,000, and no doubt were higher in 1946. Property taxes in 1945 amounted to \$2,537,000, and we can estimate that around \$7,500,000 was paid out in Federal and State income taxes by farm proprietors alone. If it were possible to trace all the other direct taxes, as well as invisible taxes involved in transactions by ranchers and farmers, we would doubtless reach a figure of better than \$20,000,000 annually during the past 2 or 3 years. This does not include taxes paid by transportation companies, processors, and other industries or businesses who derive substantial earnings as a result of our agricultural production. If all these were included, it is likely that the total would be closer to \$40,000,000 than \$20,000,000.

PRIVATE INVESTMENT IN ARIZONA AGRICULTURE NOW TOTALS MORE THAN \$300,000,000

The following tabulation, derived from census reports of the USDA, depicts both the long-term growth of Arizona agriculture and the improvement in financial condition that took place during World War II:

	Value of farms, ranches, and buildings	Farm and ranch mortgage debt		Value of farms, ranches, and buildings	Farm and ranch mortgage debt
1900.....	\$13, 683, 000	(1)	1930.....	\$184, 231, 000	\$34, 685, 000
1910.....	47, 286, 000	\$4, 880, 000	1940.....	153, 676, 000	28, 933, 000
1920.....	172, 325, 000	31, 790, 000	1945.....	287, 933, 000	26, 168, 000

■ Unavailable.

The figures on mortgage debt may be accepted as reasonably exact but the valuation statistics, being based upon voluntary returns of agricultural proprietors, are doubtless incomplete. Hence the value of farms, ranches, and buildings, as computed by the United States Department of Agriculture, is considerably understated, and we may assume that the current investment value of these items (excluding the Government's investment in dams, power plants, and irrigation systems) is well above \$300,000,000.

Senator MILLIKIN. Senator Downey, will you take a look at it, I do not mean now, but if there is anything that occurs to you will you develop it in the testimony allotted to California?

Senator DOWNEY. Yes, Mr. Chairman.

Senator McFARLAND. This will answer some of the questions you asked, Mr. Chairman, as to income received by the Government other than for power, irrigation, and so forth.

Senator MILLIKIN. All right. It has been included in the record.

STATEMENT OF PHIL J. MARTIN, JR., CITY MANAGER, TUCSON, ARIZ.

Senator MILLIKIN. Will you state your full name, your residence, and business, please?

Mr. MARTIN. My name is Phil J. Martin, Jr., and my position is city manager, Tucson, Ariz. I have been a resident of Tucson and vicinity for 40 years. I am thoroughly familiar with the needs of the community with reference to its domestic water supply.

Tucson comprises a population estimated to be in excess of 100,000 people, partly within the corporate limits of the city of Tucson and partly without the corporate limits of the city of Tucson; all, however, knit into an integral urbanized area. Tucson is rapidly expanding due to its national popularity with families from all parts of the United States seeking benefits of its health-giving climate and with those desiring to enjoy the marvelous winter sunshine and mild temperatures of the southern part of Arizona.

The University of Arizona, with an attendance of 4,500 students, is located at Tucson. Davis-Monthan Field, Army air base, is also located at Tucson. Tucson is an important railroad terminus on the main line of the Southern Pacific Railroad, a transcontinental rail route, and the American Airlines, a transcontinental air route. Tucson also is an important trading center for the west coast of Mexico and is becoming more important as time goes on in this respect.

The economy of the State of Arizona is closely associated with the welfare and prosperity of Tucson and it follows, therefore, that in

considering the general economy of the State as a whole, the metropolitan area of Tucson and Pima County must be taken into consideration.

The trend of growth of the community, based on past population increase over a period of 40 years, coupled with the present rapid increase, would indicate that the population of Tucson will double within the next 20 years, producing a population of 200,000. To meet this unusual situation, the community must look forward to a supplemental supply of water for domestic use beyond the confines of the area now furnishing the source of its present water supply. The present source of domestic water for the community is obtained from drilled wells tapping the underflow derived from the Santa Cruz River Basin and the Rillito-Panano Basin and which receive their recharge from rainfall in the mountainous areas contributing to the drainage basins mentioned. Records of underground water levels, obtained over a long period of years, indicate a rapidly depreciating water table due to the increased demand for water from this source.

Such records are available from the United States Geological Survey Water Resources, Ground Water Division, and from the records of the irrigation engineer of the University of Arizona. Such records all point to a serious overdraft of the available underground supply in excess of the recharge rate.

The only source of such supplemental water supply is the San Pedro River, located east of Tucson, from which an adequate supplemental supply of water from the Tucson area can be developed by the construction of a dam across the San Pedro River where a suitable site is available for an impounding reservoir, such as the Charleston Dam site.

The San Pedro River is a tributary of the Gila River Basin and the surface flow of the San Pedro River is utilized to a large extent downstream on the Gila River flood plain, particularly in the vicinity of Florence, Coolidge, and Casa Grande, to the northwest of the city of Tucson.

In giving consideration to the bringing in of waters of the Colorado River to the central valley area of Arizona, we in Tucson assume that present users of water of the San Pedro should consider the need of possible users upstream not now benefiting, and making available to the city of Tucson from the San Pedro River sufficient water to supplement its local underground supply.

The report, No. 33 Survey Flood Control, Gila River and Tributaries above Salt River, Arizona and New Mexico, rendered by the United States Corps of Engineers, submitted to the Chief Engineer's office in Washington, D. C., on February 15, 1946, contains a proposal to make available 12,000 acre-feet of water per annum from the proposed reservoir of the Charleston Dam, to Tucson in order to supplement its domestic water supply. This report shows that the proposal to so divert waters from the San Pedro to the Tucson area is feasible from an engineering standpoint and economically sound.

As a representative of the chamber of commerce water committee, a director of the Central Arizona Project Association from Pima County, and representing the city administration of the city of Tucson, I am authorized to state that Tucson is thoroughly in accord with Senate bill 1175, which would authorize the construction of a multiple-purpose project by which water can be brought into central

Arizona in order to furnish a supplemental supply of irrigation water for lands now being irrigated.

Senator MILLIKIN. And under the law of Arizona do you have the right to condemn water necessary for municipal purposes?

Mr. MARTIN. It is my understanding we have that right, the right of eminent domain; yes.

Senator MILLIKIN. Any further questions?

Senator DOWNEY. No questions.

Senator MILLIKIN. Thank you very much.

Senator McFARLAND. I will call Mr. Dysart.

**STATEMENT OF NAT M. DYSART, VICE PRESIDENT AND MANAGER,
ARIZONA MILK PRODUCERS, PHOENIX, ARIZ.**

Senator MILLIKIN. Will you state your full name, residence, and business?

Mr. DYSART. My name is Nat M. Dysart, and I am vice president and manager of the Arizona Milk Producers, and live in Phoenix, Ariz.

Mr. Chairman, at this point I would like to reassure you a little by saying that we do not discriminate against Colorado. We get most of our wheat flour from there, seed oats, and a lot of barbed wire and steel products and a lot of coal and coke.

Senator MILLIKIN. Well, you have made a good start.

Mr. DYSART. We also get some very good bulls from there.

Senator MILLIKIN. Would you suggest that the Colorado delegation may contribute to that?

Proceed.

Mr. DYSART. In 1913 I moved onto and started the development of a tract of 640 acres of desert land about 22 miles northwest of Phoenix, in the Agua Fria Basin, and I have lived on and operated this farm continuously since that time.

The water supply for the irrigation of this farm is obtained by pumping from wells. In 1913 and until 1926, ample supplies of water could be pumped with a pumping lift not exceeding 90 feet.

Senator MILLIKIN. How far are you from the river?

Mr. DYSART. About 2 miles from the Agua Fria, which is a tributary of the Gila, about 14 miles from the junction of the Agua Fria and the Gila.

Since 1926 the underground water table has been receding and the water lift required is now 160 feet. Since pumping costs are proportional to the distance the water is lifted and the water level is continuing to recede, it is only a matter of a few years until this operation will become uneconomical, by reason of prohibitive pumping costs, or by complete exhaustion of the underground water supply.

This farm gives steady employment to five or six people, and seasonal employment to as many more. It represents an investment of about \$75,000.

Senator MILLIKIN. What do you grow on your farm?

Mr. DYSART. I have some citrus fruit, about 20 acres. I keep about a third of it in alfalfa and barley and grain, sorghum crops and I also grow pure seed Mexican June corn which is a special corn we use in that country.

I mentioned a \$75,000 investment. It would probably be double that amount today.

A 10-room school has been built on part of this farm, at which over 400 pupils are in attendance. These pupils come from the surrounding farming area, the lands of which are situated similarly to my own with respect to water supply. The school property represents an investment in excess of \$60,000, and gives employment to 14 people. That figure, if converted into present-day cost would be nearer double that amount.

Since 1942 I have been vice president and manager of the Arizona Milk Producers, a cooperative marketing association representing about 750 dairy farmers, who last year marketed milk and butter-fat with a farm value of almost \$2,000,000.

Arizona is a deficit area in milk production. For her 700,000 people, there are, in the State, only about 45,000 dairy cows, or one cow for each 15 people compared to a ratio of 1 to 5 or 6 nationally.

Because of her geographical situation, no fluid milk is imported into the State, so the local production is first drawn upon to supply fluid milk and cream which requires more than half of the State's production. Of the remaining supply a large part is used for ice cream, and soft cheese, so that most of the State's requirements of evaporated and condensed milk, cheese, and butter must be met from sources outside the State. The State's dairy industry is therefore in no way competitive with milk production in other parts of the country. The State does, in fact, afford a good market for surplus supplies of dairy products from other areas. I might say that California is one of those supplying areas.

At least three-fourths of the dairy farming in the State is carried on in the irrigated valleys of central Arizona, and dairies operated in nonirrigated areas are almost entirely dependent on forage and grain feeds grown in the irrigated areas. Nonirrigated pastures suitable for the grazing of dairy cattle are almost nonexistent.

Successful dairy operation is particularly dependent upon adequate and continuous supplies of irrigation water. While acreages of crops such as grain, vegetables, or cotton may be to some degree adjusted to available water supplies, and may be rather readily expanded or contracted as water supplies may require or permit, the dairy farmer can not so adjust his operations.

If a dairy farm is equipped and manned to handle 30 cows, and water shortage forces the operator to dispose of 10 or 15 of them, the whole operation may become uneconomical. Nor can the dairyman immediately replace cows when normal water supplies return.

Dairy farming and the establishments engaged in the processing and distribution of milk and milk products give steady and remunerative employment to a great many people and the industry is a heavy user of supplies and equipment. Dairy farms and processing plants are substantial users of electric power for the pumping of water, refrigeration, and other purposes. The farm value of dairy products produced in the State last year was about \$8,000,000, with a manufactured value of about \$12,000,000. The industry therefore lends stability and strength to the economy of the State and makes more certain the discharge of any obligations assumed for the purpose of bringing additional water into central Arizona.

Senator MILLIKIN. Any questions?

Senator DOWNEY. No questions.

Senator MILLIKIN. Thank you very much, Mr. Dysart. We will take a 5-minute recess.

(Whereupon, a short recess was taken.)

Senator MILLIKIN. The meeting will come to order, please.

Senator DOWNEY. Mr. Chairman, yesterday I secured permission of the chairman to present certain interrogatories to Mr. V. E. Larson in relation to issues developed by his testimony.

I now have those prepared. I have handed a copy to Senator McFarland and I would now like to insert this in the record and to have a copy handed to Mr. Larson with the request, Mr. Chairman, that Mr. Larson give us copies of his answers as soon as they are prepared.

Senator MILLIKIN. Senator McFarland, do you have any objection to the interrogatories?

Senator McFARLAND. I do not think I could object to them, Mr. Chairman. It is all right to put them in the record or to have them in the record when the questions are answered. Inasmuch as I have a copy of them I do not see any necessity for them going in the record at this point, but rather put them in the record when the answers are filed. (See Appendix I.)

Senator MILLIKIN. Is that satisfactory?

Senator DOWNEY. Yes, sir.

Senator MILLIKIN. Is there anything you want the committee to do?

Senator DOWNEY. No, sir.

Senator McFARLAND. I will now call Mr. John M. Jacobs.

STATEMENT OF JOHN M. JACOBS, JOHN JACOBS FARMS, PHOENIX, ARIZ.

Senator MILLIKIN. Please be seated, Mr. Jacobs, and give your full name, business, and residence.

Mr. JACOBS. My name is John M. Jacobs. My residence is Phoenix, Ariz., and I am identified with the John Jacobs Farms.

Arizona's soil, water, and climate are particularly adopted to the production of top-quality fruits and vegetables. The production in 1946 was more than 50,000 cars from approximately 100,000 acres with an approximate value of 46½ million dollars f. o. b. Arizona, which was about 35 percent of the State's total agricultural income.

The intensive nature of these crops requires an abnormal amount of labor, making a pay roll in production, harvesting, and packing of approximately \$18,000,000 in 1946 and an expenditure of about \$14,000,000 for packing supplies, fertilizers, and insecticides, most of which are manufactured in other States also requiring several million dollars investment in farm automotive and harvesting equipment supplied by national manufacturers in other States.

This tonnage in 1946 was distributed in over 300 markets in 45 States mostly in winter and spring months, which indicates that this tonnage of perishables is not competitive but rather needed when these areas are dormant.

Prior to 1935 most of the sugar beet seed was imported from Europe. During 1935, small acreage was planted in Arizona and proved to be of such quality that the major sugar companies joined in their seed production, and up to 1946 produced 65,847,654 pounds with a peak production last year of 11,400,000 pounds, almost enough to meet the

annual requirements of the vast beet sugar industry of our Nation. Senator MILLIKIN. Do you have sugar-processing plants in Arizona?

Mr. JACOBS. No processing plants.

Senator MILLIKIN. You raise them merely for seed?

Mr. JACOBS. Merely for seed.

Practically all of this seed was planted in Colorado, Wyoming, Montana, Idaho, Kansas, Iowa, Minnesota, Indiana, Ohio, and Michigan. Also considerable of this seed has been exported to Europe since the war.

As this crop takes about 10 months from seed to harvest and requires about 5 acre-feet of water, with only 2 acre-feet allotted under the Salt River project this year, it is safe to estimate that this year's planting will be reduced approximately 60 percent by the acreage beet seed grower. A combination of our soil, water, and climate are positive factors in the swing of this basic seed production to Arizona.

This represents the foundation for 821,000 acres which produced 10,666,000 tons of sugar in 1946—these figures taken from United States Department of Agriculture record—mostly in the above-mentioned 10 States. Any substantial reduction in this seed production in Arizona will be of grave concern to the vast sugar industry and our Nation.

A fair and close estimate of the water required for producing vegetables is about one-half acre-foot per production month. Most vegetable crops require 3 to 4 months or $1\frac{1}{2}$ to 2 feet of water; likewise, sugar beet seed 10 months, 5 acre-feet; alfalfa 1 acre-foot per ton of cured hay—most grains about 2 acre-feet per crop.

This brief statement on fruits, vegetables, and sugar beet seed is more fully covered in general statements filed by Dean Stanley and John M. Jacobs.

Senator MILLIKIN. What is your turn-over on the average crop? How many crops do you make a year?

Mr. JACOBS. We make two crops a year, but our general practice is to plant in August and September for the winter crop and follow that with some grain crops, and the spring planting which takes place in November and December, and we follow that with the summer crops.

Senator MILLIKIN. Is that alternation for soil fertility reasons or economic reasons?

Mr. JACOBS. For both. Take the grain crops. We turn the straw in, and generally we add some nitrate or ammonia. We use alfalfa on long-range-rotation projects, then put it into vegetables for 3 or 4 years on short-range rotation.

Senator MILLIKIN. Any questions?

Senator McFARLAND. May his full statement be printed and also that of Dean Stanley, president and general manager, Stanley Fruit Co., Phoenix, Ariz.

Senator MILLIKIN. It may be.

(The statements of John M. Jacobs and Dean Stanley follow:)

STATEMENT OF JOHN M. JACOBS, JOHN JACOBS FARMS, PHOENIX, ARIZ.

My name is John M. Jacobs. My business is the growing of perishable and semi-perishable vegetables. I have been a grower in Arizona since 1932. My first trip into central Arizona was in 1931 at which time I saw the possibility of growing and shipping vegetables through the fall, winter, and spring months;

as I would have demand from all Northern, Midwestern, and a part of the Southern States for our products which were out of season in those areas during those months. Also, during the long growing season here, we are able to make two crops a year on most items. Our early crop planting is mostly in August and September, harvest starting in November, and finishing in January. Our late crop planting is as the early crops are taken off to harvest, starting in March, April, and May with some early potatoes through May and June and melons through June and July.

When I first came to this valley, most of the vegetable production was in lettuce and cantaloupes. During the last 15 years that production has not increased, but a more diversified production has increased total acreages, and today the perishable products grown in Arizona include mainly lettuce, melons, carrots, broccoli, celery, cabbage, cauliflower, brussels sprouts, spinach, beets, turnips, potatoes, and onions—in fact, practically all types of vegetables grow successfully in this area.

Arizona's total production last year from approximately 100,000 acres in fruits and vegetables produced 50,835 cars that brought a cash return to Arizona of approximately 46½ million dollars, or about 35 percent of the total agriculture income for the State. Most of this is from land that produces two crops annually and is a fine quality of loam soil. The above figures are from records of the office of standardization of fruits and vegetables for Arizona. This 46½-million-dollar income last year made a cash pay roll of approximately \$18,000,000 and required the purchase of about \$12,000,000 of crate material, paper, other packing material and supplies used only in the packing operations. This production also required approximately \$1,250,000 in fertilizer, imported from other States. It represents an investment estimated at around \$5,000,000 in farm equipment, trucks, and transportation, and packing equipment, most of which is supplied by the major national implement and equipment-manufacturing companies.

Figures from the quartermaster market center show that approximately 2,000 cars were purchased from this district for military use during the war. In checking the records of the distribution from records of the United States Market News Service, their figures show that approximately 50,000 cars annually mostly moved to eastern, northern, and midwestern markets, mainly through the period of late November to late May except for the movement of cantaloupes and other melons and early potatoes which are marketed through June and the early part of July. This indicates that this tonnage is not competitive, but rather needed at that time of the year when those areas are dormant or have very little production of fruits and vegetables during those months.

The production of vegetables has become probably the most intensive type of farming that there is—at least this is true in our area. Due to the high production cost, most producers have found that it is better to spend considerable time, effort, and money in heavy fertilization and growing of cover crops for plowing under to keep a high state of fertility in their soil. Most of these intensive crops require a lot of hand labor in weeding, thinning, hoeing, and harvesting; and with our present agricultural scale more than double what it was before the war, our investment per acre is so high that we can't afford to neglect any part of our production or harvesting expenses, and water is our most important item. Even a slight shortage in water can cut our yields so low that the high labor and other production costs would make it prohibitive to maintain our present acreage being grown in these essential vegetable crops. All acreage is planned according to the amount of water available per acre, and full production cannot be made on less than 4 acre-feet per year on this land. With the large acreage in fall, winter, and spring vegetables in Arizona, and with our present shortage of water—which we have developed to its fullest extent within the State—we have only one place to look for water to maintain our present production, and that is to the Colorado River.

Like most areas producing fruits and vegetables, the average acreage per farmer is small. Due to the intensive nature and high cost of production per acre, many more people—including operators and necessary labor—live on smaller acreages and make their livelihood, where it would be impossible on the same acreage in other agricultural commodities where practically all work is done on mass basis with modern machinery.

In addition to the high costs of production, most of the vegetable farmers have developed their ranches with a large investment per acre in buildings and irrigation systems such as wells, cement structures, underground tile lines to where

their investment in a few acres would show a loss on much less than full production. Thousands of workers would have to look elsewhere for employment, and many fruit and vegetable producers who have been making a substantial profit will find their position entirely changed unless supplemental water is made available and brought in from the Colorado River.

This is a serious situation for all producers of fruit and vegetables in this area, as I am sure most people have gone ahead under the impression that Arizona had a substantial allotment coming from the Colorado River, and that it would be brought in and made available when needed. That time has certainly come and all we can do now is to continue to borrow water from our underground water supply, which we could do with confidence if we knew that we would get Colorado River water within a reasonable time. If Colorado River water is not brought in we are only borrowing ourselves into disaster, as we will surely lower our water table to a depth prohibitive to pumping, which has been our only source of added water as our gravity water is fully developed. With the thousands of wells now pumping mostly in the Western States; not only the water development, but the power also is and will be badly needed within a very short time. The Bridge Canyon Dam would serve this need.

STATEMENT OF DEAN STANLEY, PRESIDENT AND GENERAL MANAGER, STANLEY FRUIT CO., PHOENIX, ARIZ.

My name is Dean Stanley. I reside at 1315 West Palm Lane in Phoenix, Ariz. I have lived in Phoenix for the past 28 years. For more than 20 years past I have owned and operated irrigated farms in the Salt River Valley of Central Arizona.

My lands have been rotated with the diversification of crops which can be grown in the area with particular emphasis upon such crops as the economy of the country needed. I have always endeavored to make the greatest use of available water supplies, and to maintain my soils in the highest state of fertility.

At the present time, more than one-half of my farm lands are growing alfalfa and barley grain crops, all of which are used for the fattening of livestock. Other crops grown on my farms, include fresh vegetables for shipment to most of the Nation's consuming markets during the winter and spring months, when similar vegetables cannot be produced in most of the other States.

These fresh vegetables are an essential part of the American food supply and a mainstay in upholding our standard of living. They are the only low-cost source of the vitamins and mineral salts so necessary in maintaining the national health standard during the winter months.

The production of winter vegetable crops is an integrated, time-tested, long established industry. The central Arizona valleys, by reason of certain soil and climatic factors, fit into the schedule of winter and spring vegetable production, and are an essential cog in the machinery of steady, plentiful supplies demanded by the consumers of the Nation.

The facts and figures in attached exhibits, which I have compiled from official records of the United States Department of Agriculture, prove the importance of Arizona fresh-vegetable production. They, also, show our part in filling the national demand, without interfering or unduly competing with other production districts.

Exhibit A shows a total of 29,543 carloads of fresh vegetables (exclusive of potatoes and onions) were produced and shipped from central Arizona during the year 1945. Comparison of central Arizona carlot shipments, with totals for the United States, are shown for different varieties of vegetables shipped during each month of 1945. This comparison shows that we supplied from 32 to 77 percent of the country's needs of our principal vegetable varieties during the periods of time when our production was greatest.

Exhibit B shows that our fresh vegetables were unloaded and consumed in 45 States, and 306 markets of the United States. Actual unloadings are also shown for those markets for which USDA figures were available.

Another important crop, which I produce each year on my central Arizona lands, is the foundation for one of the most essential agricultural crops grown in various parts of the United States. This is sugar beet seed, the production of which, I, personally, pioneered back in 1935. Since that time, central Arizona has produced

65,847,654 pounds of sugar beet seed, and we have been the leading producers of this seed every year since 1936.

Since January 1, 1941, after which it was impossible to import sugar beet seed from Europe, Central Arizona has produced 40,850,230 pounds. Last year we produced 11,400,000 pounds, or nearly enough seed to meet the annual requirements of the entire beet-sugar industry of the Nation.

We grow and supply practically all of the seed from which sugar beets are produced in the States of Colorado, Wyoming, Montana, Idaho, Kansas, Iowa, Minnesota, Indiana, Ohio, and Michigan. We also ship our seed to California, Utah, Nebraska, and most of the beet-sugar-producing areas of the United States and Canada. A large quantity of our seed has been exported to the European countries since the end of the war.

In the production of sugar beet seed, a considerable amount of water is required, from 4 to 5 acre-feet, in order to produce a satisfactory crop. Since we have available, and are allotted only 2 acre-feet of water for the year 1947 in the Salt River project, it is necessary to abandon crop production of approximately $1\frac{1}{2}$ acres for each acre of sugar beet seed being produced.

Central Arizona has the soil and climatic conditions particularly well adapted to the production of sugar beet seed. Experimental crops have been grown in many other areas, but no other section of the United States has yet been found which can approach central Arizona in the number of pounds or the quality and vitality of seed produced on our farms.

The sugar consumers of the entire country—and that means, all of us—and our great beet-sugar industry would be placed in a very precarious position, if we farmers in central Arizona are forced to discontinue the production of sugar beet seed, because of insufficient water.

Central Arizona must have a supplemental water supply for lands that are now under cultivation. No one can dispute this fact. The only source from which this supplemental water can be obtained is the Colorado River and in order to get Colorado River water into central Arizona, we must have the approval and assistance of the United States Government. If we get that approval and assistance, a present existing civilization can be saved. If we do not get it, then the existence of that civilization is in jeopardy and the agricultural economy of central Arizona must, at least in part, fail. This failure will directly affect other agricultural communities now dependent upon Arizona for the securing of sugar beet seed and will in no small measure affect the national economy. The approval of this subcommittee and the ultimate passage of S. 1175 will save us.

EXHIBIT A.—Monthly carlot production of fresh vegetables (exclusive of potatoes and onions), United States and central Arizona, 1945¹

UNITED STATES

Commodity	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Asparagus.....		3	234	654	76	14						
Beans.....	486	615	885	1,054	1,468	416	126	83	71	447	1,272	548
Beets.....	157	153	279	240	179	34	23	135	157	242	424	189
Broccoli.....	254	254	284	131	99	4	15	38	49	64	183	149
Cabbage.....	3,354	3,703	3,822	5,031	3,967	1,679	545	1,035	1,773	3,044	2,291	2,591
Cantaloupes.....					55	4,860	6,522	3,366	1,871	102		
Carrots.....	2,318	2,642	3,079	3,070	3,481	2,792	1,605	1,235	1,435	2,178	2,187	1,881
Cauliflower.....	997	1,502	1,164	758	669	304	86	501	574	520	922	1,071
Celery.....	2,727	2,693	3,095	2,474	2,804	1,264	585	853	1,147	1,881	3,281	2,806
Cucumbers.....	8		71	566	1,267	733	537	173	226	243	269	22
Eggplant.....	10	1	8	37	91	120	18			7	22	12
Escarole.....	205	249	238	231	85	13					134	266
Lettuce.....	7,945	5,576	5,302	7,686	6,281	4,667	4,649	5,160	4,626	5,627	3,980	6,965
Mixed vegetables.....	6,005	5,709	5,632	4,177	2,986	2,294	1,986	2,622	2,276	2,695	3,852	4,820
Peppers.....	101	175	335	239	543	413	242	26	37	167	530	186
Spinach.....	1,524	1,255	818	205	58	96	199	141	89	39	433	725
Tomatoes.....	414	1,185	1,774	3,513	7,683	5,941	3,046	1,244	4,126	3,417	1,779	1,046
Turnips.....	70	35	18	20	31	27	32	36	60	103	94	67
Honeydews.....						379	2,185	1,768	1,548	451	26	
Total.....	26,575	25,750	27,034	30,086	31,823	26,050	22,401	18,416	20,065	21,227	21,688	23,342

¹ Data furnished by Production and Marketing Administration, USDA.

EXHIBIT A.—Monthly carlot production of fresh vegetables (exclusive of potatoes and onions), United States and central Arizona, 1945—Continued**CENTRAL ARIZONA**

Commodity	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Broccoli.....	47	110	62	5							3	12
Cabbage.....	183	63	33	2	11						16	45
Cantaloupes.....						43	2,650	9				
Percent ¹						40.63	41					
Carrots.....	539	583	247	294	1,435	1,091					145	306
Percent ¹					41.22	39.07					6.63	16.26
Cauliflower.....	546	97		2							2	29
Percent ¹	54.76											
Celery.....	2	80	70	25								
Escarole.....												
Honeydews.....							718	713				
Percent ¹							32.86	40.32				
Lettuce.....	1,716	1,369	4,130	3,034	8						1,312	4,260
Percent ¹			77.89	39.47							32.89	61.18
Mixed vegetables.....	822	416	655	396	28	24				1	289	815
Tomatoes.....						2	7					
Total.....	3,855	2,718	5,197	3,758	1,482	1,160	3,416	722		1	1,767	5,467
Percent central Arizona of total.....	14.5	10.6	19.2	12.5	4.7	4.5	15.2	3.9			8.1	23.4

¹ Percent central Arizona of total United States.**EXHIBIT B.—Carlot unloads of fresh vegetables, 1945, Arizona ¹**

Cities	Lettuce	Carrots	Cauliflower	Broccoli	Cabbage	Celery	Chicory	Cantaloupes	Honeydews	Mixed vegetables
Atlanta.....	65	7						2	4	11
Baltimore.....	259	103	17	11		1		43	20	78
Boston.....	463	342	44	24	5			124	65	43
Chicago.....	1,005	375	71	23	64	9	28	393	107	292
Cincinnati.....	281	91	12		7	1		111	20	54
Cleveland.....	364	151	20	5	10	2	1	152	63	87
Detroit.....	495	219	19	5	20	9	1	163	54	146
Kansas City.....	301	72	14		10	4		105	14	22
Minneapolis.....	51	8	1			1		16		9
New York.....	1,289	855	168	137	22	11		321	306	265
Oklahoma City.....	119	17	4		4	2		27	2	5
Philadelphia.....	669	295	74	18	5	35	7	150	66	114
Pittsburgh.....	491	131	25	9	10	6		150	56	52
St. Louis.....	417	78	30		8			123	25	60
Washington, D. C.....	167	65	26	1	1			57	30	14
Total.....	6,436	2,809	525	233	166	81	37	1,937	832	1,252

¹ Production and Marketing Administration, USDA.**THE ARIZONA FRUIT AND VEGETABLE STANDARDIZATION SERVICE, PHOENIX, ARIZ.****CARLOT DISTRIBUTION STATE OF ARIZONA ¹**

Alabama :	California :	California—Continued
Birmingham	Colton	San Jose
Mobile	Fresno	Stockton
Montgomery	Long Beach	
Arizona :	Los Angeles	Colorado :
Phoenix	Modesto	Bunnell
Tucson	Oakland	Colorado Springs
	Sacramento	Denver
Kansas :	San Diego	Grand Junction
Fort Smith	San Bernardino	Pando
Little Rock	San Francisco	Pueblo
Texarkana		

¹ Data obtained through USDA 1944 Production and Marketing Reports.

CARLOT DISTRIBUTION STATE OF ARIZONA—continued

Connecticut:	Kentucky:	Missouri:
Bridgeport	Harlan	Joplin
Hartford	Lexington	Kansas City
New Haven	Louisville	Liberty
Norwich	Paducah	McElhaney
Waterford	West Frankfort	Monett
Waterbury	Kansas:	Springfield
District of Columbia:	Coffeyville	St. Joseph
Washington	Concordia	St. Louis
Florida:	Fort Dodge	Montana:
Jacksonville	Hutchinson	Billings
Miami	Liberal	Butte
Orlando	Manhattan	Great Falls
Tampa	Pittsburg	Missoula
Georgia:	Salina	Nebraska:
Atlanta	Topeka	Grand Island
Macon	Wellington	Hastings
Savannah	Wichita	Lincoln
Thomasville	Winfield	Omaha
Waltherville	Winona	New Jersey:
Idaho:	Louisiana:	Jersey City
Boise	Alexandria	Morristown
Idaho Falls	Baton Rouge	Newark
Pocatello	Bringham	South Kearny
Twin Falls	Lafayette	Waverley
Indiana:	Lake Charles	New Mexico:
Evansville	Monroe	Albuquerque
Fort Wayne	New Orleans	Belen
Gary	Shreveport	Clovis
Indianapolis	Maine:	Roswell
Kokomo	Bangor	Santa Fe
Logansport	Portland	New York:
Muncie	Maryland:	Albany
South Bend	Baltimore	Binghamton
Terre Haute	Hagerstown	Buffalo
Illinois:	Massachusetts:	Geneva
Bloomington	Boston	Harlem River
Cairo	Bridgeport	Jamestown
Carbondale	Melrose Junction	Maspeeth
Champaign	Somerville	Menands
Chicago	Springfield	New York
Danville	Michigan:	Niagara Falls
Decatur	Battle Creek	Rochester
Dixon	Detroit	Schenectady
Eldorado	Flint	Syracuse
Galesburg	Grand Rapids	Utica
Peoria	Ironwood	North Carolina:
Quincy	Ishpeming	Asheville
Rock Island	Jackson	Charlotte
Rutherford	Saginaw	Durham
Staunton	Minnesota:	Goldsboro
Springfield	Albert Lea	Hendersonville
Tablegrove	Brainerd	Jackson
Iowa:	Duluth	Raleigh
Burlington	Marshall	Rocky Mount
Cedar Rapids	Mankato	Salisbury
Creston	Minneapolis	Winston-Salem
Davenport	Moorehead	North Dakota:
Des Moines	Rochester	Bismarck
Dubuque	St. Cloud	Fargo
Estherville	St. Paul	Minot
Lamoni	Mississippi:	Ohio:
Mason City	Gatesville	Akron
Sioux City	Lynchburg	Bellefontaine
Waterloo	Laurel	Canton

CARLOT DISTRIBUTION STATE OF ARIZONA—continued

Ohio—Continued	Rhode Island:	Vermont:
Cincinnati	Olneyville	Rutland
Cleveland	Pawtucket	Virginia:
Columbus	Providence	Leesville
Dayton	South Dakota:	New River
Mansfield	Aberdeen	Norfolk
Massillon	Sioux Falls	Portsmouth
Middleton	South Carolina:	Pulaski
Springfield	Columbia	Richmond
Toledo	Greenville	Roanoke
Xenia	Spartanburg	Virginia Beach
Youngstown	Tennessee:	Washington:
Zanesville	Bristol	Bellingham
Oklahoma:	Chattanooga	Seattle
Chickasha	Kingsport	Spokane
Enid	Knoxville	Tacoma
Hobart	Memphis	Walla Walla
Lawton	Nashville	Wenatchee
McAlister	Texas:	West Virginia:
Oklahoma City	Abilene	Bluefield
Ponca City	Amarillo	Charleston
Muskogee	Austin	Huntington
Shawnee	Beaumont	Mabscott
Tulsa	Brownsville	Wheeling
Waynoka	Brownwood	Wisconsin:
Oregon:	Corpus Christi	Appleton
Bend	Cisco	Eau Claire
Portland	Dallas	Fon du Lac
Salem	El Paso	Green Bay
Pennsylvania:	Fort Worth	Madison
Altoona	Harlingen	Milwaukee
Cresson	Houston	Manitowoc
Enola	Longview	Racine
Erie	Lubbock	Stevens Point
Harrisburg	McAllen	Wausau
Johnstown	San Angelo	Wyoming:
Leighton	San Antonio	Casper
Middletown	Stamford	Cheyenne
Newcastle	Sweetwater	Others:
Philadelphia	Tyler	Canada
Pittsburgh	Waco	
Scranton	Wichita Falls	
Uniontown	Utah:	
Wilkes-Barre	Ogden	
Williamsport	Salt Lake City	

Senator McFARLAND. I may point out these witnesses have all been in the Salt River Valley and now we are moving up into Safford Valley. Senator MILLIKIN. Thank you.

**STATEMENT OF JESSE A. UDALL, ATTORNEY AT LAW,
THATCHER, ARIZ.**

Mr. UDALL. Mr. Chairman and gentlemen of the committee, my name is Jesse A. Udall. I live at Thatcher, Graham County, Ariz. I am 53 years of age and was born at Springerville, Ariz., and have lived in Arizona all of my life. My parents came into northern Arizona in 1880, and my family has been intimately associated with Arizona and its progress since that date.

My experience with reclamation and the diversion of water on arid lands dates back to my early boyhood, when all the people of the town of St. Johns, and other towns in northern Arizona, banded to-

gether in a community enterprise to build dams on the Little Colorado River and divert the water onto virgin lands.

In the year of 1919, after getting out of the Army, I moved to the Gila Valley, in Graham County, Ariz., and have been a resident of this area since that time, with the exception of 3 years spent at the State University of Tucson, Ariz., where I obtained my degree in law.

From 1924 to 1938, I maintained a law office in Safford. In 1938 I was elected to be superior judge of Graham County, which position I held until I entered the armed services in April of 1942, where I remained for 3½ years.

During all the time I have lived in Graham County, I have engaged in the business of agriculture and have represented the farmers of this area in many matters connected with agricultural problems. While I was on the bench, I was the judge in the trial of some very important water litigation affecting lands and water rights of citizens of the State.

In the year of 1935, a consent decree was entered in the Federal Court of the District of Arizona, in which water from the Gila River was decreed to lands in Greenlee, Graham, Pinal, and Gila Counties in Arizona and Hidalgo County in New Mexico.

Senator MILLIKIN. How would you in Arizona decree water rights in New Mexico?

Mr. UDALL. The people in Virden Valley submitted to the jurisdiction of the court and entered into a consent decree, as this was.

The lands so decreed, beginning with the upper reaches of the river are as follows:

	<i>Acres</i>
The Virden Valley in New Mexico-----	2,860.1
The upper Gila in the vicinity of Duncan, Ariz-----	5,201.25
The Safford Valley in Graham County-----	32,512.4

Total lands in upper Gila-----	40,573.72
The San Carlos, Apache Agency-----	1,000

These lands are all above the Coolidge Dam.

	<i>Acres</i>
Below Coolidge Dam: Winkleman Valley-----	1,335.15
San Carlos project in the Florence, Coolidge, Casa Grande are:	
Indians-----	50,546
White-----	50,000
Florence, Casa Grande project-----	1,544.5
Gila Crossing-----	2,992.5

Total lands decreed on Gila River-----	147,991.91
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Senator MILLIKIN. Is your system to decree the acreage and divide the available water? Is that the way you do it?

Mr. UDALL. Yes; that is nearly correct.

The land above the Coolidge Dam received an amount of water equivalent to the amount stored in the Coolidge Reservoir.

Senator MILLIKIN. The effect of this decree of acreage is what?

Mr. UDALL. To distribute as nearly as possible; equitably, of course.

The supply of irrigation water derived from the Gila River during the years of 1938, 1939, 1945, 1946, and 1947, up to date, was and is entirely insufficient for a stable agriculture. To meet the lack of irrigation water from the Gila River, it has been necessary to supplement the water supply by pumping from underground sources. However, the sources of underground water are very irregular and spotted

in the Safford and Duncan Valleys. As a result, some of the land in these two valleys receive sufficient supplemental water to assure maturing crops, whereas, many hundreds of acres in these two valleys are inadequately watered.

It is now becoming generally recognized that Arizona is one of the most desirable places to live in the United States. Its mountains and deserts, its sunshine and pure air, its desirable summer and winter climates are attracting new citizens by the thousands.

It has experienced a most remarkable growth in population during the last several years. From April 1940 to January 1947, its population has increased 37.3 percent—see the United States News, March 28, 1947. This increase is one of the greatest that has been made by any State in the Union.

Of the new population coming to Arizona, many thousands are ex-servicemen from other States who have come here to make their homes. In most instances these returned servicemen are attracted to Arizona after having spent a period of time in training within its borders. From a recent survey made by the Valley National Bank and published in the May issue of Arizona Progress, it is shown that there are 84,000 veterans of World War II now residing within the boundaries of Arizona. Of this number more than one-third have migrated from other States since leaving military service.

The publication goes on to say:

Veterans and their families are potentially great assets to the State. However, their absorption into our economy creates problems that call for considerable patience on the part of the veteran and plenty of serious planning on the part of the State leaders.

The upper Gila valleys in Graham and Greenlee Counties, like all the rest of Arizona, are faced with this very serious dilemma—an increasing population with a diminishing supply of water for the irrigated valleys that have been reclaimed from the desert by the toil, courage, and faith of the pioneers during these many decades past.

For the year of 1946 the farmers of the Safford Valley were able to divert from the Gila only 69,900 acre-feet of water for the 32,512.4 acres of land under irrigation. This supply was supplemented by pumping in some areas where underground water was available, but hundreds of acres of land did not have access to adequate underground sources of water, and these lands in the upper Gila valleys are on the verge of reverting back to the desert. The sight of burning crops, dying trees, and parched lands that once were fruitful makes a close observer wonder if this generation is keeping faith with the generation of pioneers that carved an empire out of the deserts. It also raises the question as to what this generation's responsibility is to the next.

The water prospects for 1947 are even more discouraging than they were for 1946. So far this year the farmers in the Safford and Duncan Valleys have been apportioned 0.41 of an acre-foot per acre, and no other apportionments are in prospect until July or August, when, under normal conditions, there would be some run-off from the summer rains.

If Arizona agricultural valleys are to be preserved for the population that are now here and the prospective citizens that are coming here in the future, it is imperative that additional sources of water be brought into central Arizona for distribution on the lands that are already under a high degree of cultivation. In Arizona it isn't acres,

but acre-feet that spell prosperity and progress. If a million acre-feet of water, more or less, could be brought into the Salt River and Casa Grande Valleys from the Big Colorado River farmers in Graham and Greenlee Counties could be benefited directly by receiving an additional amount of water by being permitted to retain a larger proportion of the water of the Gila River and in turn the farmers in the Casa Grande Valley could be compensated, therefore, by water brought from the Colorado River.

The plan being submitted by the Central Arizona Project Association is entirely feasible and meets with the approval of farmers from all sections of the State of Arizona. The Colorado River is the greatest resource of the State of Arizona, and according to all the laws of equity and justice the State of Arizona should be permitted and should be assisted by the Federal Government in developing and putting to use her equity in this great resource.

The products of Arizona's agriculture, such as citrus fruit, cantaloupes, melons, vegetables of all kinds, long- and short-staple cotton of the finest quality, alfalfa hay and small grains, beef cattle, dairy products, sheep and goats, and scores of other items common to Arizona agriculture are a never-ending source of wealth to this State and the Nation, and as a farmer and stock raiser of Graham County, Ariz., I recommend and urge that Senate bill 1175 be enacted into law by the Congress of the United States.

Senator MILLIKIN. Are there any questions?

Senator DOWNEY. No questions.

Senator McFARLAND. Mr. Henness.

STATEMENT OF K. K. HENNESS, COUNTY AGRICULTURAL AGENT, CASA GRANDE, ARIZ.

Senator MILLIKIN. Be seated, please, and give your full name, address, and business.

Mr. HENNESS. My name is K. K. Henness, county agricultural agent, with the University of Arizona. I have been county agricultural agent in Pinal County since April 1, 1928. I grew up on an irrigated farm near Tempe, Maricopa County, Ariz. I own and have lived on a farm near Casa Grande since 1936.

Senator McFARLAND. We have moved from southward down in here [indicating]. He is talking about this area here [indicating].

Senator DOWNEY. Principally all in Pinal County?

Senator McFARLAND. Yes.

Mr. HENNESS. Yes.

Senator MILLIKIN. Go ahead.

Mr. HENNESS. I am here to testify regarding the present situation in which our county's agriculture finds itself insofar as water supplies are concerned, and to give my estimate as to the future of farming in our county. This I will try to do.

All of you men are familiar with irrigation in the West. You know that level desert land suited for agriculture means nothing without water. Water is the measuring stick. Under our high temperatures and long growing season we consider that we need at least 4 acre-feet of water. Our entire farming economy is based upon the amount of water we have, either from gravity sources, or from underground storage.

The ideal situation in irrigated farming is to have a water supply which over the years is sufficient to annually provide the amount of water required for optimum crop growth. If a water supply is such that this amount can be delivered, let us say, for 3 years, and then perhaps only one-third of this required amount can be provided in another 3 years, then you have an unstable agriculture. You have an agriculture incapable of producing to its maximum. You have an agriculture in which farmers are unable to plan and rotate their crops and diversify and build up their soils with legumes and do all those things that people in our work encourage in every county in America. This is the picture in the San Carlos project, which represents 100,000 acres of the irrigated land in our county, one-half white-owned and one-half Indian-owned. I will talk about this project first, and later will develop the situation that exists on the pump lands of our county.

Senator DOWNEY. May I interrupt to ask is there a San Carlos River?

Mr. HENNESS. There is a San Carlos River, a small tributary to the Gila.

Senator DOWNEY. Why do you talk of this as the San Carlos project?

Mr. HENNESS. The history of it is the Coolidge Dam located at what is known as San Carlos site on the Gila River. The dam is perhaps 80 or more miles from our project up the Gila River.

Senator DOWNEY. This 100,000 acres secures its water from the Coolidge Reservoir?

Mr. HENNESS. From the Coolidge Reservoir; yes, sir.

Senator DOWNEY. Is the supply on that adequate?

Mr. HENNESS. I will develop that and show you it is very inadequate.

Senator DOWNEY. All right, thank you.

Mr. HENNESS. On the 13th of this month, when I decided to appear before your subcommittee, I took a young man from our organization who has some skill as a photographer, and drove over the San Carlos project. He took a number of photographs which I believe will tell you something of the situation our farmers are in and have been in as regards water. With your permission I am going to use a few of these in showing you what a water shortage means in a land of desert with a year-long growing season and with the high evaporation that accompanies our summer temperatures.

Do you mind, Mr. Chairman, if I step up there and point to this?

Senator MILLIKIN. No; go right up.

Mr. HENNESS. I think in the first day's testimony there was comment to the effect the land this water is asked for might be desert land, and I want to point out it will be desert land soon without more water. This land was put under irrigation in 1930 and farmed for some years. Of recent years the water supply has been so short farmers have been unable to farm but a small part of it.

My first photograph is of the Frank Williams farm, near Casa Grande. It shows Mr. Williams' irrigation ditch, and part of a 40-acre field of land designated for water, which is capable of producing, with ample water, at least 5 tons of alfalfa hay in a season, plus winter pasture, or 300 pounds of beef if grazed, or a bale to a bale and one-half of cotton.

What you see growing isn't a crop; it is Rayless goldenrod, a desert plant poisonous to livestock, a shrub which the desert uses to reclaim its own. This field hasn't been farmed since 1943. Today there are 40 acres of alfalfa on this 160-acre farm, 40 acres like the photograph, and another 80 acres idle. This farm has been allotted 0.85 acre-foot of water, a little over 3 acre-feet per acre for the land that is in alfalfa.

Taxes and water assessments are paid on 160 acres and 40 can be farmed. And, gentlemen, in my business I have a hard job when I endeavor to talk to Mr. Williams of the need for the growing of legumes and crop rotation. He has the problem of trying to grow a crop that will bring him enough cash to pay his taxes and water assessments, his interest, and his living.

Senator MILLIKIN. How much local tax does he pay on that tract?

Mr. HENNESS. His taxes are approximately \$2 per acre and his water assessment will be \$1.75.

Senator DOWNEY. Do we understand that total farm comprises 160 acres?

Mr. HENNESS. Yes, sir.

Senator DOWNEY. And it is only getting adequate water for 40 acres?

Mr. HENNESS. It is getting the allotment for this year, the total visible supply which is .85 acre-feet per acre.

Senator DOWNEY. And for how much land is that an adequate supply?

Mr. HENNESS. We consider 4 acre-feet necessary, so, if you divide that by 4 it would be somewhere around 35 or 40 acres.

Senator DOWNEY. With weather conditions as they are now, do you anticipate that would remain the firm supply for that basis, or would you expect it to decrease further?

Mr. HENNESS. We do not know. Some years we can farm all of our land. We have water enough to farm—

Senator DOWNEY. Without an additional supply from the Colorado.

Mr. HENNESS. Yes, we have wet years. Our project is based on a proposition we are in an area where we have flash floods, and you might catch a supply for 2 or 3 years in one very wet season and maybe not catch enough to farm at all in another one, or two, or three seasons.

Senator DOWNEY. Is this one of the older rights about which we are talking?

Mr. HENNESS. Well, that is the standard water right in the San Carlos project. It is the full right to share in all stored water. I do not know what the priority is, but it shares equally with all other lands.

Senator DOWNEY. When the Coolidge Dam was built and the water was allocated to this 100,000 acres, was it at that time thought there would be enough water for that 100,000 acres?

Mr. HENNESS. I presume it was.

Senator DOWNEY. Has there developed pumping that changed conditions, so that that is no longer true?

Mr. HENNESS. No; I do not think that would change that. If my recollection is right, the engineering water records behind this project indicated that the gravity flow would take care of 80,000 acres. It would be sufficient over the years to take care of 80,000 acres and that they would pump sufficient water to take care of 20,000 acres, the two

waters being placed in a common pool, and I will show you later some of this pumped water which is now being used.

Senator DOWNEY. It would appear from what you say the engineers made a serious mistake, because you only have enough water for less than a quarter of this land now?

Mr. HENNESS. We are shorter of water now than we have been in some years. I am not an engineer, but the record is that in a good many of the years since that project was started there has not been enough water.

Senator ECTON. Mr. Henness, is that allotment of water available for use any time during the 12 months' period?

Mr. HENNESS. It is supposed to be, but when we have no gravity water, as the situation is now, and only have this pump water, it is not available on demand and sometimes people may have to wait several weeks for water.

Senator ECTON. Therefore, you cannot irrigate more than possibly 40 acres out of the 160 in your rotation system because it is not available?

Mr. HENNESS. That is right, and it is not even available on that 40 acres at times when you need it.

Senator MILLIKIN. What does a farm like that sell for?

Mr. HENNESS. I think the value is the amount—the amount that farms are selling for in San Carlos is probably not justified by the water situation in my judgment, but several farms have sold, and I can think of one 160-acre farm, no better land than this, no improvements, which sold for \$35,000 last spring.

Senator DOWNEY. How many acres?

Mr. HENNESS. 160.

Senator DOWNEY. That is about \$225 an acre.

Mr. HENNESS. Yes. That is one sale. I know of another at \$200 for 160 acres in the same area with a water rate just like this.

Senator DOWNEY. May I ask this, judging now from the latest knowledge available to you and to the engineers, how much of a water supply is there lacking for that parcel of land under those water rights?

Mr. HENNESS. Over a long period of time?

Senator DOWNEY. Yes.

Mr. HENNESS. I would rather leave that to the engineers.

Senator McFARLAND. We will have some data on that.

Mr. HENNESS. I do know this, this year our allotment is 0.85 which is less than one-fourth of the need. Last year it was 0.85 and with a little summer run-off that was increased another 0.15 and we got an even 1 acre-foot. That is 1946. The year before it was 2 acre-feet.

Previous to that we had 3 years following the rather heavy run-off of the winter of 1940 and 1941 when we had, you might say, plenty of water.

Senator DOWNEY. I think you say in your written statement there has only been this one field farmed out of that since 1943.

Mr. HENNESS. That is right.

Senator DOWNEY. So in 1944, 1945, 1946, and 1947 you have only had a comparatively small acreage.

Senator MILLIKIN. What does a water right sell for?

Mr. HENNESS. We do not sell it.

Senator MILLIKIN. It cannot be severed from the land?

Mr. HENNESS. Several years ago some exchanges of water rights were made where the land was found to be unsuitable for agriculture, and the same man owned both pieces of land, and it was approved by the Department of the Interior.

Senator MILLIKIN. Suppose there were four pieces of land down there and someone wanted 4 acre-feet of water for one of the 160-acre tracts, could he buy the water rights from the other three and concentrate it on the other 160 acres?

Mr. HENNESS. He owned the land?

Senator MILLIKIN. I mean owned by different people. In other words water rights are not generally salable?

Mr. HENNESS. No, sir.

Senator MILLIKIN. They are strictly appurtenant to the land except upon special showing, which I assume is passed on by some kind of official in Arizona. Is that right?

Mr. HENNESS. These exchanges I was telling about were set up legally but they had to be approved by the Secretary of the Interior.

Senator MILLIKIN. Is that a correct statement of the situation?

Senator McFARLAND. That is correct, Mr. Chairman.

This project was developed by the Indian Service. Half of the land is on the Indian reservation and half off the Indian reservation.

Senator MILLIKIN. My general question is, Do you have the right in Arizona to transfer your water right to other land?

Senator McFARLAND. There is no right under State law. The Interior Department has granted in some instances, where the soil was poor, a few applications for the transfer of water rights and redesignation of other lands to be irrigated in the San Carlos project.

Senator DOWNEY. Judged not by what you might consider the intrinsic value of this land for agriculture with the water rights the way they are now, but judged by purchases and sales made, of \$225. Would you say about \$225 would be the ordinary selling value as now fixed?

Mr. HENNESS. Yes; from \$200 to \$225. I can give you several instances.

Senator DOWNEY. Would you estimate there is about half enough water supply there under existing conditions?

Mr. HENNESS. Under existing conditions there is probably only one-fourth enough.

Senator DOWNEY. I mean over a long period of time, taking your good years with your bad.

Mr. HENNESS. Again you get into an engineering problem. I would consider 4 acre-feet were necessary. I doubt whether over the period of years since this project was instituted that the water supply has averaged much over 2 acre-feet.

Senator DOWNEY. Over a long period of time.

Mr. HENNESS. The dam was dedicated in 1928 with the first flow of water in 1929.

Senator DOWNEY. It is the testimony of the Bureau of Reclamation that it will cost about \$500 an acre-foot to provide this water.

Mr. HENNESS. Not an acre-foot, an acre.

Senator DOWNEY. It is to be available to the farmers at a cost of \$300,000,000 for six hundred thousand-odd acre-feet. On the basis of 2 acre-feet per acre, the cost of this San Carlos project alone for replenishment purposes would be \$1,000 an acre.

Would you think, as an economist, it would be good public policy for the Government to spend or advance \$1,000 an acre to help sustain land that is only worth, with water, \$200 or \$300 an acre?

Mr. HENNESS. In the first place, Senator, I will say I am not an economist.

In the second place, I cannot answer your question this way.

If you can tell me how to measure the value of not only land but of a civilization built upon the land—homes, churches, schools, and the happiness of the people—perhaps I can answer your question.

Senator DOWNEY. Suppose there are large areas of desert land in the Southwest to which the waters of the Colorado could be applied at \$100 or \$200 an acre, would that affect your judgment?

Mr. HENNESS. I would consider the answer that would determine that matter would be a legal question and the rights of the different States in the matter, and I am not prepared to discuss that subject.

Senator McFARLAND. Mr. Chairman, our time is very limited and we are trying to get through with these witnesses. We could prolong this discussion indefinitely. I would like to complete this line of testimony. We have some engineers who will be glad to answer, Senator Downey.

Senator MILLIKIN. I do not believe the witness holds himself out as an expert on these matters.

Senator DOWNEY. I will wait, then, Mr. Chairman.

Senator MILLIKIN. What would this land be worth without water rights?

Mr. HENNESS. If that land had no ground water which could be developed, it would be worth nothing. If it had ground water which could be developed, it would be worth now about \$5 to \$40 an acre.

Senator MILLIKIN. If it had no underground water?

Mr. HENNESS. If it had no underground water, it would probably be worthless.

Senator MILLIKIN. Mr. Larson, what was the expectation of Coolidge Dam as far as these lands were concerned?

Mr. LARSON. I did not hear you.

Senator MILLIKIN. What was the expectation of Coolidge Dam as far as these lands were concerned? How much water did you expect to put on these lands?

Mr. LARSON. That is a project developed by the Indian Service.

Senator McFARLAND. We will get that information for you, Mr. Chairman. The engineering data has not proven to be correct. There is not the water we thought there was for this project.

Senator MILLIKIN. All right.

Senator McFARLAND. I believe these data were taken from the Army engineers.

Mr. HENNESS. Did you have any other questions, Senator?

Senator DOWNEY. No.

Mr. HENNESS. I have several other photographs that illustrate what a farmer in an area where there isn't enough water is up against. Here are two taken on my neighbor's farm. The first shows land that has been uncultivated for 3 years. In the background you can see the farmstead. It includes a \$20,000 home and other improvements, and without water they are not backed up by much. The other shows part of another 160 acres, idle for 2 years. You can see the old cotton stalks.

Senator MILLIKIN. Is that long-staple cotton?

Mr. HENNESS. No, sir.

Senator McFARLAND. We grew it at the request of the Secretary of Agriculture during the war. We can grow it.

Senator MILLIKIN. All right, go ahead.

Mr. HENNESS. And here is another photograph. It shows part of the Weaver farm, 80 acres. Three years ago the owner gave up and sold this farm, which had been in his family for over 30 years. He moved to Oregon and is now driving a truck. The people who bought it own adjoining land and are diverting its water to that land.

Here is a photograph of an alfalfa field on the Kochsmeier farm. It produced one crop of hay, the first cutting. By now it should be heavy with the fourth cutting. Instead you see large "burnt" spots, and some thin growth on spots which happened to have a little more submoisture.

The next two photographs are taken on the Overfield farm, one of the early developed places in our county. The first shows an alfalfa field that has not been watered in 2 years and in which most plants are now dead. This is typical of two-thirds of this farm. The second is taken of the remaining acreage to which has been diverted all of the water allotted to the entire farm in the past 2 years. It cost money to plant and then lose that alfalfa.

Senator MILLIKIN. I think it is abundantly clear to the committee, Senator, what happens if you do not have water.

Senator MacFARLAND. Very well, do you think that is sufficient?

Senator MILLIKIN. Senator Ecton, do you wish more illustration?

Senator ECTON. I do not think it is necessary.

Mr. HENNESS. I only have one or two more illustrations.

Senator MILLIKIN. Very well; go ahead.

Mr. HENNESS. Now, let's take a look at the irrigation structures that serve these lands when there is water.

I don't have a photograph of the Coolidge Reservoir, but let me assure you it went dry almost 2 months ago. Here is a photograph of the Gila River just above our Ashurst-Hayden diversion dam. Were storage water available in Coolidge Dam, at this time of year 1,000 to 1,200 second-feet of water would be flowing in this river, which is now a dry sandy bed. The photographer turned around and took a photograph of the diversion structure and gates. That isn't water you see; it is dry sand and silt.

And here is another photograph taken about one-eighth mile down the canal, looking toward the diversion dam. This canal is the sole artery that carries life-giving water to the 100,000 acres of the San Carlos project. It is dry now and no water can be expected until the latter part of July, when summer rains usually give some flash run-off. That photograph was taken on the 13th of this June.

Senator MILLIKIN. When should that canal have water in it? Is it your point that at the date you mention that canal should be full?

Mr. HENNESS. Yes; it should have from 1,000 to 1,200 or 2,000 to 2,400 acre-feet in 24 hours. Now it is dry and the reason it is dry is because the Coolidge Dam, some 80 miles up the river, is dry.

I am using these photographs to show what the farmers are doing down there trying to meet some of their problems.

One measure of conditions during the drought is the effort farmers are making to help themselves. Here is the concrete-line Pima lateral,

the sole source of gravity water for the 50,000 acres of Indian-owned lands in our project. It, too, is dry.

Here is another photograph showing a project-owned pump pumping into this lateral. This pump provides, I would estimate, about 3 acre-feet of water each 24 hours, but it is doing its best.

Here is another photograph taken further down the main canal. You can see the remains of a sandbag dam built in an effort to divert a small head of water, hardly enough to more than wet the bottom of this canal, into a gate so it could wet a suffering crop.

Next is a project-owned pump pumping into a canal. In order to save evaporation and seepage a dirt dam has been built just above the spot where the water enters the canal.

And here is a canal plugged with canvas in an effort to divert water to a dirt tank where cattle can be watered.

Senator MILLIKIN. There at a time when under the expectations they should have water?

Mr. HENNESS. Here is the irrigation season when they should have water.

Senator MILLIKIN. Was that a canal intended to be supplied by pumping?

Mr. HENNESS. No, sir; gravity supplemented with pumping.

I hope these photographs haven't bored you. I have used them to try and give you a visual picture of what the situation is on the San Carlos project this 26th day of June 1947.

Now I want to talk to you about another 163,000 acres of land in our county. This is irrigated land watered exclusively by pump. These lands have no gravity water right. They are watered by privately owned pumping plants. They are drawing their water supply from underground storage, which according to carefully kept records of the Geological Survey, is being taken out much faster than the recharge to the underground basin.

In 1931, 16 years ago, there were 69,446 acres of land in cultivation in Pinal County, most of which was in the San Carlos project. Today the figure approximates 250,000. In 16 years, our agriculture has expanded three and one-half times, mostly through pump development. This figure of 250,000 represents cleared and leveled land that has been farmed, but it is not a total of land farmed in any one year.

This expansion was brought about by men and women who saw rich land which needed water, and who were willing to do the hard work and make the investment necessary to clear and level and prepare it for irrigation.

As the depth of water declines, the expenses of pumping water are increased and the volume decreases, and less land can be farmed. Other witnesses will provide information on this subject.

With this expansion of agriculture has come expansion of business and growth of towns. Twenty years ago Coolidge was a small cluster of buildings built around the intersection of the railroad and our main county highway. Today it is an incorporated town of over 3,500 people. Eloy was only a siding on the railroad, where one pioneer farmer shipped a few cars of lettuce each winter. Today it has a population of over 2,500. I have the freight loadings for Eloy last year, and carlots coming in—1,553 carloads of farm produce were shipped out, 1,036 of which were winter vegetables. Prob-

ably an equal volume of crops were hauled by truck. We have no record of these; 514 cars of food and supplies and manufactured goods were shipped into Eloy in the same year. Much more was trucked in.

Such a volume of business to be sustained and increased must be based, under our conditions, upon an adequate and dependable water supply. What does the future hold?

If I am to judge the future I must forecast separately for the San Carlos project which receives gravity water, and the pump lands, which do not. I would say that on project lands we will have years with ample water when run-off is good, and other years of shortage like we are experiencing now. I am not a weather prophet but that is the record. Under such conditions we can never have a permanent and satisfactory agriculture. Our farmers can never adopt those farming practices the value of which they know so well, and which make for a successful and continuing agriculture.

And now for the pump lands. With a declining water table the future offers more expensive and less water, added investment in greater horsepower equipment for pumping, abandonment of tens of thousands of acres to the desert, practical exhaustion of the underground water supply except in the more favored areas of shallow lift.

Some of the photographs I have exhibited show that the desert even now, in this period of high farm prices, is moving back. The desert is reclaiming its own. There will be more and more of this, in my judgment, in the years to come. Already many good farm families have left, and more will go. Total county agricultural output will drop and income will in turn decline. With this will come a blighting of the investments made in the several towns of our valley by businessmen and those whose living depends upon agriculture, and by our farmers.

Winter vegetable harvest and other work that now furnishes a livelihood for some 5,000 migrant workers, and which may, with adequate water, furnish work for 10,000 or more, will furnish less and less jobs.

In my judgment, our county at the present is producing less than one-half of what it could produce were sufficient supplemental water available to firm the present supply. The future situation that I have described can be avoided through the provision of those structures that will make available additional water to firm the present supply, coupled with the wise use of our present water resources.

Senator MCFARLAND. Do you have some questions?

Senator DOWNEY. I have a very few brief questions, Senator.

Senator MILLIKIN. Go ahead.

Senator DOWNEY. What proportion of this land in Pinal County is in cotton?

Mr. HENNESS. This year we have 105,000 acres of cotton. The total farm land is approximately 250,000.

Senator DOWNEY. So about 40 percent of your land is in cotton?

Mr. HENNESS. That is right.

Senator DOWNEY. Is that the largest acreage you have, cotton?

Mr. HENNESS. That is the largest crop we have. We grow about 60 percent of Arizona's cotton.

Senator DOWNEY. What is the acreage devoted to the next largest crop?

Mr. HENNESS. Alfalfa, probably 60,000. It is not produced very much on account of the water shortage.

Senator DOWNEY. Your next largest crop?

Mr. HENNESS. Senator, grain, barley, and some wheat.

Senator DOWNEY. Do you have some citrus areas in that section?

Mr. HENNESS. We have some areas that we consider suitable for citrus.

Senator DOWNEY. Do you have any orchards at all?

Mr. HENNESS. No. Let me correct that. We have a few small orchards in the eastern part of the county, way up here, you see [indicating].

Senator DOWNEY. They are not affected by this condition you are talking about?

Mr. HENNESS. They are on a little creek there and seem to be getting along all right.

Senator DOWNEY. Your figures seem to indicate on your pump lands you have 69,000 acres in cultivation in 1931?

Mr. HENNESS. That is total land. That is the 1931 acreage and approximately all of it is on the San Carlos project.

Senator DOWNEY. I did not understand that.

Mr. HENNESS. Yes, sir.

Senator DOWNEY. Did you have any land irrigated by pump in 1931?

Mr. HENNESS. Yes. I could not say how much, but several thousand acres.

Senator DOWNEY. But a very minor amount?

Mr. HENNESS. Yes; not near as much as now.

Senator DOWNEY. Oh, yes. Well, as a matter of fact practically all of that area that has been developed by pumping, that 163,000 acres has gone in since 1940, has it not?

Mr. HENNESS. Well, I would have to figure the amount. A lot of it has. I would say too we put in a lot of new land in 1936 and some in 1937.

Senator DOWNEY. I am talking about your pump land.

Mr. HENNESS. The pump land. I am talking about the pump land too. I would say fully half the pump land has been put in since, that is, for the first crop since 1940.

Senator DOWNEY. Has there not been a great deal more than that, Mr. Henness?

Mr. HENNESS. I do not believe so. I would have to look up the records.

Senator DOWNEY. Could you get the figures?

Mr. HENNESS. I do not know where we could get very adequate figures. I will try.

Senator MILLIKIN. Why should they not be easily obtained?

Mr. HENNESS. Down in our county all these pump lands are privately owned enterprises and we have no over-all council, company, or association or anything of that sort to collect that information, and we do not have the time or facilities to get it.

We do get it on the San Carlos project accurately.

Senator DOWNEY. Mr. Henness, I hold in my hand here a pamphlet printed by the central Arizona project. Under the heading of "Pinal County counts agricultural growth as a national asset." It shows

figures indicating that the farm acreage in this county increased from 110,000 acres to 300,000 acres from 1941 to 1945.

Mr. HENNESS. We had nothing to do with arranging that.

Senator DOWNEY. I am just asking you, do you or do you not think those figures are accurate?

Mr. HENNESS. I do not consider that 300,000 correct. I just told you we have approximately 250,000 acres in my testimony.

Senator DOWNEY. I am glad to have you make that statement and that is the correct answer, but the pamphlet says that there was an increase from 1941 to 1945 of almost three times over, which would indicate that, on that ratio, practically all your pump area must have come in in the war years.

Mr. HENNESS. The 300,000 figure is 50,000 acres too high. This is sort of in the nature of a chamber of commerce publication.

Senator DOWNEY. Do you think then it would be a fair statement to say the land in your county did increase from 110,000 to 250,000 acres since 1941?

Mr. HENNESS. Oh, you see we had 100,000 acres in the project all this time with the exception of the little that is not developed in the Indian lands. So, I would say the 110,000 acres for 1941 as the total crop land is too low. I think we had more than that in 1941.

Senator DOWNEY. How much more did you have?

Mr. HENNESS. As an approximation I would say probably that acreage should be nearer 125,000.

Senator DOWNEY. I think that is all, Mr. Chairman.

Senator MILLIKIN. Senator McFarland.

Senator McFARLAND. No questions.

Senator MILLIKIN. Thank you very much.

Senator McFARLAND. Mr. Chairman, I wonder if we could have Dr. Barr to outline the high points in his statement and probably the rest of his statement in the record?

Senator MILLIKIN. How long will it take him?

Senator McFARLAND. Just as long as the chairman will listen.

Senator MILLIKIN. I am going to recess. Have you any quick witness?

Senator McFARLAND. He is as quick as any.

Senator MILLIKIN. How long will it take to give his testimony?

Senator McFARLAND. How long would it take you, Dr. Barr?

Dr. BARR. About 7 or 8 minutes.

Senator McFARLAND. His testimony will be an answer to quite a number of questions the chairman has been asking in regard to income.

Senator MILLIKIN. All right, let us have it.

Supplementing what I said earlier, it is the hope of the Chair that Arizona can finish its case tomorrow afternoon in the main, and that California can start Saturday morning, that California will be through by Wednesday and that Arizona will complete its rebuttal on next Thursday.

Now that may be subject to some changes, but roughly that is what is in the mind of the Chair in timing this.

Senator McFARLAND. Our difficulty has been that so much time has been occupied by the Reclamation Service. We have had very little time to present our case in chief; that will not give us our 8 hours.

Senator MILLIKIN. The Reclamation Service was testifying in your behalf.

Senator McFARLAND. I thought that was not to be counted against us.

Senator MILLIKIN. Arizona will be dealt with fairly.

Senator McFARLAND. We will put quite a number of our statements in the record.

Senator MILLIKIN. All right.

**STATEMENT OF DR. GEORGE W. BARR, AGRICULTURAL ECONOMIST,
UNIVERSITY OF ARIZONA, TUCSON, ARIZ.**

Dr. BARR. My name is George W. Barr, agricultural economist, University of Arizona, Tucson, Ariz.

I have been with the university 17 years, and have owned land in the Salt River Valley.

Senator DOWNEY. Mr. Chairman, I would like to intervene to say the doctor is evidently the main witness for whom I have been waiting, to test on this question of the rate of repayment for water.

I would like to have an opportunity to cross-examine.

Senator MILLIKIN. Is that pertinent to your testimony?

Dr. BARR. I have not referred to that specifically.

Senator DOWNEY. Well, he is an economist, and a man of very large reputation in Arizona.

Senator MILLIKIN. Of course we do not intend to examine him on anything he does not testify to.

Senator DOWNEY. Very well, Mr. Chairman.

Dr. BARR. I have a prepared statement, a part of which I would like to present orally and the entire text of which I would like to present as a part of the record.

Senator MILLIKIN. Very well.

Dr. BARR. The development of irrigation has been costly. At times it has appeared that the expenditures were unnecessarily large and that public and private money was being wasted, but now that the system has been developed neither the State nor the Nation would want to do without the irrigation or the population and the business economy which this irrigation development supports. The net result has been the development of the forty-eighth State—a State which has contributed much to the entire Nation by extending the climatic range of the country, by providing an area for wholesome relaxation, recreation, and physical recuperation for many Americans. From an agricultural point of view the irrigated acreage developed has supplied in part the food required for this growing population, and has provided America with winter vegetables and other specialties, many of which cannot be produced in most parts of America.

An important problem from the standpoint of the stability of the economy of Arizona results from the inability of the present irrigation systems and private wells to permanently maintain the present irrigation development. A study which I made in the winter of 1945-46 indicated that the amount of water delivered to Arizona farms in 1945 approached 3,000,000 acre-feet, of which about one-half was pumped from ground-water supplies.

A still higher percentage of the total water delivered was pumped from ground-water storage in the year 1946. The bringing of additional Arizona land into cultivation since 1930 has been made possible, almost exclusively, by the drilling of wells and pumping from ground-

water reservoirs. Most of this development has been by private enterprise.

Each year since 1940 it has become increasingly evident that the underground storage of water is being depleted at a far greater rate than it is being replenished.

A study of the reports of the Geological Survey and of the records of ground-water use in the Salt River project, in the Roosevelt Irrigation District, and in other Maricopa County projects leads to the conclusion that possibly one-half of the pumped water, or 750,000 acre-feet pumped in Pinal, Maricopa, Pima, and Santa Cruz Counties in each of the years 1945 and 1946, was in excess of the safe annual yield. This is an ample water requirement for about 175,000 acres.

Already there is much evidence of water shortage on lands developed for irrigation. In the first place, about 950,000 acres have received water in Arizona at one time or another. Substantial blocks of this land, totaling about 175,000 acres, which have been cleared and leveled at very considerable expense is now lying idle. A portion of this land once receiving water and now idle, is within the boundaries of the San Carlos project. In this Government irrigation project, developed under the Indian Service, about one-half of the area, or 50,000 acres, is receiving no water at all in 1947.

On the other hand, of the area in the State actually receiving water a substantial portion has been allotted only from one-half to two-thirds of an adequate supply for the year 1947. The latter includes lands within the San Carlos project and within the Salt River project where the allotment is only 2 acre-feet per acre instead of an adequate amount of about 4 acre-feet.

By adding the 175,000 acres of lands once farmed but not farmed in 1946 and 1947 to the 175,000 acres that on the basis of conservative estimates will be abandoned because of dwindling ground-water supplies, there appears to be a total of around 350,000 acres once highly productive, irrigated land that will not be receiving any water at all within a very few years. This 350,000-acre area does not include any of the lands in the Salt River project or that portion of the lands in the San Carlos project that in a year of normal surface-water supply receive adequate irrigation water but on certain years, such as 1940, 1946, and 1947, received a very inadequate supply.

Since the turn of the century more than \$100,000,000 has been spent in developing irrigation systems and irrigation facilities for Arizona. In terms of April 1947 dollars this amounts to nearly \$200,000,000.

In the half century period of this development both Government and private funds were used, but nearly 60 percent were private funds. Interest rates varied from 3 percent to 10 percent but probably averaged around 5 percent. The annual interest charge on the entire sum expended was around \$5,000,000. In terms of 1947 dollars this annual interest charge would be around \$10,000,000. This amount of money, in turn, would pay interest on a \$400,000,000 debt assuming interest rates of 2.5 percent could be obtained. This latter rate is probably higher than would obtain if new construction were undertaken by the Government.

The expenditures in developing 400,000 acres of permanent agriculture when adjusted to 1947 dollar values and 1947 interest rates was the equivalent of \$1,000 per acre.

This looks like a large cost, but in looking back on the expenditure one would not say that the development should not have occurred because the cost was too high. In fact it would seem that a future generation might look back on an expenditure now of a like amount, \$1,000 per acre, as justifiable for providing a permanent water supply for new lands in Arizona. Such an expenditure per acre would appear to be more readily justified if it were used, as is now contemplated, to provide water for land that has already been cleared, leveled, laid out for irrigation, and possibly provided with other improvements, and in all cases farmed for a period of time.

While it is recognized that the purpose of the proposed project is to provide supplemental water for land already irrigated, the effect might be expressed in the following ways: If water permanently available were applied to an acreage which it would properly irrigate then the State's irrigated area would be limited to 600,000 acres.

One million acre-feet of additional water used and reused in central Arizona should furnish ample water for 300,000 acres in addition to the 600,000 acres already provided with an adequate supply. A cost of \$300,000,000 or \$1,000 per acre in terms of 1947 dollar values and interest rates, would appear justified. It would add 50 percent to the permanent agricultural wealth of the State and provide the agricultural basis for an Arizona State economy one-half greater than is provided at present. When this additional water is used as a supplemental supply it will produce even more additional return because of the increased efficiency in the use of irrigation water that is associated with an adequate supply.

Senator MILLIKIN. Any questions?

Senator DOWNEY. I do have certain questions I would like to ask, but I do not want to detain the chairman.

Senator McFARLAND. May we do that on California's time? We cannot present our case and lose a lot of time on cross-examination.

Senator DOWNEY. Mr. Chairman, I have only cross-examined two witnesses out of the seven.

Senator MILLIKIN. The Chair is making allowances for cross-examination, and Arizona will have the time necessary to present her case.

Senator McFARLAND. Thank you.

(The prepared statement of Dr. Barr is as follows:)

STATEMENT OF DR. GEORGE W. BARR, AGRICULTURAL ECONOMIST, UNIVERSITY OF ARIZONA, TUCSON, ARIZ.

The growth of Arizona as a Territory, and later as a State, has been closely associated with the development of irrigation. From 1900 to 1947 the acreage receiving irrigation water increased about fourfold, from 200,000 acres to 775,000 acres. In that time the population increased sixfold, from 123,000 in 1900 to an estimated 700,000 in 1947. The development of irrigation has been costly. At times it has appeared that the expenditures were unnecessarily large and that public and private money was being wasted, but now that the system has been developed neither the State nor the Nation would want to do without the irrigation or the population and the business economy which this irrigation development supports. The net result has been the development of the forty-eighth State—a State which has contributed much to the entire Nation by extending the climatic range of the country, by providing an area for wholesome relaxation, recreation, and physical recuperation for many Americans. From an agricultural point of view the irrigated acreage developed has supplied in part the food required for this growing population, and has provided America with winter

vegetables and other specialties, many of which cannot be produced in most parts of America.

But in recent years new problems have developed. In the first place, irrigation development has not kept up with population growth. (Fig. 1, table 1.) Especially has this been true since 1920. Had irrigation development kept up with the population growth Arizona would now have almost 1,200,000 acres irrigated instead of less than 800,000. This failure of irrigation development to keep up with population growth has been a factor in shortages of some common foods that are ordinarily produced near the point of consumption, such as fresh milk.

A still more important problem from the standpoint of the stability of the economy of Arizona results from the inability of the present irrigation systems and private wells to permanently maintain the present irrigation development. A study which I made in the winter of 1945-46¹ indicated that the amount of water delivered to Arizona farms in 1945 approached 3,000,000 acre-feet, of which about one-half was pumped from ground-water supplies.² A still higher percentage of the total water delivered was pumped from ground-water storage in the year 1946. The bringing of additional Arizona land into cultivation since 1930 has been made possible, almost exclusively, by the drilling of wells and pumping from ground-water reservoirs. Most of this development has been by private enterprise.

Each year since 1940 it has become increasingly evident that the underground storage of water is being depleted at a far greater rate than it is being replenished. In a substantial portion of the pump areas the ground-water level, according to reports received from farmers and corroborated by studies made by the United States Geological Survey, has been dropping about 5 feet per year. While it has not been established how long this process can continue and irrigation water still be supplied, it appears to the careful observer that some time in the not far distant future the ground-water supply will be exhausted. There is no way of measuring exactly how much land that is growing crops in 1947 will be abandoned if no way is found to replenish the present source of water. A study of the reports of the Geological Survey and of the records of ground-water use in the Salt River project, in the Roosevelt Irrigation District, and in other Maricopa County projects leads to the conclusion that possibly one-half of the pumped water, or 750,000 acre-feet pumped in Pinal, Maricopa, Pima, and Santa Cruz Counties in each of the years 1945 and 1946, was in excess of the safe annual yield.³ This is an ample water requirement for about 175,000 acres.

Already there is much evidence of water shortage on lands developed for irrigation. In the first place about 950,000 acres have received water in Arizona at one time or another (table 2). Substantial blocks of this land, totaling about 175,000 acres, which has been cleared and leveled at very considerable expense is now lying idle. A portion of this land once receiving water and now idle, is within the boundaries of the San Carlos project. In this Government irrigation project, developed under the Indian Service, about one-half of the area, or 50,000 acres is receiving no water at all in 1947.

On the other hand, of the area in the State, actually receiving water a substantial portion has been allotted only from one-half to two-thirds of an adequate supply for the year 1947. The latter includes lands within the San Carlos project

¹ Arizona Agriculture, 1946, Arizona Agricultural Experiment Station Bulletin No. 202, p. 2.

² This is corroborated by Arizona Annual Water Level Report, 1945, U. S. Geological Survey, by S. F. Turner, mimeographed, which reported 936,600 acre-feet pumped from wells in the Gila Basin above confluence with the Salt. In addition pumping by two Maricopa County projects, Salt River Valley Water Users Association and Roosevelt Irrigation District totaled about 540,000 acre-feet. Other Maricopa County districts (Gillespie Land & Water Co., Maricopa County Municipal Water Conservation and Drainage District, No. 1, Goodyear, Litchfield area, etc.) accounted for another 200,000 acre-feet, making a gross of 1,700,000 acre-feet and net pump water delivered to the land of about 1,500,000 acre-feet.

³ This estimate is obtained as follows: The Arizona Annual Water Level Report, USGS, 1945, p. 2, states that "the amount of water pumped in excess of the safe annual yield" in Pinal, Pima, and Santa Cruz Counties was 524,500 acre-feet. A print by T. A. Hayden, Salt River Valley Water Users Association, revised 1938, entitled "Effect of Pumping on Ground Water—Salt River Project" shows that in the 7-year period, 1931-37, inclusive, the ground-water level in the SRVWU Association remained about constant and the annual pumping averaged 380,000 acre-feet. In comparison the combined pumping by SRVWU Association, RID, and Roosevelt Water Conservation District averaged annually more than 600,000 acre-feet in the years 1945 and 1946. The latter indicates pumping in excess of the safe annual yield in these three projects of at least 220,000 acre-feet which when added to the excess reported by the USGS for Pinal, Pima, and Santa Cruz Counties of 524,500 acre-feet accounts for about the total of 750,000 acre-feet without giving consideration to numerous other areas such as those west of Agua Fria River, and the Marinette, Deer Valley, and Queen Creek areas where the water table has been falling rapidly in recent years.

and within the Salt River project where the allotment is only 2 acre-feet per acre instead of an adequate amount of about 4 acre-feet.

By adding the 175,000 acres of lands once farmed but not farmed in 1946 and 1947 to the 175,000 acres that on the basis of conservative estimates will be abandoned because of dwindling ground-water supplies, there appears to be a total of around 350,000 acres once highly productive, irrigated land that will not be receiving any water at all within a very few years. This 350,000-acre area does not include any of the lands in the Salt River project or that portion of the lands in the San Carlos project that in a year of normal surface-water supply receive adequate irrigation water but on certain years, such as 1940, 1946, and 1947 received a very inadequate supply.

Since the turn of the century more than \$100,000,000 has been spent in developing irrigation systems and irrigation facilities for Arizona. In terms of April 1947 dollars, this amounts to nearly \$200,000,000. In the half-century period of this development both Government and private funds were used, but nearly 60 percent were private funds. (Table 3.) Interest rates varied from 3 to 10 percent, but probably averaged around 5 percent. The annual interest charge on the entire sum expended was around \$5,000,000. In terms of 1947 dollars, this annual interest charge would be around \$10,000,000. This amount of money, in turn, would pay interest on a \$400,000,000 debt, assuming interest rates of 2.5 percent could be obtained. This latter rate is probably higher than would obtain if new construction were undertaken by the Government.

Now, let us see what this expenditure has been in terms of dollars per acre. The increase in acreage from 1900 to 1947 for which there is a permanent water supply is about 400,000 acres (775,000 acres now irrigated, less 175,000 acres which is now irrigated but for which there is an inadequate supply of water, and less 200,000 acres already irrigated in 1900.)

The expenditures in developing 400,000 acres of permanent agriculture when adjusted to 1947 dollar values and 1947 interest rates was the equivalent of \$1,000 per acre. (\$400,000,000 divided by 400,000 acres.) This looks like a large cost, but in looking back on the expenditure one would not say that the development should not have occurred because the cost was too high. In fact, it would seem, that a future generation might look back on an expenditure now of a like amount, \$1,000 per acre, as justifiable for providing a permanent water supply for new lands in Arizona. Such an expenditure per acre would appear to be more readily justified if it were used as is now contemplated, to provide water for land that has already been cleared, leveled, laid out for irrigation, and possibly provided with other improvements, and in all cases farmed for a period of time.

While it is recognized that the purpose of the proposed project is to provide supplemental water for land already irrigated, the effect might be expressed in the following ways: If water permanently available were applied to an acreage which it would properly irrigate then the State's irrigated area would be limited to 600,000 acres. One million acre-feet of additional water used and re-used in central Arizona should furnish ample water for 300,000 acres in addition to the 600,000 acres already provided with an adequate supply. A cost of \$300,000,000 or \$1,000 per acre in terms of 1947 dollar values and interest rates would appear justified. It would add 50 percent to the permanent agricultural wealth of the State and provide the agricultural basis for an Arizona State economy one-half greater than is provided at present. When this additional water is used as a supplemental supply it will produce even more additional return because of the increased efficiency in the use of irrigation water that is associated with an adequate supply.

By way of summary it may be said that spectacular as has been the growth of irrigation in Arizona in the last 46 years, yet this development has not kept pace with population growth. The economy of the State cannot function best unless basic foods and feeds can be produced. In the urge for agriculture to keep pace with the population growth of the State there has come about an over-development of water use and of lands prepared for irrigation to the extent of about 350,000 acres, one-half of which land is still receiving water through continued annual depletion of groundwater.

Agriculture is a vital part of the economy of practically every area on earth and it is a vital part of the economy of Arizona. The State's agriculture is seriously in need of additional water, first to "firm" the water supply for the State's largest gravity projects where inadequate water supplies exist on certain years, and second, to prevent the economic losses that otherwise appear inevitable through the abandonment of at least 175,000 acres of presently productive land.

In looking back over the development of Arizona it is obvious that a great commonwealth has developed on the desert. It has been costly of money and

much more costly of human effort, but in this backward look the costs appear inconsequential compared to the results. Now that the State has been developed no one would suggest that this development was a mistake. It would seem wise for America to proceed to retain what has been developed by making such moves and expenditures as is necessary to preserve the basic agricultural economy which has developed on this desert.

TABLE 1.—*Land receiving water in Arizona and population of Arizona, 1900–46*

Year	Acres	Population	Year	Acres	Population
1900	198,000	123,000	1929	574,000	430,000
1905	247,000	123,000	1930	607,000	434,000
1910	330,000	206,000	1931	587,000	429,000
1913	363,000	236,000	1932	571,000	426,000
1914	375,000	253,000	1933	568,000	426,000
1915	391,000	263,000	1934	547,000	428,000
1916	409,000	282,000	1935	560,000	434,000
1917	440,000	311,000	1936	619,000	443,000
1918	452,000	320,000	1937	671,000	453,000
1919	467,000	329,000	1938	653,000	466,000
1920	476,000	340,000	1939	665,000	484,000
1921	475,000	351,000	1940	681,000	502,000
1922	468,000	360,000	1941	731,000	512,000
1923	474,000	371,000	1942	750,000	550,000
1924	495,000	382,000	1943	753,000	602,000
1925	518,000	393,000	1944	765,000	638,000
1926	537,000	403,000	1945	775,000	630,000
1927	556,000	414,000	1946	775,000	660,000
1928	566,000	422,000	1947		700,000

Source: 1. Data for irrigated acreage compiled by Department of Agricultural Economics, University of Arizona from records of irrigation districts and water companies and from records on file in Department of Agricultural Engineering, University of Arizona, and other sources. Acreage, 1900 to 1945, published in graphic form by counties, in Arizona Agricultural Experiment Station Bulletin No. 202, dated January 1946.

2. Population data, 1910 to 1944: U. S. Department of Commerce, Bureau of Census report entitled "Estimated Population of the United States, by States: 1910 to 1944"; 1945: "Estimated Population of the United States by States: 1940 to 1945, Bureau of Census"; 1946: OPA estimate, Apr. 15, 1946, from No. 4 Ration Book data; 1947: estimated figure by H. A. Leggett, statistician for Valley National Bank, Phoenix, Ariz.

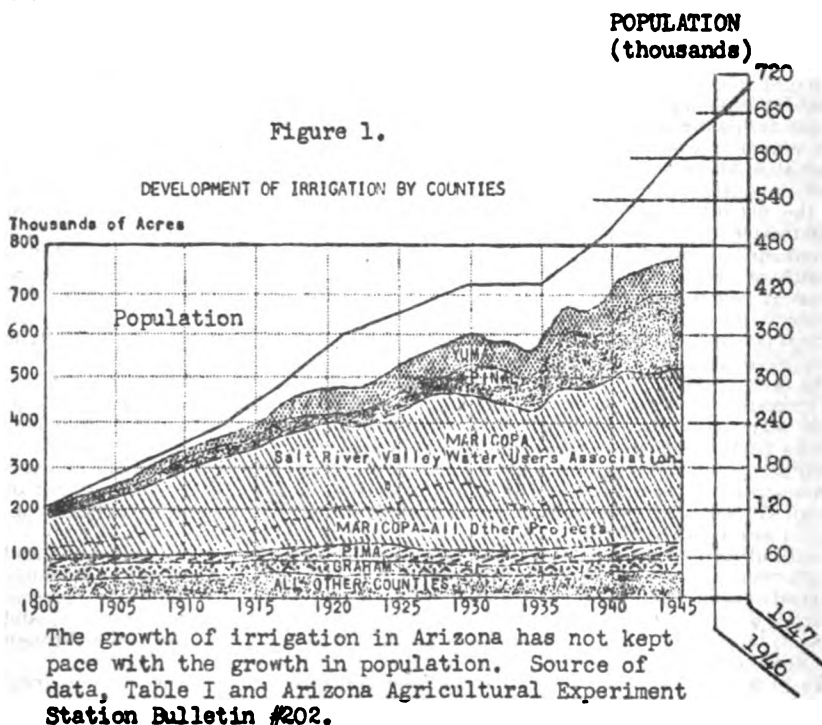


TABLE 2.—*Lands in Arizona which were at some time irrigated between 1900 and 1947, by counties*¹

Counties:	Acreage	Counties—Continued	Acreage
Apache.....	13, 000	Navajo.....	10, 000
Cochise.....	15, 000	Pima.....	35, 000
Coconino.....	3, 000	Pinal.....	260, 000
Gila.....	2, 000	Santa Cruz.....	3, 000
Graham.....	35, 000	Yavapai.....	13, 000
Greenlee.....	6, 000	Yuma.....	90, 000
Maricopa.....	465, 000		
Mohave.....	2, 000	State total.....	952, 000

¹ In preparing this table the department of agricultural economics, University of Arizona, used as a basis (1) a tabulation made by the department entitled "Development of Irrigation in Arizona by Counties," Aug. 13, 1945, which shows the maximum acreage irrigated in any year by counties, and which was put in graphic form in Agricultural Experiment Station Bulletin No. 202, dated January 1946; (2) reports at hand of many of the larger irrigation projects showing maximum acreage irrigated; (3) reports of the Maricopa County agricultural agent; also (4) a summary prepared by the Bureau of Reclamation, March 1947, entitled "Central Arizona Project, Land and Water Data—Present Conditions."

TABLE 3.—*Estimate of cost of physical facilities constructed in Arizona for the principal purpose of furnishing irrigation water to lands within the State—expenditure at time incurred, approximate date of expenditure, and estimated cost in terms of April 1947 dollars*

[Items of expenditure are rough estimates only, and the year of construction only an approximation; also prororation of Colorado River construction is not based on any detailed study. Does not include in most cases construction which has been included as maintenance cost to improve operation of projects]

Item of expenditure	Approximate amount of expenditures	Year of expenditure	Costs in terms of April 1947 dollars ¹
Salt River project system including Roosevelt Dam, Granite Reef Dam, and Joint Head Dam.....	\$12, 000, 000	1911	\$27, 500, 000
Stewart Mountain Dam.....	2, 800, 000	1929	4, 400, 000
Mormon Flat Dam.....	1, 600, 000	1924	2, 400, 000
Horse Mesa Dam and power plant.....	4, 200, 000	1926	6, 300, 000
San Carlos project.....	10, 000, 000	1929	15, 700, 000
Boulder Dam (¼ of \$70, 600, 000).....	10, 000, 000	1932-34	20, 900, 000
Carl Pleasant Dam with irrigation system and additions.....	5, 500, 000	1927	8, 600, 000
Roosevelt irrigation district system.....	3, 000, 000	1925	4, 300, 000
Gila project.....	1, 000, 000	1943	1, 400, 000
Cave Creek.....	600, 000	1922	930, 000
Laguna (¼ of \$1, 921, 000).....	500, 000	1908	1, 100, 000
Parker (¼ of \$8, 805, 000).....	1, 000, 000	1938	1, 900, 000
Bartlett Dam.....	4, 500, 000	1937	7, 890, 000
Roosevelt Water Conservation District system.....	3, 800, 000	1925	5, 500, 000
Imperial Dam (¼ of \$7, 552, 000).....	1, 300, 000	1936	2, 400, 000
Headgate Rock Dam.....	500, 000	1939	970, 000
Upper Gila system.....	500, 000	1920	4, 800, 000
Cortero Farms.....	1, 000, 000	1925	1, 400, 000
Pinal County electrical district No. 2.....	460, 000	1928	700, 000
Buckeye irrigation district.....	300, 000	1925	430, 000
Flowing Wells district.....	160, 000	1925	230, 000
Mohawk district.....	500, 000	1927	780, 000
Yuma Valley siphon and canals.....	2, 000, 000	1906	4, 600, 000
Canal systems on projects not itemized above.....	5, 000, 000	1925	7, 200, 000
Wells, pumps, and motors on 2, 500 irrigation wells capable of lifting 2, 000, 000 acre-feet of water annually. For ¼ not included above.....	10, 000, 000	1925-45	18, 600, 000
Leveling land by farmers, including lateral systems for irrigation; 800, 000 acres, at \$25 per acre.....	20, 000, 000	1910-45	33, 000, 000
Total.....	112, 220, 000		183, 840, 000

Adjusted by wholesale commodity index, Bureau of Labor Statistics.

Senator MILLIKIN. We will recess until 3 o'clock tomorrow afternoon.

(Whereupon, at 12:45 p. m., the subcommittee adjourned until 3 p. m., Friday, June 27, 1947.)

BRIDGE CANYON PROJECT

FRIDAY, JUNE 27, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to recess, at 3 p. m., in room 224, Senate Office Building, Senator Eugene D. Millikin presiding.

Present: Senator Millikin (presiding).

Present also: Senators McFarland and Downey.

Senator MILLIKIN. The committee will come to order, please. Is Dr. Barr here?

Senator MCFARLAND. Yes.

Senator MILLIKIN. Will you take the stand, please, Dr. Barr?

This is Dr. George Barr, continuing testimony from yesterday.

Had you finished with Dr. Barr, Senator?

Senator MCFARLAND. Yes.

FURTHER STATEMENT OF DR. GEORGE BARR

Senator DOWNEY. Mr. Chairman, I have here certain tables that were worked out on the basis of certain data presented by Dr. Barr. I request that at his leisure he check over our computations, which were made from his calculations, and see if our figures are correct.

Incidentally, I may explain the chart, Mr. Chairman. Mr. Larson of the Bureau of Reclamation stated that the water rate of \$4.50 an acre-foot was fixed upon the full ability of the land to pay that amount and that the basis of the ability of the land to pay was figured on farm prices of 1939 to 1944, inclusive.

Now, the income per acre as we calculated it from Dr. Barr's figures during that period was \$121 an acre. The average income per acre for the 16 years given by Dr. Barr was \$95, and the income per acre—the average income per acre for the years from 1929 to 1938, inclusive, was \$79.

And, Dr. Barr, I won't detain you longer at this time.

Mr. Chairman, I would like to put that chart in the record, subject to clarification or correction by Dr. Barr.

Senator MILLIKIN. The chart will be put in the record. And, Doctor, if you will send the committee any correction you have to make on it, those, too, will be put in the record.

Senator DOWNEY. Dr. Barr, have you your statement before you?

Mr. CHAIRMAN. I want to expedite matters, for the assistance of everybody here. So I am only going to ask Dr. Barr about some questions as to which I want to clarify my own understand of his statement.

On page 6, Dr. Barr, you have a statement that I will read to the committee:

One million acre-feet of additional water used and reused in central Arizona should furnish ample water for 300,000 acres in addition to the 600,000 acres already provided with an adequate supply.

First, Dr. Barr, may I ask you, when you refer to that 1,000,000 acre-feet of additional water used and reused, you are referring to the water that will be brought from the Colorado River under this proposed project?

Dr. BARR. I am not assuming that the water will become available. I am simply saying that if water is available of that nature, yes; that that's the kind of water I am referring to—water of that kind; yes. I am referring to a million-acre figure of water, regardless of its source, that is delivered to that same position in the central part of Arizona.

Senator DOWNEY. Yes. Very well.

You then proceed to say that this million-acre-feet of water should furnish ample water for 300,000 acres in addition to the 600,000 acres already provided with an adequate supply.

Do you intend us to understand by that, that that 300,000 acres you mentioned would get its total water supply from that million acre-feet?

Dr. BARR. As I understand the proposed project, it is an effort to provide supplemental water—I said that in the first sentence of this paragraph. So, I am simply setting up a hypothetical condition in which the waters that are now available for all the land, permanently available for the land, were supplied to a concentrated acreage of 600,000, we have enough water for that.

Now, this would assume that if an additional million acre-feet of water were brought in to those valleys, that with use and reuse there would be, I have said "ample" water—not as much as could be used but ample—for irrigation purposes.

Senator DOWNEY. Well, a million acre-feet of water applied to 300,000 acres, assuming it was all beneficially consumed, would provide $3\frac{1}{3}$ acre-feet per acre.

Dr. BARR. Without reuse.

Senator DOWNEY. No. I mean you couldn't get more than a million acre-feet of beneficial use of a million acres because beneficial use means the consumption of water; you can't get more than a million acre-feet of beneficial use. It is the maximum.

Dr. BARR. I am talking now about 1,000,000 acre-feet of water regardless of its beneficial use. I am not trying to define those terms, or work out those terms. I am talking about a million acre-feet of water that could be brought in, possibly, to the central valleys.

Now, that water, I assume, would go several ways. The first part of it, some of it, would be put in canals; some of it would go into the underground stream. I am talking about use and reuse.

Senator DOWNEY. You are not suggesting that out of a million acre-feet you could get more than a million acre-feet of beneficial use.

Dr. BARR. I am suggesting that out of a million acre-feet of water that becomes available in an area—I am setting up my own hypothetical case here—that the water would be applied to land, some of it would percolate and add to the underground water reservoirs. And I am also assuming that it would be pumped—the part that percolates would be pumped and used again. Those are the conditions that I set up here.

Senator DOWNEY. Certainly, Doctor. But if you have the optimum conditions, the perfect conditions, if you get the beneficial use of every drop of water, you couldn't get any better than 1,000,000-acre use out of a million acre-feet. You can't get something out of nothing. If you use beneficially a million acre-feet, if you get that out, it would be the optimum. You might get less. You might get seven, eight, or nine hundred and fifty thousand but you couldn't get over a million.

Dr. BARR. It is possible you could get more than a million acre-feet in the terms of what a farmer is interested in. He is interested in the water that comes down over his weir at the head of his land, and that's what he pays for.

Now, from the standpoint of my statement here, if that is the first time the water comes down, or the second time, to the farmer, it is water he has to pay for ordinarily if it is pumped by an irrigation project.

Senator DOWNEY. Well, Dr. Barr, if he got 6 acre-feet of ground application and he used beneficially 4 acre-feet and then 2 acre-feet went into the underground and then was pumped by him or somebody, you would have the beneficial use of that 6 acre-feet but you wouldn't have the beneficial use of more than 6 acre-feet.

In your calculations do you assume that 300,000 acres would be wholly irrigated by this million acre-feet of water used any way you want, over and over again? Or, do you assume it would have an additional supply beyond that?

Dr. BARR. No; I am assuming that, under my stipulation in the first sentence of the paragraph, in spite of the fact that the water, as I understand the project, is for the purpose of supplementing, and I think should be used for the purpose of supplementing water on areas that are now irrigated or have been irrigated; yet, for the hypothetical condition that I have set up here I am assuming that 1,000,000 acre-feet of water used and reused would be adequate for 300,000 acres.

Senator DOWNEY. Without any other source of irrigation?

Dr. BARR. Except the natural rainfall.

Senator DOWNEY. Yes.

And then you proceed from that to state that the cost of \$300,000,000, or \$1,000 per acre in terms of 1947 dollar values and interest rates would appear to be justified. In other words, you take your hypothetical million acre-feet of water and your hypothetical 300,000 acres, and then you take your \$300,000,000, and that averages out \$1,000 an acre, which you state you consider a reasonable allowance. That is right?

Dr. BARR. I think it is clear how I arrived at the thousand dollars per acre.

Senator DOWNEY. Yes.

Dr. BARR. Now, the question as to how I arrived at the conclusion that a thousand dollars per acre is justified. That, based upon the—

Senator DOWNEY. No, Dr. Barr. I don't want my questions to go to that. You have thoroughly covered that.

Senator MILLIKIN. He is not questioning you about that, Dr. Barr.

Senator DOWNEY. Don't you know that Mr. Larson of the Bureau of Reclamation testified that over the 50-year period, the first 50-year period, the average amount of water that would be available would only be 636,000 acre-feet and not a million acre-feet?

Dr. BARR. In preparing my testimony here I, of course, did not know what Mr. Larson would testify.

As I understood Mr. Larson's testimony, and I may not have correctly understood it, that was the amount of water that would be salable. I am not sure that that is correct but I believe that was the amount of water that was salable. If that is the case, it would be an entirely different figure than the one that I am talking about here.

I realize that as quick as water comes into an area—if Colorado River water were to be brought into the Salt River Valley—as quick as you turn that water loose there would be percolation, and there would be problems—problems of collecting for all of that water.

And then I realize that there is a salt-balance question involved, a very definite and a very serious one. So that—and it is possible that the money, that it would be difficult for the farmers to be charged for removal of salt. There are a lot of problems involved when it comes to paying for a proposition of this kind.

And I am not assuming that the farmers can pay a thousand dollars an acre for this. But I am assuming that the million acre-feet of water will have the effect of adding approximately the equivalent of 300,000 acres of permanent agriculture in spite of the fact that some of the water is going to have to be used for salt valleys.

Senator DOWNEY. Well, Dr. Barr, Mr. Larson's testimony speaks for itself, and I don't want to prolong this cross-examination. I think his testimony is to the effect that because of your difficulty with salt and the necessity of adjusting your salt balance it would take 50 years' time before the full million acre-feet of water could be utilized and that the amount that could be successfully and physically utilized on the average over that period of years out of a million acre-feet of water, would be only 636,000 acre-feet.

Senator MILLIKIN. Mr. Larson, is that the effect of your testimony?

Mr. LARSON. No. The figures that are being compared are a little different.

Dr. Barr is considering the full amount delivered to the area and considering the reuse.

As I explained in my testimony, the water that I was considering, as referred to by Senator Downey, is the water delivered to the farmer's head gate, which does not include the delivery losses. In other words, delivery losses—part of that loss would return to the ground-water basin and could be repumped, as Dr. Barr has explained.

Senator DOWNEY. Mr. Chairman, may I ask Mr. Larson a question?

Senator MILLIKIN. Surely.

Senator DOWNEY. Mr. Larson, aren't you directly on the record that over the 50 years there would only be an average of 636,000 acre-feet available for irrigation of the farmers' land?

Mr. LARSON. That is delivery to the farmers' head gates, that would be salable at \$4.50 per acre-foot.

But of the water delivered into the area we also have a statement included which shows that approximately one-third of the water delivered from the district head gates is lost in seepage and that seepage water could be repumped.

Senator DOWNEY. Yes; but, Mr. Larson, you are not contending that you can get more than 636,000 acre-feet of beneficial use?

Mr. LARSON. That is the salable water at the farmers' head gates, but he could pump additional water because of this one-third recharge to the ground-water basin.

Senator DOWNEY. You mean from the 636,000 acre-feet.

Mr. LARSON. No; from the water that is delivered to the district head gate.

Senator DOWNEY. May I ask you this question?

Of that about 300,000 acre-feet out of this water, out of the million, required for your salt balance and to carry your salt away—

Mr. LARSON. About 376,000.

Senator DOWNEY. Is there any way of charging the farmer for that, charging him for the loss required to maintain the salt balance?

Mr. LARSON. No.

Senator DOWNEY. All right.

We start with 1,200,000 feet gross diversion. Is that correct?

Mr. LARSON. Yes.

Senator DOWNEY. We lose something in other seepage and to the head gates of the canal, don't we?

Mr. LARSON. There is about 200,000 acre-feet lost in the Granite Reef aqueduct, and then 50,000 more in the Salt-Gila aqueduct. About 50,000 acre-feet of this seepage water will reach the ground-water basin.

Senator DOWNEY. So, we would have about a million acre-feet of water now that would be available for use in this area?

Mr. LARSON. That's right.

Senator DOWNEY. And about 300,000 acre-feet of that would be necessary to maintain your salt balance, wouldn't it—376,000?

Mr. LARSON. 376,000.

Senator DOWNEY. And you have stated that you see no way of compelling the farmer to pay for that 376,000 acre-feet.

Mr. LARSON. That is right.

Senator DOWNEY. And your calculation of \$4.50 an acre does not cover anything for the use of that water.

Mr. LARSON. That is right.

Senator DOWNEY. That's right.

So, Dr. Barr, I now ask you, if there are only 636,000 acre-feet of water available to sell to the farmer, you can't calculate this on the basis of a million acre-feet, can you?

Dr. BARR. As I have already said, the amount that can be sold to farmers is decidedly different than the amount that may actually be of value to an area of this kind when you bring water in from the outside because a part is the salt balance and a part is the reuse of that water.

It may be hard to charge the farmers. In fact, I am very much of the opinion that the farmers haven't in the past, and maybe cannot in the future, pay any very sizable part of such costs.

Senator DOWNEY. Well, again I want to say, of course, the record speaks for itself, but as I understand Mr. Larson, there will be between 6 and 7 hundred thousand feet available for irrigation and another 300,000 feet available to force the salt out of the area which will not be available for irrigation, but will be required to carry the salt out. It will leave the district the 600,000 acre-feet.

I think, Mr. Chairman, the record is here that later on engineers may testify. Thank you very much.

Senator McFARLAND. Just one question. Dr. Barr, you are assuming in your testimony, as I understand it, that this million acre-feet of water will be used and reused, recaptured. That is the beneficial use that you are assuming, which, if that is done, would mean more than a million acre-feet of water diverted to the lands. That is the reuse, counting upon the original diversion?

Dr. BARR. Yes. I am counting reuse in my calculation.

Senator McFARLAND. Then, as I understand your testimony, there is no difference as to whether this new water is used to take care of the salt condition or the old water is used—

Dr. BARR. Yes.

Senator McFARLAND. You have the same beneficial result to the Central Valley?

Dr. BARR. We have the salt problem regardless of whether new water is brought in or old water is used. I took the time last summer to make a rather extensive study of that, and I am convinced that there is a tremendous salt problem now that has accumulated over a period of time and which is going to get worse as more water is brought in.

Senator McFARLAND. And if the new water isn't used for that purpose and this million acre-feet isn't brought in, why, we would have to use some of the water we have now for the same purpose.

Dr. BARR. Yes; to the extent that we have water now.

Senator McFARLAND. Yes. That is all.

Senator DOWNEY. Dr. Barr, there isn't the water there now to take care of this salt balance, is there?

Senator McFARLAND. I don't want to confuse the issue.

What I am getting at is, we would have to put part of our land out of cultivation and use the water intended for it for the purpose of washing out the salt.

Senator DOWNEY. Well, all right.

Senator McFARLAND. I will call Mr. Jones and Mr. Jackson, if they will come around both at the same time, please.

Mr. Chairman, I am going to try to comply with the wishes of the chairman and close our testimony this afternoon, and we have covered the various districts in the State. We have some more testimony which we will offer by way of statements. But these boys came from the Indian part of the San Carlos project, on the Indian reservation, and I thought they ought to be permitted to speak.

I will have Mr. Jones make his statement first.

STATEMENT OF GEORGE TRUMAN JONES, MEMBER, PIMA INDIAN TRIBE, GILA RIVER INDIAN RESERVATION, ARIZ.

Senator MILLIKIN. Mr. Jones, will you give your full name, your residence and your business to the reporter?

Mr. JONES. My name is George Truman Jones. I am a full-blooded Pima Indian. The Pima Indian Tribe is located on the Gila River Indian Reservation in the south central part of Arizona between Phoenix and Tucson. I have lived all my life on this reservation. I have always taken an interest in the affairs of our reservation and its people and was elected secretary of the first tribal council which was formed after our tribe organized under the Indian Reorganization Act of 1934.

When Coolidge Dam was completed in 1929, and the Government appropriated certain sums of money for the reclaiming and rehabilitating of the Pima's land, I was employed by Pima Agency on that development job—

Senator MILLIKIN. May I ask, please, how long has that area been a reservation?

Mr. JONES. I am afraid I cannot answer that question.

Senator MCFARLAND. I believe he covered the answer, away back in the early days.

Mr. JONES. 1800—1880.

Senator MILLIKIN. Before your time?

Mr. JONES. Something like that, quite a long time ago.

And after its completion have been employed in the irrigation department which operates the Indian portion of the San Carlos irrigation project. My position with the irrigation department is water-records clerk and it is my duty to record the water that is delivered to the different Indian farmers and other water users on the project.

The Gila River Indian Reservation contains 372,022 acres. There are 50,000 acres included in the Indian portion of the San Carlos project of which about 40,000 acres are prepared and ready for irrigation. The remaining 10,000 acres still are undeveloped. On our Indian project there are 1,172 farm units varying from 10 to 80 acres. The larger acreage is possible only by leasing among ourselves as we are allotted only 10 acres of irrigable land. There are no large land holdings on our reservation but total amount of farm products and livestock produced on this project during the fiscal year 1946 had a cash value of \$575,000.

In my grandfather's day these farms were operated for subsistence purposes only but with the settlement of white communities surrounding our reservation the economy of the Indian has been changed from a subsistence economy to a competitive commercial economy which present conditions enforce upon Indian people. Our ponies are no longer an adequate means of transportation any more than our hand sickle is now an adequate method of harvesting our wheat. We have fully adopted the white man's civilization and, through the education with which our Government has provided us, we are trying to become good self-sustaining American citizens.

The Pimas have accepted the white man's social customs, his economy, and his religion to a greater extent than any other tribe in the Southwest and in so doing have contributed much toward the development of southern Arizona. We have always been friendly to the white man. There is no case on record where we have taken a white man's life, even during the turbulent times in our State's history when many other Indian tribes were hostile to white immigration. We have learned many things from our white neighbors and in turn we have enriched their culture with some things from our own. Among things our white neighbors learned from us is irrigation.

According to archaeologists our irrigation project is the oldest in America. Some of our lands have been under irrigation for nearly 14 centuries. At the beginning of the Christian era there was a race of people living along the Gila that we call Ho-ho-kam, which translated into our language means, "The people who went away." By 600 A. D., the Ho-ho-kam had progressed in their primitive civilization to the point that they had learned to divert water from the Gila

River onto the desert land and produce crops of corn, squash, and beans. Some of the old canals that these prehistoric people built have been excavated and it was found that some were as much as 10 feet deep and 20 feet wide and these were dug with stone tools and the earth carried out in baskets, for at the time they were dug there were no horses in America.

Along about 1300 A. D., another race of people known as the Salados came into our country. They were Pueblo people and lived with the Ho-ho-kam for about 150 years. Their greatest achievement probably was the building of the Casa Grande ruins which still stands as a monument to their thrift and ability. After their stay along the Gila they migrated back, presumably to the Pueblo country along the Rio Grande, and shortly thereafter the Ho-ho-kam too disappeared, and archaeologists have not found any reliable trace of where this entire race of people dispersed to. They do not know where they went but they are fairly well agreed on why they went away. It was because there was no water with which to irrigate their crops and they left in search of other lands where they could produce the simple necessities of life.

Then another race of people moved in along the Gila some time after the ancient race had gone away, and in 1694 Father Kino, a Spanish priest from Mexico, visited this tribe and he called them the Pima Indians and these people were my ancestors. Father Kino described them as "peaceful farmers subsisting themselves by means of irrigated agriculture." They had rehabilitated some of the canals of the old Ho-ho-kam and built others of their own and were able to subsist themselves adequately so long as the water flowed in the Gila. Father Kino brought in livestock and farm crops and these greatly improved the economy of the Pima people. After his death in 1711 there was a period of more than 100 years during which very few white men came into the Pima country.

Senator MILLIKIN. How many Pima Indians are there?

Mr. JONES. There are about 5,000.

Senator MILLIKIN. Are you increasing?

Mr. JONES. Yes, sir.

Our territory passed from Spanish control to Mexican control during that period and it was not until 1846 that we had any contact with the American Government. In that year Captain Kearney at the outbreak of the Mexican War led a military expedition into our country. This expedition was not against us for the white people have always been friendly to us as we have been to them. Our country was then a part of Mexico and remained so until after the Gadsden Purchase in 1854. We were able to furnish Captain Kearney food for his soldiers and his horses, and in the years following the stage route that was established across the Southwest passed through our villages because we gave not only food but protection against hostile tribes to all travelers who came our way.

During the Civil War we sold thousands of bushels of wheat to the Union Army—wheat that had been produced from seed brought in by Father Kino more than a century before. In the unsettled period following the war when it became difficult for the small population of Arizona to cope with the law and order problem in the State, we formed Company C Arizona Volunteers and were the first Indians in our State to wear the uniform of the American Army.

After the Civil War there was a flood of white migration through our country and many white people settled on the river above us and practiced our way of farming by diverting water from the stream. In a matter of a few years the river along our fields and villages was dry and for a period of 40 years we experienced severe hardships through a shortage of water with which to irrigate our lands. We sustained ourselves by cutting wood from the mesquite thickets along the river and from labor in the white communities that surrounded us.

Then in 1929 the Coolidge Dam was completed and water was restored to our land, so we thought. The dam which was to impound 1,200,000 acre-feet has never filled and for the past several years the run-off into our reservoir has been far below normal. Precipitation this year has been only 23 percent of normal and our reservoir is now dry. Our allocation of water is 0.85 of an acre-foot per acre, which means that we can farm only one out of every four acres of our small farms. Our allotments are 10 acres each, which means that I can only farm $2\frac{1}{2}$ acres of land to subsist myself and those dependent upon me. That amount is only possible because the white man with his engineering ability has located nearly 50 irrigation wells on our reservation and it is from these that we are getting our water. How long the underground reservoir from whence this water comes will supply water for our lands we do not know, nor has any of our white neighbors an answer to that question. But when that underground supply does fail, we no doubt will be in the same condition as the Ho-ho-kam and the Salados who preceded us but we will have no place to go, for there are no longer vast domains that may be had for the taking.

Our lands are our only resources—we have no oil, no timber, no industries. We are still farmers like Father Kino found us $2\frac{1}{2}$ centuries ago and we still depend on our little 10-acre farms to provide ourselves and our families with the necessities of life. We were glad to join with our white neighbors in presenting our plea to you for the building of Coolidge Dam and with them we labored for that development, thinking that with it our future would be assured. There evidently were things that neither the white men nor the Indian knew about rainfall on the watersheds above that dam, for it has not achieved what either of us had expected.

Now our white friends and neighbors have developed another idea that will provide the supply of water which we both need and we are glad to have the opportunity to work with them in this cause. We are pleased to have the privilege of joining with them, as we have throughout the history of our contact with our white neighbors, in working for the common good of both. Our white neighbors represent the fourth civilization which has depended upon this land for their subsistence. The first two of those civilizations were destroyed because of lack of water with which to irrigate their lands. Our civilization survived through the aid of the white civilization that had come in among us. Now we believe that the survival of both our white neighbors and ourselves is still dependent upon water with which we may irrigate our land and we believe that the central Arizona irrigation development is the only dependable source from which that water can be obtained.

Senator McFARLAND. No questions.

Senator DOWNEY. No questions.

Senator McFARLAND. Mr. Jackson has a short statement.

**STATEMENT OF ALFRED JACKSON, MEMBER, PIMA INDIAN TRIBE,
GILA RIVER INDIAN RESERVATION, ARIZ.**

Senator MILLIKIN. Will you state your full name, your residence, and your business to the reporter?

Mr. JACKSON. My name is Alfred Jackson and I am a member of the Pima Indian Tribe of Arizona. I was born in the village of Sacaton and have lived on the reservation all my life. I attended school in Tucson and later went to Phoenix Indian School from where I graduated in 1915. Since leaving school I have taken an active part in the social, religious, and economic life of our little community. I might add that our family have for many generations been interested in the improvement and development of our people and their reservation.. My colleague, Mr. Jones, has given you the history and background of our irrigation project and I, in turn, will tell you something about our social and economic life—the way we live, the kind of homes we build, the crops we grow, and other facts about our people.

I might say that we have been the connecting link between the prehistoric man of the Stone Age and the white man who has come into our country and created what we call the machine age. Our people did not make stone implements. Our ancient farmers planted their crop with the aid of a sharpened stick with which they opened the soil and after dropping in the seed they tamped the earth about it with their foot. Their women and children guarded the growing crop against destruction from birds and wild animals and the men themselves defended their harvest with their war clubs against marauding bands who came to steal it from them.

They grew corn, beans, squash, and cotton. Their native corn was not like that grown in the Iowa Corn Belt. It grew only a few feet in height and the small ears with their irregular rows of small round kernels seldom yielded more than 10 bushels per acre. For several centuries we have grown a little bean that we call Teppery. Some are white, some are brown, and even today they are still a favorite with our people and we grow a lot of them for our personal use. Often when the summer rains were short our corn did not mature and the quicker growing bean provided our only source of food. Our pumpkin-like squash was cut in strips and dried and stored for winter use very much as I understand the early white farmers did a century ago. From our native cotton we wove material for our breechcloth and other clothing for our women and children. When our fields did not produce the simple necessities of life for us because of lack of rain, we turned to the desert for our subsistence. We gathered the fruits of different cactus plants and dried them and stored them away. We gathered the beans from the mesquite tree, the palo verde, the catclaw, and other seeds and berries that grew along the desert washes. The early Spanish padres brought in horses, cattle, wheat, and other farm crops that we found would grow on our lands. Wheat soon became the most important item in our diet. We did not have any flour mills but we ground the whole kernels on a flat stone which we called a metate, and from this coarse flour and a little grit we made a thin cake which we cooked on coals and called tortilla. Also we placed some live coals in an earthen pot and sprinkled wheat over these coals and parched it, then ground it into fine meal which we called piñole.

We mixed this into a thin uncooked gruel which we drank and it gave us great strength. When our warriors went out to battle, a little bag of piñole tied to their belt took the place of the field kitchen in a modern army.

With the coming of American farmers into our country all these things changed. They brought in many other crops, and today we are growing alfalfa, barley, sudan grass, sorghum grains, wheat, and cotton, along with many vegetables and fruits, the same as any white farmer in our area may grow. Last year we sold 40,000 bushels of wheat, 55,000 bushels of barley, and 80,000 bushels of sorghum grains. This latter grain has taken the place of corn in the Southwest, since it yields much more per acre than corn. We no longer grow the short-fibered wild cotton that our forefathers grew, but the Department of Agriculture has developed a variety of cotton at the Sacaton Experimental Station that is known as Pima long-staple cotton, and is used all over the world. We have not been able to plant cotton this year because of lack of water. We have 3,500 acres of wheat and barley that are now ready for harvest, and it has required all of our allotment of water to mature those crops, so our cotton and summer grain sorghum will be short this year. For the past two seasons it has only been possible for us to operate about 25 percent of our land.

Senator MILLIKIN. Are your young people staying on the reservation?

Mr. JACKSON. Yes; pretty well.

Our homes are built from native materials we find close at hand. We use adobe, ribs from the giant cactus, mesquite, and cottonwood poles from along the river, and we thatch our roofs with a thick mat of arrowweeds that grow in the bottom land, and over this thatch we lay a heavy layer of earth that not only keeps out the rain but some of the heat from our Arizona sun. Our houses are quite different from the beautiful homes I have seen in Washington on my first visit to this city, but for us they are home, and we are comfortable and happy in them. I will not say we are content, for we are not. We want a house like our white neighbor has. We want an electric refrigerator and a radio and modern farm machinery like he has. We are thrifty, and we want to work and earn these things. Our climate is good, and our lands are fertile, but we have one great need, and that is water, and unless you have felt the thirst of the desert as we have it is hard to realize how great that need is.

We realize that our lands represent only an insignificant part of the wealth of southern Arizona, but to us they represent all that we have. They are our last heritage. The large commercial farms, the citrus groves, the date orchards, and the vast fields of winter vegetables that the white men have represent an immense commercial investment, while our lands mean our subsistence, our only way of making a living. We appreciate the interest of our white neighbors and the opportunity they have given us in presenting our case to you, for we want our children to share along with theirs in the benefits and the advantages that the central Arizona project will bring to both.

Senator MILLIKIN. Mr. Jones and Mr. Jackson, we are honored to have you here with us.

I think they have brought us a very eloquent and colorful sweep of present problems. We are indeed honored to have you here with us.

Senator McFARLAND. Now, Mr. Chairman, in order to comply with

the wishes of the Chair, we are going to ask permission to introduce a number of people who are here and ask that their statements be placed in the record. Part of them will be here. We will have sufficient number of people here that if there are any questions that the chairman, or any members of the committee, or Senator Downey may have we will answer them later on, and if not by these witnesses then by others.

I want to first introduce Mr. L. G. Galland, discussing the situation from the standpoint of the National Farm Loan Association, who has prepared a brief paper.

Mr. Galland is in charge—what is your official position, Mr. Galland?

MR. GALLAND. I am secretary-treasurer of the Phoenix National Farm Loan Association, serving—we have about 2,400 customers—and the Arizona Farmers Production Credit Association, serving on short-term loans throughout central Arizona.

Senator McFARLAND. We would like to have his statement placed in the record.

Senator MILLIKIN. His statement will be placed in the record. And we are glad that you have come, Mr. Galland.

(Mr. Galland submitted the following paper:)

STATEMENT OF L. G. GALLAND, SECRETARY-TREASURER, PHOENIX NATIONAL FARM LOAN ASSOCIATION, AND SECRETARY-TREASURER, ARIZONA FARMERS PRODUCTION CREDIT ASSOCIATION, PHOENIX, ARIZ.

As secretary-treasurer of the Phoenix National Farm Loan Association, I service long-term farm mortgages in central Arizona for the Federal Land Bank of Berkeley, Calif. As secretary-treasurer of the Arizona Farmers Production Credit Association, I make short-term crop and livestock loans throughout Arizona, discounting this paper with the Federal Intermediate Credit Bank of Berkeley. These two associations now operate from one office in Phoenix. They have served this district ever since they were authorized to do so by the United States Congress—the farm loan association since 1917, and the production credit association since 1933.

The history of these two loan companies is very definitely associated with the financial stability of the area which they serve. A large majority of all of the loans made by each association has been on lands and agriculture and allied livestock of the Salt River irrigation project, which comprises 242,000 acres of irrigated land located in Maricopa County, Ariz.

Since 1917 a total of 2,482 farm loans have been made by the National Farm Loan Association for a total of \$12,924,900. Our borrowers have weathered two depressions since we started to do business in this district. There have been a few foreclosures and in rare cases borrowers have deeded their farms to the Federal land bank rather than put the bank to the expense of a foreclosure action. The net outcome of these repossession, instead of resulting in a loss to the association and the Federal land bank, as is usually the case, is that our real-estate account shows a profit of \$61,000.

The loan activity of the Arizona Farmers Production Credit Association did not begin until early in 1934 when agriculture was showing a slight sign of recovery from the depression which began in 1930. Consequently, the loan record of this association is not as true a barometer of the financial stability of the district as that shown in the loan history of the Phoenix National Farm Loan Association which weathered two depressions without a loss.

I am sure you will be interested to know that our short-term credit association has made 7,400 loans for a total of over \$33,000,000. We have charged off \$2,100 in bad loans and on some of these we are still making collections.

The farmers in our district are not superagriculturists. I was born and raised on a dairy farm in Wisconsin and for a number of years after receiving my degree from the university handled middlewestern farm loans for a Chicago bank. I find the farmers of the Salt River project good average farmers. A large share of the unusually satisfactory results of our financing program should

be credited to soil and climate—our only handicap is a serious shortage of irrigation water which has materially affected our maximum crop production a number of times in the history of this project. An adequate irrigation water supply will make central Arizona outstanding in the agriculture of America.

Senator MCFARLAND. We would like to have placed in the record the statement of Mr. A. Van Wagenen, Jr., who is both a farmer and an attorney. He has been here and will probably be here during the course of the week.

Senator MILLIKIN. That will be done.

(Mr. Van Wagenen submitted the following paper:)

STATEMENT OF A. VAN WAGENEN, JR., ATTORNEY, PHOENIX, ARIZ.

My name is A. Van Wagenen, Jr. I came to Arizona in 1922 and located at Casa Grande in Pinal County.

Pinal County joins Maricopa County on the south. The Gila River flows through the county from east to west and joins the Salt River about 15 miles to the south and a little west of Phoenix.

Casa Grande, along with Coolidge, Florence, and Eloy are small towns serving the farming community which is located in what is known as the Casa Grande Valley. The floor or plane of the valley runs about 75 miles in a northwesterly and southeasterly direction and is almost 50 miles across at its widest point.

The Casa Grande Valley has very fertile soil. It is, on the whole, a remarkably level plain and merges into the fertile Salt River Valley south of Chandler. In driving from one valley to the other it is impossible to recognize any geographical or physical division. Both valleys have the same climatic and rainfall conditions. Both valleys are blessed with large areas of level fertile ground and have about the same elevations, and, in fact, the economic, social, and agricultural development of the two valleys are inseparable.

The greatest difference between the two valleys is the fact that the Salt River Valley in Maricopa County is served with irrigation water from the Roosevelt Dam on the Salt River, while the gravity irrigation in the Casa Grande Valley is served with irrigation water through the San Carlos irrigation district and from water stored by the Coolidge Dam on the Gila River.

The Coolidge Dam is intended to serve gravity water to approximately 100,000 acres of land in the valley—one-half belonging to the Pima Indians and the other half belonging to white settlers.

In addition to the gravity lands being served, individual farmers have reclaimed the desert by drilling wells and pumping water for irrigation. In this manner nearly 200,000 acres of additional farming land have been brought into cultivation and have furnished homes and independence for thousands of farm families, among whom are included many veterans of both the First and Second World Wars.

I myself came to the Casa Grande Valley shortly after being discharged at the end of the first war. I practiced law at Casa Grande and handled the legal proceedings in the organization of municipal electrical districts to bring electricity to farmers for pumping water for irrigation.

I have, therefore, had an opportunity to watch closely the development of the Casa Grande Valley for the past 25 years. I have seen the pioneers who have gone out on the hot desert, have cleared away mesquite, greasewood, and cactus, and invested their savings in a well and pumping plant to change it all to green fields, homes, and productive farms—farms that helped produce the fiber, food, and feed so badly needed during the last war.

During last summer and this spring I have noticed various tracts of land in central Arizona that are under cultivation and irrigated by gravity water. These fields are planted to alfalfa and that alfalfa is gray for lack of water, and on these fields there are grazing hungry, lean cattle trying to nibble the last sprigs of feed, and the farmers who are farming these fields are trying to pay expenses on a production basis of farming 4 or 5 acres and producing only as much as normally would be produced on 1 acre.

I have also seen the farmers who pumped water for irrigation forced to drill new wells, deeper wells, and lower their pumps to follow the falling water tables.

All because it seems that the Southwest, and especially Arizona, has entered a dry cycle. Reservoirs have gradually been depleted and the underground water supply has been called upon for more than ordinary demands to make up for the lack of surface water.

Perhaps it will rain normally next year. That might bring temporary relief, but we know now that either we must have supplemental water from the Colorado River or a large portion of the presently developed lands will go back to the desert and ghost towns will appear on the returned dry plain.

We farmers—for I am a farmer also—visit the Colorado River, where we see the water flowing peacefully into the Gulf of Lower California. We see the great Boulder Dam which regulates the flow of a part of the water into the Imperial Valley of California to irrigate hundreds of thousands of acres with such a plentiful amount of water that much is wasted into the Salton Sea. We know that practically all of this has been accomplished with funds furnished or loaned by our great Government.

In central Arizona we only need a small portion of the remaining water that continues to flow, and will for many, many years continue to flow into the Gulf to be lost forever, not only to us but to the whole United States.

In Eastern States where rainfall is plentiful rivers are of value to drain off surplus water. In the arid West the opposite is true. Water is a natural resource which when applied to the land is as valuable as the minerals which are mined or the oil which is reclaimed from subterranean sources. One acre-foot of water placed on Arizona land will produce an average of \$40 in agricultural products.

Every year millions of acre-feet of water go down the Colorado River to the Gulf. This means that not only Arizona but the whole United States has lost millions of dollars of potential wealth which would have gone to labor in producing and processing farm products. This wealth is gone—it can never be recovered. Our copper, coal, and oil remain as permanent natural resources until they are mined. Not so with the water of the arid West. Unless it is captured before it reaches the ocean it is lost, never to be recovered.

Arizona is asking that only about 1,000,000 acre-feet of water each year be brought into the central portion to save the present population and development. The cost of the project will be paid back to the Government time and time again during the life of the project. This cannot be denied. Must we in Arizona, with our parched lands, watch the waters of the Colorado continue to flow on through our State to the ocean because of lack of constructive action?

Our only hope is congressional action. Therefore, we are now before Congress seeking that aid. Passage of Senate bill 1175 will save us.

Senator McFARLAND. And Mr. Archie Bartlett. Mr. Bartlett is a Purple Heart veteran of the First World War, and he is a farmer. He owns land of his own. His boy is a veteran of this war. And he is also president of the Farm Bureau of Pinal County. We would like to have his statement placed in the record.

Mr. Bartlett analyzes the situation existing in the project, and that the project has, since the construction of the Coolidge Dam, had a shortage of water.

Senator MILLIKIN. That will be done.

Thank you for coming, Mr. Bartlett.

Mr. BARTLETT. Thank you, sir.

(Mr. Bartlett submitted the following paper:)

STATEMENT OF A. L. BARTLETT, OF COOLIDGE, ARIZ.

Mr. Chairman and members of the committee, my name is A. L. Bartlett. I appear here in behalf of the central Arizona project as proposed under Senate bill No. 1175, and in an effort to explain to the committee the urgent need for the importation of Colorado River water into central Arizona area, and to explain in particular the needs of my immediate locality for an additional or supplemental water supply.

I represent and speak not only for the general economy and interests of our valleys, but for hundreds of the smaller farmers and working people who, partly because of the very circumstances we are considering, are unable to spare either the time or the money to appear here.

I am a farmer living on and operating a farm which I own near Coolidge, Ariz. I am a Purple Heart veteran of World War I, and during the recent war served on the Pinal County USDA War Board. I am president of the Pinal County Farm Bureau. The area in which I live is called the Casa Grande Valley

and is located entirely within Pinal County, Ariz. This county has an area of some 5,350 square miles and is larger than either of the States of Connecticut, Delaware, or Rhode Island.

I went there from my native State of Massachusetts early in the year 1912, arriving just as Arizona was celebrating its admission to statehood. I have seen thousands of acres of the dry barren desert cleared, leveled, and brought to a high state of production. I have seen towns and cities built and a prosperous and substantial civilization established as a result of irrigation there. This has all been possible through the use of water which was available in our rivers and in the underground reservoirs which were found to exist under a portion of the central Arizona valleys.

We are now finding that, to some extent, our available gravity supply from the rivers has been overestimated and, perhaps more important, that the underground supply is not proving sufficient to maintain our present development. We are already seeing some abandonment because of falling water supply. Some of our farmers who were in a position to do so have already moved out. We are convinced that abandonment of both farm and urban development, and of the civilization dependent upon it, will be an ever increasing result unless the required supplemental water can be secured. Because the Colorado River is the only remaining source from which this additional water can be had, we are desperately in earnest in our appeal for Federal assistance as provided in this bill. We do not ask this as a gift or subsidy, but ask that it be approved as a justified and worth while investment—one which will more than repay its cost.

The Casa Grande Valley is part of a broad river plain formed by deep alluvial deposits from the Gila River and its two large tributaries, the Salt River and the Santa Cruz River. This broad valley is adjacent to the Salt River Valley in which lies the Reclamation Bureau's Salt River project, and which it adjoins on the south. Its irrigated portion is about midway between the cities of Phoenix and Tucson. There are now approximately 250,000 acres in cultivation in this Casa Grande Valley. This acreage amounts to about $7\frac{1}{2}$ percent of the county's total area. We have no expectation of irrigating any additional acreage and are making no effort to do so.

The irrigated lands in our area are divided into two general classes. First, we have those lands with gravity water rights, these being entitled to take water from the Gila River by established legal right. Such rights are appurtenant to these particular lands and cannot be traded or transferred at will. The waters of the Gila River are impounded behind the Coolidge Dam which is located about 60 miles east of the valley area. These waters, to the extent available, are used during each irrigation season for release down the stream and for diversion to the lands having these rights. These are the lands included in what is known as the San Carlos Federal irrigation project, and to which I may refer simply as "the project." Lands in this class are known as gravity lands because their water supply comes by gravity flow through the canals and laterals of the project system.

Our other class of lands is that which obtains its water solely from underground sources through pumping. The area of these lands has been increasing rapidly during the past few years, and the area now irrigated solely by pumping is in excess of that by diversions from stream flow.

GRAVITY LANDS

Irrigation with waters of the Gila River in my area dates back many years.

The Pima Indians have lived in our county along the banks of the Gila from time immemorial and have always been an agricultural people. They, as well as we who have arrived in more recent years, are dependent on the water supply. These Pimas have their own reservation just below and adjoining the area settled by the whites and are entirely dependent on the supply of irrigation water which may be available through this San Carlos project.

Irrigation by the whites in Pinal County commenced sometime between 1860 and 1870, being confined at first to small tracts along and near the Gila. These served an important place in the furnishing and feeding of both man and beast during those pioneer days when travel was by stage coach and mule team. Without them travel through this area would have been impossible during a large part of each year because of lack of food for the people and grain and hay for their teams. As the years went on and population increased, more and more canals were constructed and more land cleared. One canal was built about the

year 1895 which took water from the Gila at a point above Florence, at the head of our valley, and extended about 40 miles to a point west of Casa Grande. A system of laterals from this main canal delivered water along the way to about 6,200 acres then owned and farmed by those pioneers.

In those early times, without modern methods and equipment, it was necessary to rely on brush-and-fill dams to raise the water and divert it to the canals. These were insecure and unsatisfactory. The dams would be put in and repaired while there was little or no water in the river. Then, when the rains came, often the floods would be so heavy that the dams would be taken out by them. Repairs could not be made until the flow subsided, and then perhaps it would be too late to secure much of the water. At the time of my arrival there, because of this lack of security, many of the settlers had become discouraged and moved out. A new group, with new enthusiasm and optimism, was moving in. We pinned our faith on new construction and new methods. Owners and entrymen on around 100,000 acres in the Casa Grande Valley formed a mutual association and pledged themselves to meet assessments, either in labor or in cash, and start construction. I, myself, put in about 4 years of my time and all of my available money in the prosecution of that effort. Before we finally became convinced that we could not keep going and complete the undertaking we had expended some \$140,000 in the building of a main canal. This is the identical canal later taken over and completed by the United States Indian Service in their construction of the San Carlos project.

The project is composed of 50,000 acres of irrigable land in the ownership of non-Indian farmers and 50,000 acres under existing canals in Indian ownership within the Gila River Indian Reservation. The project extends along the valley of the Gila River for a distance of approximately 40 miles, the northwest portion being adjacent to the lands of the Salt River project a few miles south of Chandler, Ariz. This San Carlos project was initiated by the Interior Department through the Indian Irrigation Service, primarily as a means of reestablishing an irrigation water supply for the Pima Indians who had been irrigating from the Gila River from time immemorial. With the advent of the white men who settled along the river above them the supply of the Pimas had been depleted, and this was in some measure restored through the construction of the project. Since that construction and the initial storage of water behind the Coolidge Dam, the water supply problem of the area below the dam, on the lands of both Indians and Whites, has been altered somewhat due to the rapid expansion of other agricultural areas higher up the river above the dam and also in the areas immediately surrounding the project acreage. It has been found that demands on the Gila River above Coolidge Dam are greater than were estimated some 30 years ago when construction of this San Carlos project was under study. The pump-irrigated area in the valley surrounding and adjoining the project has been growing to such an extent that the so-called pump lands now reach to the very boundaries of the project area, and because of this pumping the gravity lands within the project have suffered along with other lands in the general lowering of the underground-water table.

It is generally accepted that lands in this locality and climate require a minimum of 4 acre-feet per year to yield efficient production. A lesser water supply results in less yield of important crops, or in the growing of the less desirable crops, and in the abandonment of crop rotation practices which are important in maintaining economic production. With proper water supply we are able to not only produce better yields of the more essential crops, but are able to follow rotation and soil-building practices which will maintain the condition and fertility of the land for future years and for the future generations who we hope will follow us there. Based on the 4 feet for each acre, the lands under the San Carlos project require a total of 400,000 acre-feet each year.

Because of the serious lack of sufficient water available through the gravity system since the construction of this project, an effort has been made to make up the deficiency by pumping from the underground into its canals and laterals, thus supplementing and adding to the gravity supply. During recent years the amount pumped by the project has exceeded the amount available from its stream and reservoir supply. Even with this pumped water included, the total which could be delivered to project lands has been considerably less than a normal supply. It still has been necessary to abandon a large part of each farmer's acreage. In this connection it must be remembered that we cannot expect this supplemental pumped supply to remain always available because of the steadily lowering underground water table. Many of the project wells have failed seriously and

some have failed completely. A program of deepening is now underway whereby an effort is being made to get this supply from the greater depths.

In the neighborhood where my farm is, water stood in the wells at 30 to 50 feet from the surface a few years ago. Now we find it at 80 and 90 feet in the same wells. In some localities water is now being pumped from more than twice that depth.

Distribution of water for use on gravity lands is under direction of the project and each acre is allotted an equal share in the stored and pumped waters available. The administrative organization responsible for the operation and maintenance of irrigation works and general administration of the affairs of the 50,000 acres of lands owned by non-Indian farmers, is called the San Carlos Irrigation and Drainage District. The care of the irrigation works and the administration of matters affecting the 50,000 acres of Indian-owned lands on the project is under the direction of the Secretary of the Interior acting through the Office of Indian Affairs.

Returning now to the amount of water available for use on gravity lands each year, I desire to make the point that the farmers on gravity lands are primarily concerned with the amount of flood run-off from the upper watershed of the Gila River which enters San Carlos Reservoir behind Coolidge Dam and becomes stored there for release to and use upon their lands below. To the extent that winter snows and early spring rains combine to produce stored water during the months of December to March, inclusive, the farmer in the valley below is assured of a controlled supply for his crops during the period following the winter months which produced the run-off and the stored supply. The heaviest run-off since the completion of the Coolidge Dam occurred during the winter of 1940-41 and the resulting stored supply carried the gravity lands for a 3-year period. However, in years of extremely low flow, where these occur in sequence such as has been experienced during the years 1944 to 1947, gravity lands enter the year with inadequate stored supply and must then depend largely on water from pumped sources. Since the pumped supply cannot be depended upon to furnish more than 20 to 30 percent of an adequate amount, an almost empty reservoir behind Coolidge Dam such as has obtained during the past 2 years, forces the gravity land farmer to restrict his farming operations to that portion of his acreage which can be served by pumps. He cannot spread the short supply thinly over all his land because by such means no single acre would yield any crop. With 25 percent of a year's supply available, such as we have on the project at present, he must farm but 25 percent of his farm area. The balance of his farm must be retired until all or a portion of it may be farmed in some future year as water from the stream may be captured in storage.

Showing this variable and uncertain supply of water for gravity lands, there is tabulated here the apportionment made available for each acre of land in the San Carlos project for the years 1938 to 1947, inclusive:

Total yearly allotment of stored and pumped water for San Carlos project, Arizona, as related to normal requirements of 4 acre-feet

Year	Total acre-foot per acre	Deficiency	Year	Total acre-foot per acre	Deficiency
1938	1.55	2.45	1943	4.00	0.
1939	1.25	2.75	1944	3.35	.65
1940	1.40	2.60	1945	2.05	1.95
1941	3.60	.40	1946	1.00	3.00
1942	4.20	0.	1947	.85	3.15

It should be noted that the above table includes water available from both gravity supply and from pumps. Of the above amounts, pumps produced 0.60 to 0.70 acre-foot for each acre. For example, during the year 1946, 1 acre-foot was allotted to each acre of land, and of this amount about 0.60 acre-foot, or 60 percent, was supplied by pumps.

A study of this tabulation establishes clearly the uncertain supply received by gravity lands in the valley. Since a yearly application of 4 to 4.5 acre-feet of water to each acre is necessary for the raising of diversified crops, the table also shows the extent of shortage being suffered by farmers under present conditions.

PUMP LANDS

I have previously referred to a large acreage which receives its water solely from underground sources through pumping. As distinguished from the gravity lands, I shall refer to this large area as pump lands.

Except for small isolated cases, pump lands lie generally in a large, compact area on the flood plain of the Santa Cruz River near the confluence of that stream with the Gila River. These lands are contiguous to the gravity lands of the San Carlos project and lie generally to the south and west of the project. Several thousands of acres of pump lands are interspersed with project lands in such manner that problems affecting one class of land become common to the interests of all.

This community of interest extends to the vital problem now facing all agriculture in Pinal County and other parts of central Arizona and resolves itself into the question of how we are to find supplemental water.

The wells from which the water supply for most of these pump lands is derived tap the ground-water reservoir underlying the Santa Cruz River. The drainage area of this stream reaches south into the higher country near the Mexican border, part of the drainage originating across the border in Mexico.

Previous to pumping development the ground-water basin was similar to an underground lake the water surface of which showed little change because no withdrawals occurred. The underflow of the stream replaced amounts which spilled over at the lower and as natural seepage or outflow from the area.

Development of lands by pumping started about 1920 and continued steadily. About 1940 it became apparent that the safe yield of the basin was being overdrawn. With the beginning of the recent war period the bringing in of new land continued at an increased rate and with the intensive crop program practiced during the past 6 years the yearly draft on ground water has increased to such an extent that water requirements for the area now under cultivation are drawn from reserves in ground-water supply, the draft being greatly in excess of the amount recharged into the ground-water reservoir.

This great area of highly developed land embraces approximately 150,000 acres. Frost occurs but rarely and the growing season extends throughout the entire year. I know of no large agricultural area which surpasses the great body of pump lands in south-central Pinal County in productivity of soil, diversity of crops, and general economic value per acre, if given adequate water for irrigation. In the years just past, when water has been generally available at economical depths, the lands have yielded exceedingly high production.

The owners of pump lands have organized their various areas into electrical districts and have bonded their lands for the construction of lines and equipment for the conveyance of electrical energy used in pumping. These organizations have proven successful, and electric transmission lines now extend into all portions of the area. Approximately \$2,000,000 is invested in electric distribution lines serving some 450 pumping plants. These pumping plants have motors of 50 to 150 horsepower each and produce from 1,500 to 3,000 gallons per minute from the individual wells.

CONCLUSION

A conservative estimate of the value of the developed lands, the constructed irrigation works, and the investment in homes and business districts in the towns and cities related to and dependent on the agricultural production would be \$50,000,000. This total would represent farm land and improvements, \$18,000,000; San Carlos project cost, \$12,000,000; electrical district power lines, \$2,000,000; industrial plants outside of cities and towns, \$500,000; city property, \$11,000,000; public utilities, \$1,000,000; telephone and telegraph, \$500,000; and railroads, \$5,000,000. I have not included here the valuation on mining properties in the northern part of the county or of the towns of Superior or Ray which are not directly related to the agricultural area.

In order to protect and preserve this development and the territory which it sustains there must be found means of supplementing and stabilizing the water supply to such extent as will make available the water needed for irrigation. I shall not venture to say just what the existing shortage, including the overdraft on ground water, amounts to each year. It is my understanding that it has been computed at from 400,000 to 500,000 acre-feet for all of the lands now under irrigation in Pinal County alone. Whatever the figure might prove to be, it is the measure of supplemental water necessary to be brought into the area if future

use is to be placed in balance with the supply. This is a portion of the water we hope to transport from the great Colorado River for use in Arizona as proposed by the bill now before your committee.

I have attempted to show the condition which must be remedied if agriculture is to survive on the San Carlos project and on this adjacent area of pump-irrigated land, and if this large and productive area is to continue to bear its important contribution to the economy of the State and Nation.

I cannot quote statistics to prove the economic values involved in maintaining the present agricultural status of our area. These will doubtless be presented by others qualified to do so. However, I am satisfied that the values involved in the preservation of highly developed agriculture on the 100,000 acres comprising lands of the San Carlos project and the additional 150,000 acres of pumped lands, a total of 250,000 acres, are tremendous. I know that the yearly contribution of these lands to the economy of the State and Nation is substantial and cannot be permitted to become lost. The welfare of some 32,000 residents of Pinal County, together with the interests of additional thousands in other portions of Arizona, is at stake.

In the past Arizona agriculture has provided opportunity for thousands of share croppers, tenant farmers, and farm laborers who were forced to leave the farming areas of other States because of adverse circumstances. These and many other thousands of persons have settled in the farming areas in central Arizona and now constitute a large portion of the population of the State. If the bulk of the farm lands in central Arizona must go out of cultivation because the present inadequate water supply is not supplemented, what is to become of the thousands of inhabitants dependent upon the successful farming of such lands is far more than merely an Arizona problem. If such persons can no longer gain the means of livelihood in this farming area they must move on elsewhere. The reestablishing homes and gainful occupations for them will fall on other States whose farming areas are already overburdened. The cost of providing relief for those made destitute will no doubt substantially increase the expenditure of State and National Governments for such purposes. This problem is obviously of such vital importance as to warrant attention and assistance by the representatives of our National Government.

Senator McFARLAND. Then, Mr. Chairman, I would like to call Mr. Leon M. Nowell.

Senator MILLIKIN. Mr. Nowell.

Senator McFARLAND. Mr. Nowell, you are president of the San Carlos irrigation and drainage district?

Mr. NOWELL. Yes, sir.

Senator McFARLAND. Mr. Nowell has a statement representing the views of the San Carlos irrigation and drainage district, which comprises the lands which are not included in the Indian reservation on the San Carlos project, which I would like to have placed in the record.

Senator MILLIKIN. We will give your statement careful consideration, Mr. Nowell. Thank you for coming.

(Mr. Nowell submitted the following paper:)

STATEMENT OF LEON M. NOWELL, PRESIDENT, 'SAN CARLOS IRRIGATION AND DRAINAGE DISTRICT, COOLIDGE, ARIZ.

My name is Leon M. Nowell. I reside at Coolidge, a town with a population of about 3,500, located in Pinal County, Ariz. I am president of the San Carlos irrigation and drainage district, an organization of agricultural landowners whose lands comprise one-half the acreage of the San Carlos Federal Irrigation project. I have owned and operated farm land within the district for many years. All of the district area is in a high state of cultivation and capable of producing high yields if given adequate water for irrigation.

I make this statement for the purpose of presenting to your committees information regarding the urgent need of a supplemental water supply for use on agricultural lands of the central Arizona area as proposed in Senate bill 1175 now before you. The entire area embracing over 600,000 acres comes within the scope of this bill and sound reasons will doubtless be presented justifying action by the Congress looking to the protection of all portions of that area.

I am familiar with the entire area under consideration. I am particularly familiar with the area along the Gila River and those lands located in Pinal County, Ariz., embraced within the area of the San Carlos project and the San Carlos irrigation and drainage district.

THE SAN CARLOS PROJECT

The San Carlos project is located along the Gila River in that portion of central Arizona known as the Casa Grande Valley. The project is composed of 100,000 acres. Half of this area is within the Gila River Indian Reservation, the land being owned by Indians, the majority of these farmers being of the Pima Tribe. The remaining 50,000 acres is under the ownership of white farmers, and is included within the San Carlos irrigation and drainage district. The district is organized under the provisions of Arizona law, and operates and maintains the white or non-Indian portion of the project. The source of water for irrigation is the run-off from the Gila River, supplemented by underground water obtained by pumping from wells.

The project had its inception in the construction of Coolidge Dam, a large concrete structure on the Gila River about 60 miles east of the project area. The reservoir behind the dam has a capacity of 1,285,000 acre-feet for the storage of flood flows of the Gila for subsequent release to and use upon the cultivated lands on the project below. The watershed above Coolidge Dam embraces a drainage area of 12,880 square miles, reaching easterly into the mountains of New Mexico and to the south across the border into Mexico.

Before white men settled in the valley of the Gila River, the Indians enjoyed unrestricted use of the water from that stream. As population increased the Indians found that incoming settlers were diverting the supply above them and for many years subsequent to 1880 the Indians found themselves without sufficient water supply to sustain their long-established farmed acres. It was primarily to reestablish the water supply for these Indian lands that the San Carlos project was constructed. The project was constructed by the Department of the Interior through the United States Indian Service.

PROJECT WATER SUPPLY

While the Indians within our project area have irrigated their lands for hundreds of years, many acres within the district area were settled and irrigated for cultivation nearly 80 years ago. Adjudicated water rights on white lands date from a priority of 1868 and several thousand acres have rights which result from appropriation and use prior to 1916. Thus it may be said that the owners within the San Carlos project, Indians and whites, pioneered in Arizona agriculture and established rights in the Gila River long before the availability and broad use of underground water was generally recognized. In 1931 approximately 67,000 acres of land was under irrigation in Pinal County. I believe that nearly all of that acreage was within the San Carlos project area and nearly all was irrigated from surface waters of the Gila.

Water rights to lands within the project and to all agricultural lands on the Gila River above the project extending for some miles into the State of New Mexico have been adjudicated by Federal court decree. The proceeding leading to the entry of the decree and the fixing of rights on the stream was instituted by the Government in order that rights in and above the project might be definitely ascertained and administered. The decree was entered in 1935 and the waters of the Gila River have been administered under its terms since that year. The decree recognizes the rights dating back to an immemorial priority on Indian lands, the priorities on lands in white ownership ranging from the year 1868 to about 1924.

Early estimates of water expected to be available for storage in San Carlos Reservoir for use on the 100,000 acres below have not materialized. These estimates, made about 1915, were based on conditions then existing and resulted in the finding that about 320,000 acre-feet would be available annually for use on project lands. The dam was completed in 1923 and the project works in the valley below were completed about 4 or 5 years later.

But conditions have changed in Arizona since 1915 and these changed conditions have affected stream flow on the upper Gila. This is due in part to addi-

tional use of water in the Safford Valley area above Coolidge Dam and to increased uses in New Mexico. Moreover, during the decade following 1880, extensive operations by the Federal Government in works for water retardation and soil conservation resulted in the diminution of flood flows and less stored water for irrigation purposes.

As a result of insufficient stored water the project installed a system of irrigation wells during 1935 and since that time the water pumped from these wells has been used to supplement the stored supply. With this combination of stored water and supplemental pumped water, the project has been able to deliver a fair amount of water to the lands of the Indians and to the lands in the district except in years of extreme drought. Here I think I should state that the total supply of water available during a given year is apportioned equally to each acre within the 100,000-acre project.

However, during years of pronounced drought, when gravity or stored water supply is far below average, all possible water must be pumped in an attempt to make up the deficiency. When these drought years occur often, or extend into a continuous period of three or four consecutive years, the sustained draft on the underground water causes the water level to recede and thus the supplemental ground-water supply falls off or, in certain areas, it may fall entirely. This combination of circumstances has prevailed on the project and in fact in many other areas in central Arizona and has brought to us the conviction that remedial measures must be taken if our agriculture is to survive.

Records of the stream since storage was begun in the reservoir behind Coolidge Dam indicate that the supply of gravity water available to the project annually is averaging about 2.5 acre-feet per acre at the point of storage. Some of this water is lost through evaporation and in transit to the lands so that our present stream supply measured at the land is about 2 acre-feet per acre on the average, for each year. We can safely pump about 50,000 to 60,000 acre-feet per year. Since the requirement at the land is about 4 acre-feet per acre, the indicated shortage for our project is approximately 1.5 acre-feet per acre per year or about 150,000 acre-feet of water per year.

Some of the members of your committee may recall that in February of this year, various officials representing the Interior Department together with officials of our district, including myself, appeared before you seeking authority to undertake the construction of an emergency program of drilling new wells and deepening existing wells on the project. We received favorable consideration at your hands, the legislation was passed and the construction program is now under way. The authorization to proceed with that work has been the means of saving severe crop loss on the project this year because our surface supply has failed and some of the new wells, drilled under that authorization, are already in operation and supplying water to crops.

POSSIBLE EARLY IMPROVEMENT TO PROJECT WATER SUPPLY

For many years landowners on the project have attempted to prevail upon the Department of the Interior, through the Indian Service, to construct an additional dam and reservoir on the Gila below Coolidge Dam. This new construction would be at what is known as the Buttes site, a short distance above the project diversion point east of Florence. Such a dam would impound floodwaters of the San Pedro River, a tributary of the Gila. The floodwaters of this stream enter the Gila below Coolidge Dam and therefore run uncontrolled past the project headworks. While these floodwaters occur frequently during summer months, the flows are violent and of short duration so that controlled diversion of any substantial quantity of such floods is now impossible. Floodwaters, so wasted past the project, amount to about 50,000 acre-feet per year. The construction of the Buttes Dam would conserve these floodwaters for irrigation use on the project.

This improvement has been considered by engineers as a necessary unit in the construction of the central Arizona project. Surveys, preliminary construction plans, and cost estimates have been completed. I know of no single construction project proposed in our area which is so economically feasible and which would result in more immediate benefit to a large part of the Casa Grande Valley than the proposed Buttes Dam. Logically, it could be constructed as one of the initial steps in the broad program embraced in the bill now before you.

INVESTMENT IN PROJECT WORKS

The investment in the San Carlos project, in terms of construction cost, is about \$12,000,000. The works built with this investment include Coolidge Dam, two diversion dams near the head of the project lands, a system of canals and laterals conveying water to the entire area, including auxiliary structures of modern design, and a power system, including a hydroelectric plant at Coolidge Dam and a Diesel-electric plant on the project area, with transmission and distribution system to all points within the area. These improvements are held by the United States for the benefit of project landowners. Landowners within the San Carlos district are under contract with the Secretary of the Interior for the repayment to the Government of their share of the cost of the project. The lien against district lands is approximately \$98 per acre.

From this basic investment there has resulted additional improvement to the area in the building of towns and cities, industrial and utility construction, and other investment to the extent that a conservative valuation of the project area is set at \$30,000,000.

These values cannot well be separated from those added values which attend the development of agriculture on the pump area adjacent to the project. Most of the improvement of this large area of some 150,000 acres is represented by the efforts of individual owners of these lands. I am informed that a conservative estimate of the values included within the total project and nonproject area in Pinal County, embracing an aggregate of about 250,000 acres together with properties related to and dependent upon agriculture, is in the neighborhood of \$60,000,000.

Most of the membership of congressional Public Land Committees are westerners and are familiar with the values involved in the construction of large irrigation projects and the improvement and expansion which follow the development of irrigated agriculture. It becomes difficult for one who is not an economist to explain all the complex values which attend this development and I shall not attempt to do so. I am sure that if a number of your membership had the time to make even a casual examination of the Casa Grande Valley, noting the lands in the project, the large acreage developed exclusively by pumping which lies generally to the south of the project in the Santa Cruz Basin, and noting also the size and character of urban development and other improvements which have resulted from and are supported by agriculture, you would be impressed with the necessity of protecting the economy of the area by any reasonable means.

Obviously crop returns from all these lands over past years has been greatly in excess of the amount invested. What they have returned in terms of taxes to the State and to the Nation, I cannot say. These figures are doubtless being made available by others better qualified in that field than I. Whatever these values may be, I am sure in my own mind that they are great enough to exert an important influence on the national economy and that they should be preserved at any reasonable cost.

Senator McFARLAND. Now, Mr. Chairman, I would also like to have placed in the record some statements of people, some of whom have been here and some who did not come, because we told them that our time would be limited.

Mr. Clyde Neely, president of the Arizona Farm Bureau Federation, showing from actual experience the necessity for additional water.

(Mr. Neely submitted the following paper:)

STATEMENT OF CLYDE NEELY, PRESIDENT, ARIZONA FARM BUREAU FEDERATION,
PHOENIX, ARIZ.

My name is Clyde Neely. I live at Gilbert, Ariz., I am president of the Arizona Farm Bureau Federation, and also president of the Arizona Crop Improvement Association, the latter being sponsored by the Agricultural Extension Service. I am speaking, however, from the standpoint of an Arizona farmer. I have been farming in Arizona for 22 years. Part of my operations are in the Salt River

Valley project and a part in the Roosevelt water conservation district. Both of these projects have a common problem—that of trying to spread their inadequate water supply to the land that has been developed within their projects.

For the past 20 to 25 years, the available supply of water has progressively decreased until it is now less than 3 acre-feet per year per acre, when we really need an average of 4 acre-feet to produce the maximum yield from our land. In those years when the available water has been at its lowest, the hardship worked on the average farmer has been very great, particularly the small operator who was not in a financial position to let a part of his acreage lie idle in order to have sufficient water for the balance. I emphasize the small farmer because the larger operator could possibly get by under such conditions.

In my farming operations I produce registered and certified seeds which include barley, wheat, flax, oats, and grain sorghums. Due to the high productivity of our Arizona soil, and the particular type of growing season, it is a well-known fact that the production of crops for seed is a matter of no small consequence. For example, in 1946 there were approximately 18,000 acres of certified grain sorghums which produced around 450,000 sacks. This seed is exported to practically every State in the Union, particularly the Southern States, a large portion of it going to Texas and Oklahoma. A great deal of barley, wheat, oats, and flax are also exported to the States that produce these particular crops. From 3,000 to 4,000 acres of alfalfa are grown for seed, the production last year being around 400,000 pounds. This likewise, is to a large extent, exported to other nonproducing alfalfa seed States.

It has been found that no other area in the United States is so well adapted to the production of sugar-beet seed as central Arizona. In 1946 there were approximately 3,500 acres planted to this crop which produced almost 11½ million pounds of seed, the average yield being better than a ton and a half per acre. This year in 1947, in Maricopa County alone, there are about 3,000 acres planted to sugar-beet seed and in Graham County there are better than 700 acres.

There are many other crops besides seed crops that are particularly adapted to our State. A great many of them probably could not be produced elsewhere.

At the present time there are approximately 725,000 acres under gravity and pump water in central Arizona. A considerable amount of this acreage is under pump entirely. With the underground water supply progressively receding, without a question of a doubt, unless additional water is obtained within the very near future, at least 200,000 acres of this highly productive land will go back to desert. This would be no less than a catastrophe. The economy of the State of Arizona is based to a very great extent on its agriculture. Obviously a blow to the economy of Arizona would also be a blow to that of the entire United States.

In 1946 the State of Arizona produced \$160,000,000 worth of agricultural products. In order to maintain the acreage that has already been developed, at least a million acre-feet of water is needed to supplement the amount now available from gravity and underground pumping.

Now I am not an engineer, neither am I a lawyer, but a farmer who is interested in the welfare of our State and Nation. I do not believe I have to be an engineer to know that our only chance for supplemental water is from the Colorado River. It is common knowledge that since the building of Boulder Canyon Dam that an average 8,000,000 or 9,000,000 acre-feet of water a year has been flowing down the Colorado River to the Mexican border.

To get this water to our land, we must have the assistance of the National Government. We are not asking for a gift. The project as proposed will pay for itself within a reasonable length of time and the National Government will benefit in many ways such as income tax returns, and so forth. The bill now before this committee, S. 1175, will authorize the building of the project and save agriculture in Arizona.

I repeat, Arizona must have supplemental water or we are faced with ruination.

Senator McFARLAND. Mr. George W. Mickle, from the chamber of commerce standpoint, covering climate, educational institutions, and class of citizens in our State.

Senator MILLIKIN. Mr. Mickle's statement will be placed in the record.

(Mr. Mickle submitted the following paper:)

STATEMENT OF GEORGE W. MICKLE, CHAIRMAN OF THE IRRIGATION AND RECLAMATION COMMITTEE OF THE PHOENIX CHAMBER OF COMMERCE AND PRESIDENT OF THE PHOENIX TITLE & TRUST CO.

I am a native of Ohio and a resident of Arizona for 33 years. I speak not alone for the Phoenix Chamber of Commerce, but for each and every chamber of commerce in our State. Virtually all organized groups of Arizona citizens favor S. 1175. We are united and unanimous in urging this committee to act favorably on this legislation.

If it were practical to have each Member of the Congress to visit Arizona for 1 week, I venture to assert that at least 90 percent of the Congress would favor our project. We seek no gift or subsidy from the Nation's Government—only a long-time loan, amply secured, that will be repaid in full from the sale of water and power. The Federal Treasury will receive vastly increased tax revenues as a result of this legislation when the project is completed. It will benefit every State in our Nation. Our agricultural products are largely specialized crops maturing at seasons of the year that will not bring them into competition to any great extent with crops from other States.

Because of our mild climate and sunshine, thousands of citizens of all States of the Union come here for relief from arthritis, sinus, heart, and pulmonary trouble. Fortunately many of them are benefited and remain here. Most of them become able to do at least light work but should remain in this climate. Our agricultural products offer the work needed by this type of citizen. Unfortunately many of them come here without sufficient finances and become a financial burden to Arizona, therefore, their native States, in many instances, are relieved of this welfare work and expense. Our State university and our two State colleges turn away thousands of applicants from out of the State, many of whom also like to take their college work in a climate less rigorous than many of the Eastern States.

We do have a mild climate and an abundance of sunshine, but sunshine alone will not support our university, colleges, hospitals, resorts, and sanitariums. We must have a supplemental water supply from the Colorado River, the last source of supply for central Arizona for the 725,000 fertile acres already in cultivation.

States east of the Mississippi indirectly are great beneficiaries of western reclamation projects. From them we purchase our farm machinery, our electrical supplies, automobiles, and most of our manufactured products. Over 50,000 carlots of incoming products of all kinds are shipped by rail annually to central Arizona from manufacturers from all parts of the United States. To them we send our raw material for conversion.

During these times when Congress is being besieged for loans and gifts for foreign nations, they should think of the old adage "charity begins at home," paraphrased "loans should begin at home."

Arizona played an important part in World War II. Because of our perfect flying weather thousands and thousands of young men were trained at our air training fields. Without the help of citizens of towns in central Arizona—towns created as a result of reclamation—these airfields would not have been discovered nor would it have been practical to use them for that purpose without water and other facilities made available as a result of reclamation.

Producing one-third of the copper of the United States, the cost per pound of copper would be greatly increased if the copper industry alone had to support the tax burden of the State without the aid of agriculture.

I am in sympathy with the economy program of the present Congress, but I repeat this is not an expense, but an investment that will prove profitable to the Nation as a whole.

Senator McFARLAND. Mr. E. Ray Cowden, from the standpoint of the livestock, cattle and sheep industry in Arizona, and relating to the relations of the livestock industry to agriculture.

Senator MILLIKIN. Mr. Cowden's statement will be placed in the record.

(Mr. Cowden submitted the following paper:)

STATEMENT OF E. RAY COWDEN, PRESIDENT, COWDEN LIVESTOCK, ARIZONA

My name is E. Ray Cowden. I reside near Phoenix, Ariz., where I have lived since 1912. I am engaged in the cattle and farming business. I operate four cattle ranches, one in southern Arizona and three in northern Arizona. I also operate a farm in the Salt River Valley. I annually grow and finish for market 5,000 to 8,000 cattle.

The State of Arizona contains 73,015,669 acres and is the fifth largest State in the Nation. There are 775,000 acres of presently irrigated land in the State or a little over 1 percent of Arizona's entire acreage. The balance of over 72,000,000 acres is suitable only for grazing of livestock. Of this total, more than 80 percent is owned and administered by Federal agencies. Approximately 50 percent of this area has an average annual rainfall of less than 10 inches which is not sufficient to produce perennial grasses.

During the period from 1920 to 1947 cattle numbers in Arizona declined from 1,620,000 in 1920 to 921,000 on January 1, 1947. Sheep and other livestock numbers also declined during this period. During the same period the human population of the State more than doubled, increasing from slightly less than 340,000 in 1920 to an estimated 700,000 in 1947. If this same rate of increase is maintained for 10 years, it is easy to see that Arizona will be required to import cattle from other States as the people of this State are now consuming approximately 235,000 head of cattle and calves annually.

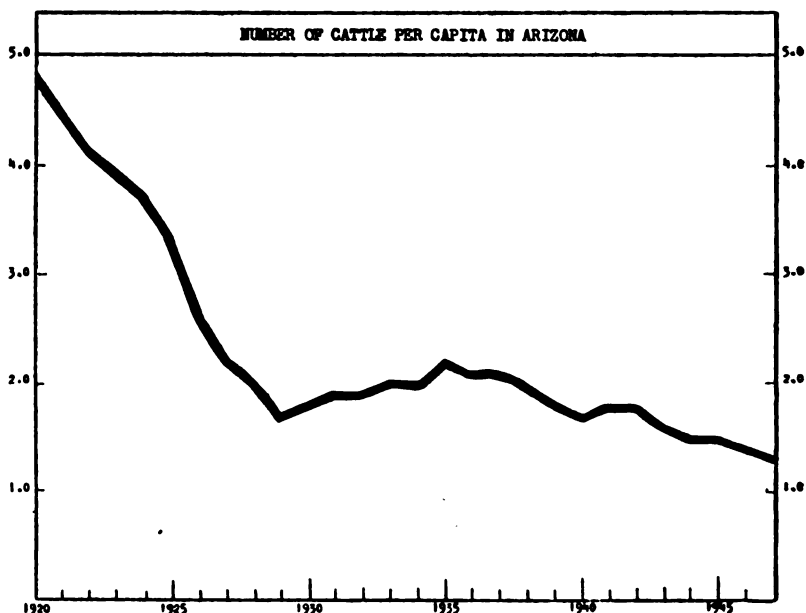
In 1946 the State of Arizona marketed approximately 410,000 head of cattle and calves. The excess over our own requirements were marketed at California markets. The records of the Los Angeles union stockyards show that cattle were received from a total of 25 States and that Arizona furnished 20 percent of the total. Sales of Arizona livestock account for 35 percent of the cash income from agricultural and ranch production.

The livestock industry in Arizona is entirely dependent on the irrigated areas of the State for pasture and feed to finish and fatten cattle and sheep for market. All of the hay, grain, cottonseed meal, ensilage and other farm products which are fed to cattle in the feed lots of central Arizona are grown on the irrigated land of the State. In addition, thousands of sheep are moved to the irrigated valleys each fall for the lambing season and are kept on the irrigated pastures until lambs are fat and ready for shipment to market. In order to maintain present production on lands now in cultivation and to continue the livestock feeding and fattening operations resulting therefrom, it is absolutely necessary that we have supplemental water. Due to rainfall deficiency and consequent reduction of our stored water, the only possibility of obtaining this supplemental water supply is from the Colorado River.

I am familiar with the requirements of water for irrigation in the Salt River Valley, having learned this through many years of farming experience and also having served 8 years on the board of governors of the Salt River Valley Water Users' Association. I sincerely request that your wholehearted support be given to Senate bill 1175 which should alleviate for all time the water shortage in our irrigated areas of central and southern Arizona.

Trend of Arizona's cattle industry

Year	Human population	Cattle population	Year	Human population	Cattle population
1920.....	339,548	1,620,000	1934.....	428,331	840,000
1921.....	350,964	1,575,000	1935.....	434,498	858,000
1922.....	360,269	1,492,000	1936.....	442,563	939,008
1923.....	370,942	1,454,000	1937.....	452,823	958,000
1924.....	382,355	1,411,000	1938.....	466,154	920,000
1925.....	392,926	1,300,000	1939.....	483,740	855,000
1926.....	403,317	1,032,000	1940.....	501,773	864,000
1927.....	413,830	917,000	1941.....	511,713	916,000
1928.....	422,412	835,000	1942.....	550,106	980,000
1929.....	430,096	735,000	1943.....	569,357	931,000
1930.....	434,110	770,000	1944.....	638,412	959,000
1931.....	428,962	800,000	1945.....	630,298	930,000
1932.....	425,968	824,000	1946.....	660,000	949,000
1933.....	425,531	835,000	1947.....	700,000	921,000



Senator McFARLAND. Mr. John T. McChesney, who deals with the date industry, showing the development thereof and the necessity of additional water in connection therewith.

Senator MILLIKIN. Mr. McChesney's statement will be placed in the record.

(Mr. McChesney submitted the following paper:)

STATEMENT OF JOHN T. MCCHESENEY, MANAGER, PHOENIX DATE CO., PHOENIX, ARIZ.

My name is John T. McChesney and my address is Route 7, Box 1172, Phoenix, Ariz. My age is 27, and for the past 2 years I have been employed as manager of the Phoenix Date Co. In 1941 I obtained a degree in civil engineering from Stanford University; then served in the Army Air Force as a flying officer for 4 years. In addition to my flying duties, I was charged with the responsibility of securing water, by new wells, for my squadron at various stations in northern Australia and New Guinea. I have just completed a rough survey of the date industry in central Arizona, and wish to submit the following statement relating to our serious water problem.

The present planting of dates in central Arizona is approximately 550 acres. This is valuable acreage involving not only long-term investment in grove property, but equally heavy investment in specialized processing, packing, and selling operations. It is valuable acreage in its production of food, producing, for example, more than three times the calories per acre obtained in wheat. It is valuable acreage in the absorption of labor, running yearly pay rolls many times greater than that of most other agricultural pursuits of same acreage. It is pioneer acreage of a youthful industry, and is still an agricultural frontier. It contributes to our high national standard of living, producing the finest quality of dates known in the world, and becoming in increasing importance an integral part of the American diet. And this acreage is of vicarious interest to the United States Government, which sponsored the introduction of date palms here and which demonstrates its continued interest by the maintenance of experimental stations in Arizona and California.

A good yield of 7,000 pounds per acre gives central Arizona a potential total annual production of 3,850,000 pounds of marketable dates. This in effect, can

amount to more than 2,000,000 pounds of natural fruit sugar. Inasmuch as one-half of the total planting has not yet reached maturity, our current production should be at least 1,925,000 pounds; actually our normal production is close to 1,250,000. This discrepancy of more than one-half million pounds can be directly traceable to inefficient grove management, insufficient fertilizing, and insufficient irrigation. Of these three causes, insufficient irrigation may be said to eclipse the other two combined. We are not getting enough water, and since date palms are able to store up and carry themselves through short drought periods, the consequences of the current shortage are not yet fully apparent. It is apparent, however, that our young palms are not enjoying normal growth and that our bearing palms are seriously wanting not only in quantity of production, but in quality.

Dates require a lot of water. The minimum requirement for normal production would be between 4 and 5 acre-feet per year, and more water than that could be beneficially used, particularly where the soil is sandy. Most of the acreage in central Arizona in dates is in the Salt River Valley Water Users' Association project. Land under that project has been allotted 2 acre-feet this year. Some of the acreage in dates will receive supplemental irrigation water from private wells but not enough to meet the desired quantity. Not all owners of date orchards are able to put down private wells, and the future projects for well water are not bright due to the consistent lowering of the underground water table due to excessive pumping.

It is estimated that by doubling his present allotment of water, the date grower could increase his production by as much as 80 percent. This would be in line with the national effort to combat inflation or recession by volume production; and yet it is beyond the power of the grower, excepting that he can add his voice to that of other industries and activities directly or otherwise reliant on water. Regarding date growing, the need for supplemental water is not merely a case for increased production. It is a case of survival, horticulturally and financially.

The date industry of central Arizona wholeheartedly supports the objectives of Senate bill 1175, and on behalf of that industry I am glad of the opportunity to submit this statement.

Senator McFARLAND. Mr. Dean Stanley—I believe Mr. Stanley's statement was placed in the record previously.

Is Mr. Lane here?

Mr. LANE. Yes.

Senator McFARLAND. Mr. Lane is an engineer, formerly State engineer in our State and, incidentally, he was county engineer when I was down there as county attorney. He is now an engineer for one of our irrigation projects. His statement summarizes the needs for water in the State from an engineering standpoint. His statement will be available, and if any questions arise which the committee may want to ask, he will be present during the course of these hearings.

Senator MILLIKIN. Thank you very much for coming, Mr. Lane.

(Mr. Lane submitted the following paper:)

STATEMENT OF W. W. LANE

My name is W. W. Lane. I am a consulting civil engineer from Phoenix, Ariz. I have been engaged in irrigation work in Arizona and the Southwest for the past 30 years, and for the past 15 years have been associated with the development and operation of the Maricopa County municipal water-conservation district, an irrigation district near Phoenix, comprising 35,000 acres.

The chief purpose of my appearance before the committee is to present data with respect to the irrigation development in central Arizona, the present water supply for such development, the need for an additional supply if the civilization as now existing there is to be fully sustained.

Central Arizona has become a large agricultural empire founded upon irrigation, and playing a considerable part in the economy of the Southwest.

In prehistoric times prior to the coming of the white man, 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 unquestionably abandoned because of prolonged droughts.

With the coming of the white man into the Southwest, irrigation of lands was revived by small earth-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 started and carried to completion. Subsequently, other dams were constructed, until now all of the principal intrastate streams in central Arizona are being put to beneficial use. Beginning in the late teens and early twenties, large irrigation wells were resorted to as a supplemental and additional irrigation supply. This type of development has gone forward progressively until now about half of the irrigated lands within this area are dependent upon such supply.

Due to the progressive installation of such wells, many farmers gave little thought to, nor understood, the source of the underground supply, but considered it inexhaustible. On the contrary, however, such underground supply is very similar to a surface reservoir. It must have an incoming supply equal to the amount pumped to maintain its level. With progressive overpumping as is now occurring, the level of the water below ground is receding rapidly, thereby increasing the depth it must be lifted, and is rapidly reaching the depth that pumping can no longer be done economically. As such occurs the land dependent upon such irrigation supply can only be returned to the desert from which it was reclaimed.

There is now approximately 725,000 acres of irrigated land in central Arizona dependent upon the two sources of water supply. This land is highly productive with an adequate irrigation supply, and without such a supply it is totally non-productive. It is mainly valley land, of good soil rather than the more sandy lands found in much of the Southwest. For this reason it holds the moisture applied for the benefit of the plants to a high degree. This land requires approximately 4 acre-feet applied to the land to result in the amount necessary to be consumed for full production. To obtain this amount at the land from river supply it is necessary to divert at its source approximately 5.8 acre-feet per year per acre, and an average of 4.6 acre-feet produced at the well. When this is contrasted with the higher requirement of water of the more sandy and pervious soils in some areas in the Southwest, it is evident that an acre-foot of water used in central Arizona produces more and, therefore, adds greater to the national wealth than the use per acre-foot in some other areas.

At the time of setting up the Federal reclamation projects in Arizona, 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, and the water supply estimated accordingly. This was based upon general farming as was the practice in general farming areas. It is of interest to note that major irrigation projects, therefore modern irrigation as we now know it, is young—all of this century. The major irrigation projects within this area were planned at the early stages of this period and without the experience that has now been had, and particularly as it fitted this area. Due, however, to the climatic conditions permitting long growing seasons and the highly fertile soils in this area, it has been found to be particularly adaptable to specialized crops out of season to most of the Nation, 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 725,000 acres of irrigated land as considered in central Arizona lie approximately as follows:

	Acres
Maricopa County-----	445,000
Pinal County-----	240,000
Graham and Greenlee Counties-----	40,000
Total -----	725,000

There are three projects within the area now having river supplies with storage dam facilities as follows:

	<i>Acres</i>
Salt River Valley project with dams on the Salt and Verde Rivers, a Federal reclamation project.....	242, 000
Coolidge project, a Federal Indian and white project with dam on the Gila River.....	100, 000
Maricopa County municipal water conservation district on the Agua Fria River.....	35, 000
Total	377, 000

Other areas or projects that have stream diversions are as follows:

From Gila River:	<i>Acres</i>
Duncan Valley.....	8, 000
Safford Valley.....	32, 000
Buckeye irrigation project.....	16, 000
Arlington irrigation project.....	5, 000
Gillespie irrigation project.....	20, 000
Salt and Verde Rivers, Roosevelt conservation district.....	40, 000
	<hr/> 121, 000

Total having stream diversions from partial supply.....	498, 000
Areas relying entirely upon pumping from the underground reservoir....	227, 000
	<hr/>

Total 725, 000

All of the foregoing projects and areas having stream diversions rely substantially upon pumping from the underground reservoirs, the amount pumped annually depending upon the annual sufficiency of the river supply. This results in a reduction in annual stream diversion below the requirements of the area or project.

The projects or areas are progressively downstream from each other. Water diverted by the upstream projects or areas is always and must be in excess of consumptive use. However, through the process of nature, excess water not consumed by plants or lost by evaporation will eventually flow or seep back into the stream and again becomes usable stream flow water, again available for diversion to areas further downstream. That amount of water diverted and not so returned to the stream is considered as consumptively used, or the diversion less return to the stream, and becomes stream depletion by irrigation. As this water is diverted and partially returned, it accumulates salts from the soils. As it passes downstream and is progressively reused, the salt content is accelerated until it contains an excess amount of salt to permit its use for plant irrigation. This has occurred within the lower areas and must be corrected by the release of salt-burdened water to protect these lower lands. The fact that this condition is now prevalent progressively down the stream is evidence of the reuse or subsequent diversions of previously diverted water.

The average annual diversions from the Gila system for the foregoing areas for the past 15 years or from 1930 to 1944, inclusive, has been 1,697,000 acre-feet. The records for 1945 and to date in 1946 are not yet completed but will be less than the above average. They are as follows:

1930.....	1, 462, 052	1939.....	1, 288, 621
1931.....	1, 591, 329	1940.....	1, 150, 513
1932.....	1, 965, 570	1941.....	2, 128, 859
1933.....	1, 746, 325	1942.....	1, 933, 273
1934.....	1, 450, 336	1943.....	1, 739, 946
1935.....	1, 709, 952	1944.....	1, 731, 889
1936.....	1, 735, 232		
1937.....	2, 143, 645	Average.....	1, 697, 000
1938.....	1, 673, 417		

Of the foregoing average diversions, it is calculated that the water so included in the total diversions is made up as follows:

[179 Bureau basin report]

	<i>Acre-feet</i>
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-----	302,000
Total-----	1,637,000

Based upon the average estimated previous diversions of 5.8 acre-feet to deliver 4 acre-feet per acre to the land, the foregoing average diversions would provide an adequate supply for 292,000 acres only of the 725,000 acres. Using the estimated delivery loss of 15 percent for water pumped or 4.6 acre-feet pumped to deliver 4 acre-feet per acre to the land, it is evident that to maintain the supply for the remaining 433,000 acres it will require 433,000 times 4.6 acre-feet or 1,990,000 acre-feet of pumped water. Without additional water added to the area it is estimated that consistent pumping cannot be maintained in excess of 1,000,000 acre-feet per annum. This leaves a deficit of 990,000 acre-feet or the equivalent without any water of about 213,000 acres which are now endeavoring to exist. This, however, will not be the actual result. The available water is under the ownership and control of several districts and many individual operators, each trying to make it on too little water spread too thin, which now does and will increasingly mean less production per acre and at increasing cost. Many more than the 213,000 acres will therefore eventually be dropped as nonprofitable to operate. To supply this acreage from stream flow using the foregoing diversion factor of 5.8, it would require approximately 1,200,000 acre-feet additional water diverted for the area.

All of this additional water cannot be consumptively used within the area. From 20 to 25 percent will become return flow to the river. This amount of such return flow will be effective in maintaining the salt balance for the area.

The above figures are based upon averages. During the past 4 years the normal rainfall and resultant river flows have been low. As surface reservoir supplies have been drawn down, more pumping has been resorted to to supplement this supply. Such operation would be normal and economic if the average demand for underground water equaled the average supply. However, when the average withdrawal exceeds the average supply, as it now does, such accelerated draft upon the underground supply, without the possibility of full subsequent recharge, can only accelerate the time when this source of supply will become uneconomic for use.

Regulation of pumping in the State is inevitable, and will be done. Such regulation, whether by law or forced by economics, and if not supplemented with additional water, can only result in curtailment of the acres now farmed, and the ultimate return of considerable land to desert, with the resultant loss to the Southwest and the Nation. While such regulation is necessary and inevitable, it is not the answer. The only answer to maintain the economy and civilization as now exist in central Arizona is additional water as above estimated.

The only remaining source from which the additional water is available is from Arizona's share of the Colorado River, from which source sufficient water is available to assure stability of the present civilization of central Arizona.

Senator McFARLAND. Now, Mr. Chairman, in order to further shorten the hearings, I would like to ask that Mr. Charles A. Carson's testimony which he gave before the House hearings on H. R. 5434 on the reauthorization of the Gila project be incorporated in the record or referred to by reference, and when the record is printed that such testimony be printed in full along with the other statements.

I can give the pages of the testimony but I can give that to the clerk later on. I don't suppose it is important.

Senator MILLIKIN. It will be a good idea to have it in because California might want it.

Senator McFarland. Yes. It is in volume II, pages 367 to 445 and 517 to 533.

(The testimony referred to follows:)

STATEMENT OF CHARLES A. CARSON, SPECIAL ATTORNEY, STATE OF ARIZONA, ON
COLORADO RIVER MATTERS, PHOENIX, ARIZ.

Mr. CARSON. Yes, Mr. Chairman. My name is Charles A. Carson, of Phoenix, Ariz., appearing here on behalf of the State of Arizona as special attorney for the State of Arizona in connection with Colorado River matters, under an act of the Arizona Legislature, which authorized the Governor to appoint attorneys and engineers.

There has been so much said here on the question and so many questions interjected here that I would like, if I can, to make a kind of a general geographical and historical statement without interruption in order to get it clear in this record as to Arizona's view on these matters.

Chairman MURDOCK. The witness may proceed to make a connected statement without interruption. Of course, there will be questions later.

Mr. CARSON. Yes; as soon as I am through.

Mr. WHITE. That was apparently for the ranking member on the Democratic side, was it not, Mr. Chairman?

Chairman MURDOCK. The matter about asking questions, well, no, not altogether.

Mr. CARSON. I wanted to call your attention to the map on the wall there of the Colorado River Basin.

This map on the wall represents by this outline the natural drainage basin of the Colorado River system, with the one exception that down here on the California side of the river it also takes in an area which comprises the Imperial irrigation district, the Coachella Valley, the Metropolitan water district area, and the county of San Diego. That is not a natural part of the Colorado River Basin. The basin line at that point is indicated with this dotted line [indicating on map]. This map [indicating] does not show the areas in the upper basin outside of the natural drainage area of the basin from which water may be utilized.

The definition of the Colorado River compact takes into account not only the natural drainage basin but also areas upon which water from the basin might be utilized, and in that connection it is interesting to note that the natural drainage basin comprises some 240,000 square miles, of which Arizona contains 103,000 square miles; California, 4,000 square miles; Nevada, 12,000 square miles; Utah, 40,000 square miles; New Mexico, 23,000 square miles; Colorado, 39,000 square miles; and Wyoming, 19,000 square miles.

This history of the controversies concerning the Colorado River is not particularly important for the consideration of this bill, it seems to me, with some notable exceptions.

The first development, aside from a small development in the Palo Verde area was at Blythe, and the Yuma project, both in California and in Arizona, was begun about 1895 by some California financiers who owned land in the Imperial Valley of California and in the Mexicali Valley of Old Mexico, and at that time they initiated the right to divert water through the old Alamo Canal through Mexico for the use of the Imperial Valley and also for the use of the Mexican land.

That contract provided that, of the water flowing through that canal, Mexico should be entitled to one-half.

The plan involved in the filing of water rights and in the operation contemplated a canal of 10,000 cubic feet per second capacity, which, if it ran all year, would be some 7,000,000 acre-feet of water, of which Mexico would be entitled to one half.

Then coming on down, the material thing, it seems to me, to this issue is this: Remember at that time, if you please, that Arizona was a territory. In the early stages of this Arizona had not acquired the status of statehood, and did not acquire that status until 1912 when the Constitution of Arizona was adopted in accordance with the enabling act of Congress passed in 1910.

In that enabling act there is a significant provision, the United States required that Arizona by its constitution agree that the United States withdraw from entry and reserve all of the power dam sites on the Colorado River across the State of Arizona with the right to withdraw and reserve the lands bordering that stream across the State of Arizona, which Arizona did by the adoption of its constitution. So that Arizona has never had the ordinary rights enjoyed by the other basin States to control or to build or operate dams and diversion works from the Colorado River.

It has always been my thought that those provisions were inserted there for the protection of the development of the Imperial Valley and the Mexican lands then owned by California financiers.

Mr. Harry Chandler, of the Los Angeles Times, testified in 1924 before this committee that at that time he and his associates owned 833,000 acres of land in Mexico immediately below the border, of which some 600,000 acres were irrigable from the water of the Colorado River.

Now, keep that in mind, if you please. The canal right gave them the right, assuming continuous flow, to the use of 3,500,000 acre-feet in Mexico. This 600,000 acres of land had a diversion right, assuming 5 acre-feet per acre, which would make 3,000,000 acre-feet of water of the Colorado River going to Mexico, and the restrictions placed upon Arizona at the time of its admittance as a State and in the constitution assured those people, I assume, or, at least, they thought it did, that Arizona could not divert water from the main stream of the Colorado River without the consent of Congress.

Well, Arizona became a State in 1912.

The next point I want to go to is the Colorado River compact that was signed at Santa Fe, N. Mex., in 1922. It was not ratified by Arizona, nor by the other States, so as to make it effective until June, or approximately June 1929.

At that conference attempts were first made to divide the water between the States, and no agreement could be reached. Finally an agreement was reached dividing the water between the upper basin and the lower basin at Lee Ferry. They did not undertake to divide at that time all of the water of the stream because at that time it was calculated that the average annual flow was greatly in excess of the 15,000,000 acre-feet that was divided, 7,500,000 acre-feet to the Upper Basin, and 7,500,000 acre-feet to the lower basin.

Mr. PHILLIPS. That was in 1929?

Mr. CARSON. 1922 was when the compact was written.

At that conference Arizona's representative, Mr. W. S. Norviel, was concerned because the over-all definition of the Colorado River system, as contained in the compact, did include and does now include the Gila River and its tributaries in Arizona which enter the river at Yuma below a point where they can ever be used again in the United States, and which were at that time wholly appropriated. So, Mr. Norviel refused to affix his signature to that compact until the provisions were written into the compact that are in article 3 (b) of the compact, which were added after this first draft had been completed and accepted by all the other States. I will read article 3 (b) for the record: "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." Which was then the estimated use then being made of the Gila River. He would not sign it then until there was an oral understanding, not binding, but an oral understanding and agreement between the States of California, Arizona, and Nevada, and accepted by all of the people attending that conference, that when that conference adjourned they would undertake to write out a tri-State compact between Arizona, California, and Nevada apportioning the water allocated to the lower basin, and in that compact or contemplated tri-State compact provide that the exclusive beneficial consumptive use of the water of the Gila River should go to Arizona.

At this point I would like to insert in the record a letter and a picture, a letter from Mr. Herbert Hoover, who was chairman of that conference, to Mr. W. S. Norviel, and a picture of Mr. Hoover also sent to Mr. Norviel, the picture carrying this notation. "W. S. Norviel, from Herbert Hoover—in tribute to a million acre-feet and a fine associate." The letter reads:



Mr. S. Norvel to Mr. Herbert Hoover -
In tribute to a million acre feet and a
fine associate.

DEPARTMENT OF COMMERCE
OFFICE OF THE SECRETARY
WASHINGTON

LOS ANGELES, CALIF., November 26, 1922.

Mr. W. S. NORVIEL,
State Engineer, Phoenix, Ariz.

MY DEAR NORVIEL: This is just by way of registering again my feelings of admiration for the best fighter on the commission. Arizona should erect a monument to you and entitle it "One million acre-feet."

I am sending you herewith a photograph which does not purport to be a likeness, but it is a better-looking fellow than the one you have, and I send it as an excuse for writing this letter expressing my personal appreciation of this fine association which we have had.

Faithfully yours,

HERBERT HOOVER.

Mr. ROCKWELL. What is the date of that?

Mr. CARSON. November 26, 1922. The compact was signed in Santa Fe, N. Mex., November 24, 1922.

Mr. ROCKWELL. I thought you said something about the fact that it was not signed until 1929?

Mr. CARSON. The compact was signed at Santa Fe, N. Mex., November 22, 1922. It required ratification by the various States and the Congress before it could become effective, which was not brought about until 1929.

Then I should also like to put in the record the testimony of Gov. Thomas E. Campbell, who was then Governor of Arizona and in attendance upon this Santa Fe conference, given before the Colorado River Commission of Arizona in 1933 or 1934; I think it was 1933.

Mr. PHILLIPS. What is the document from which you are reading?

Mr. CARSON. I am reading from a brief that I prepared in 1934 for submission to the Secretary of the Interior, but which was not in fact filed with the Secretary. Chairman MURDOCK. But this is testimony of Gov. Thomas Campbell.

Mr. CARSON. Yes, sir; Gov. Thomas E. Campbell [reading]:

"TESTIMONY OF GOVERNOR THOMAS E. CAMPBELL GIVEN BEFORE THE ARIZONA-COLORADO RIVER COMMISSION

"Q. Were you present at the time of the execution of the Colorado River compact, at Santa Fe, N. Mex., on November 24, 1922?—A. Yes; I was present.

"Q. At that time what was your official position in the State of Arizona?—A. I was governor of the State of Arizona for the years 1919, 1920, 1921, and 1922; and was governor of the State of Arizona at the time of the conference at Santa Fe, and at the time the Colorado River compact was signed.

"Q. Were you present at Bishop's Lodge, near Santa Fe, N. Mex., during the negotiations and discussions leading up to the agreement that was signed at that time respecting the waters of the Colorado River?—A. Yes; I was.

"Q. Had you appointed Mr. W. S. Norviel as the representative of the State of Arizona at that conference?—A. No; I did not appoint Mr. Norviel as the representative of the State of Arizona. That was taken care of by the fact that the Enabling Act, which provided for a meeting of the representatives of the several Colorado River Basin States, designated the water commissioners of the several States as representatives at the conference. I had appointed Mr. Norviel as the water commissioner of Arizona, and during that year—1922—he was the qualified water commissioner, so that when the act was passed by the United States Congress, providing for the meeting of the representatives of the several States, he automatically became the representative from Arizona.

"Q. Do you recall who were present at the time of the Colorado River conference at Santa Fe during the fall of 1922?—A. Yes; I recall many of the persons who were there. The United States was represented by Herbert Hoover, who acted as chairman. He had been previously selected at a meeting in Washington. California was represented by W. F. McClure, who has since died; Colorado was represented by Delph E. Carpenter; Nevada by J. G. Scrugham; New Mexico by Stephen B. Davis, Jr.; Utah by R. E. Caldwell; Wyoming by Frank C. Emerson, who afterward became Governor of Wyoming and has since died; and Arizona was represented by W. S. Norviel. The Reclamation Service was represented

by Arthur P. Davis and several advisers. Judge Richard E. Sloan was present in a legal capacity on behalf of Arizona besides Mr. Norviel and myself. California had many representatives, from the Imperial Valley and other places.

"Q. How was the conference organized?—A. Mr. Hoover acted as chairman; he had tendered the services of Clarence C. Stetson, of Maine, as secretary of the conference, and Mr. Stetson acted as secretary. The proceedings were taken down in shorthand, and I presume were transcribed, although I have never seen a copy.

"Q. The Enabling Act directed that the water of the river be divided among the States. Why was this not done?—A. We found it would be impossible, because every State at that time was claiming more water than was in the system, and early in the conference we came to the conclusion that it would not be possible to arrive at a compact which would definitely allot to each State any definite amount of water.

"Q. As the conference progressed, did you come to a solution of this question of division of the water?—A. Yes; we finally concluded a compact could be arrived at by dividing the water among the States represented by groups.

"Q. Then what was done?—A. It was the consensus of opinion, and agreed to, that the States be separated into two divisions, known as the upper basin and the lower basin. The upper basin was to include the State of Colorado, Utah, New Mexico, and Wyoming, and those comprising the lower basin were Arizona, California, and Nevada. It was further agreed that Lee Ferry would be a division point between the two basins and that would be the point considered for a division of the water—Lee Ferry and not at the so-called dam site. The division was to be 50-50 as to the amount of water, $7\frac{1}{2}$ million acre-feet to the upper basin and $7\frac{1}{2}$ million acre-feet to the lower basin. When the question of the system was presented to the Arizona delegates, composed of the State water commissioner, Judge Sloan, and myself, we objected vigorously to the inclusion of the waters of the Gila River, inasmuch as that water had been placed to beneficial use and would be of no value for storage at any place in the river for the lower basin States. After 2 days of discussions, mainly informal, it was finally agreed by the other participants in the compact that there would be allowed an extra million acre-feet, which was approximately the amount run off in the Gila system, to be used by Arizona to its exhaustion.

"Q. What attitude did the commissioner or the representatives from Arizona take toward the compact as written, and before the arrangement was made as to the million acre-feet—did you refuse to sign the compact because of the inclusion of the waters of the Gila River?—A. Absolutely we did. That was the reason why section 3B was put into the compact.

"Q. Was anything said about designating this million acre-feet for Arizona?—A. Yes; that was discussed, and it was concluded that we could not tag that as belonging to Arizona because the plan on which we proceeded was that the waters be divided among the basins and no particular water would be allowed to any one State. If we attempted to tag it, then every other State would demand that it get a certain amount of water.

"Q. Was there any agreement between the Arizona representative and the representatives of the other lower basin States as to setting aside to Arizona the water described in paragraph 3B of the proposed compact?—A. Yes; there was a definite understanding that after the seven-State compact was ratified, so far as the three States in the lower basin were concerned, they would enter into a compact in which it would be agreed that all of the water of the Gila River would go to Arizona.

"Q. Who were present at the discussions which resulted in that understanding?—A. Mr. McClure, of California; Mr. Scrugham and Mr. Squires, of Nevada; and Mr. Norviel and myself, of Arizona.

"Q. Did these discussions take place before the execution of the compact on November 24, 1922?—A. That understanding was arrived at before the compact was ratified and signed.

"Q. For what purpose was the water of the Gila River to go to the State of Arizona?—A. For the benefit of Arizona and for use in irrigation.

"Q. At the time the discussions were had with reference to putting this paragraph 3B into the compact, did all of the delegates to the conference know that Arizona had objected to the compact without such a provision?—A. Absolutely; they all knew that was the fact; it was the lock upon which we had stuck for a couple of days, and discussions were had by all of the delegates and commissioners. I assume these discussions would appear in a transcript of the minutes; the fact was well known and discussed by everybody present. Without

that provision of 3B, by which Arizona was awarded an extra million acre-feet of water for the inclusion of the water of the Gila River, the compact would never have been signed by Arizona.

"Q. Then after the arrangement was made for the inclusion of paragraph 3B in the compact, it met with the approval of Arizona, and Mr. Norviel signed the compact for Arizona?—A. He did.

"Q. Why was it that this understanding for the tri-State compact between California, Nevada, and Arizona was not carried out?—A. The new administration in the State of Arizona was opposed to any compact and never went ahead.

"Q. Who was the Governor-elect of Arizona?—A. Gov. George W. P. Hunt defeated me in the November election of 1922, and with my going out of office the continuity of the negotiations with respect to the carrying out of the compact were blocked and no progress was thereafter made.

"Q. Have you ever discussed this question of the Colorado River compact and the provision of this paragraph 3B since that time?—A. No; I have never been in court or before any official body to present my knowledge of the understanding that was arrived at at that time. I have always been anxious to tell what took place at the conference and why the compact was drawn in the way that it was."

I also have the testimony of Mr. W. S. Norviel and of Mr. C. C. Lewis, who attended that conference, to the same effect, but I think it unnecessary at this time to encumber the record with it.

Chairman MURDOCK. May we see the picture in that little pamphlet? You had a picture there that I am interested in.

Mr. CARSON. I will be glad to if you will tear the picture out of this book and put it in the record, and also the letter and the other statements by the other men also.

Chairman MURDOCK. I will pass this picture along to the committee. Some of you will recognize quite a change in Mr. Herbert Hoover of 1922—this picture may have been taken before 1922—and the elder statesman of today. I think this is material evidence that goes to show just what took place.

Without objection, we will include the testimony of Mr. Norviel and Mr. Lewis.

Mr. CARSON. The testimony is in this brief, and it is to the same effect as that of Governor Campbell.

Chairman MURDOCK. It was testimony given before the same board as Governor Campbell's testimony?

Mr. CARSON. Yes.

(The matter referred to is as follows:)

"TESTIMONY OF MR. W. S. NORVIEL GIVEN BEFORE THE ARIZONA-COLORADO RIVER COMMISSION

"Q. State your name, residence, and profession.—A. W. S. Norviel, Phoenix, Ariz., attorney at law.

"Q. How long have you been a practicing lawyer in Arizona?—A. Since 1916, except two short periods.

"Q. Are you still active in the practice?—A. Yes.

"Q. In 1922, what, if any, was your official position in Arizona?—A. State water commissioner.

"Q. By reason of your being water commissioner, were you designated as a commissioner under the Federal enabling act respecting the division of the waters of the Colorado River?—A. Yes.

"Q. Did the State water commissioners of the States of Arizona, California, Nevada, New Mexico, Wyoming, Utah, and Colorado meet pursuant to the provisions of the enabling act?—A. Yes. That is, those having charge of public waters, mostly called State engineers, met.

"Q. Where did you first meet?—A. Washington.

"Q. Who was elected chairman?—A. Herbert Hoover, then Secretary of Commerce.

"Q. Was Mr. Hoover designated by the Federal authorities as the United States representative?—A. Yes.

"Q. Who was the secretary of the conference?—A. Clarence C. Stetson was made executive secretary.

"Q. How long did the meeting at Washington last?—A. Four or five days.

"Q. What matters were discussed at Washington?—A. It was the first coming together of the commissioners. After the organization, the representatives were called upon to express ideas as to the proper procedure to accomplish the pur-

poses of the congressional act and the acts of the several State legislatures. I presented a written proposed compact, and discussion then followed upon it.

"Q. Did the question first come up at the Washington conference of dividing the waters, not among the States, but between two groups of States, namely, the upper basin and the lower basin?—A. At the Washington meeting we discussed the division of the waters among the several States, but it immediately was apparent that there never could be an accord as to the proper allocation to each State.

"Q. Before the conference broke up at Washington in January 1922 did you accomplish anything definite with respect to an agreement on the division of the waters?—A. No. The commissioners were without sufficient information and were unwilling to be bound to anything definite, save procedure.

"Q. After the Washington meeting in January 1922, when did you next meet?—A. Public hearings were held in various cities of the interested States.

"Q. Did the conference convene in Santa Fe, N. Mex., in November 1922?—A. Yes.

"Q. Was the meeting in Santa Fe, N. Mex., in November 1922, a continuation of the Washington meeting, with the same persons present and the same States represented?—A. Yes.

"Q. Was Mr. Hoover present?—A. Yes.

"Q. Did Mr. Hoover preside as chairman and did Mr. Stetson serve as secretary?—A. Yes. At all the meetings.

"Q. Were the minutes of that meeting taken down stenographically?—A. Yes.

"Q. Have you a copy of those minutes?—A. No.

"Q. Have you ever seen a transcript of the stenographic record?—A. No.

"Q. Did you at that meeting agree to divide the waters of the Colorado River between two groups of States, designated as the upper and lower basins?—A. Yes.

"Q. Why was that done, rather than divide the waters among the several States, allocating to each State a definite amount?—A. It was agreed that insurmountable difficulties would block any effort to allocate to the several States a definite portion of the water. The general consensus being often expressed that nothing should be granted to a single State, no State or stream particularly or otherwise favored or hindered.

"Q. In the compact that was finally signed, in paragraph (a), article II, the Colorado River system is defined, and in paragraph (b), article II, the Colorado River Basin is defined, which terms include the Gila River and its tributaries. Why was the Gila River included in the Colorado River compact?—A. The terms 'Colorado River system' and 'Colorado River Basin' were defined to include all the streams tributary to the Colorado River and the area draining into the Colorado River, and it was deemed advisable to make no exceptions of any particular tributary. Arizona objected vigorously to the inclusion of the Gila River, but our objections were overruled.

"Q. Is it true that in November 1922 the Gila River was then in use, or had been appropriated completely?—A. Yes.

"Q. Is it not a fact that the Gila River enters the Colorado River below the point where all interested parties contemplated the dam would be built?—A. Yes.

"Q. At the November 1922 conference, what was the consensus of opinion as to where the first dam would be built in the River?—A. It was the general opinion that such dam would be located in Boulder Canyon.

"Q. Was this point not above the point where the Gila River enters the Colorado River?—A. Yes.

"Q. Could any States benefit by the fact that the Gila was included in the Colorado River system?—A. No. Its waters enter the main stream of the Colorado at a point which prevents the use of the Gila waters within the United States.

"Q. Were those matters discussed at this meeting?—A. Yes. It was my contention that only Arizona could use or had a right to Gila waters.

"Q. Did you point out that the definition 'Colorado River system' included the Gila River system in the division of the waters?—A. I raised the question and demanded the Gila be specifically excluded.

"Q. What position did you take on the inclusion of the Gila River in the compact?—A. That it be excluded entirely from the discussion. Later we compromised when the conference granted an extra million acre-feet to Arizona. This extra million acre-feet was intended for the sole use of Arizona to compensate for the inclusion of the Gila River as part of the Colorado River system. Following the predetermined plan of allocating no water to any particular State, but to groups or basins only, the provision for this extra million acre-feet was

couched in language as used elsewhere in the compact; that is, it read to the lower basin, rather than to Arizona, but it was definitely understood that this additional water was for the exclusive use of Arizona.

"Q. Was the draft of the compact prepared and submitted to the conference before it was finally signed up?—A. Yes.

"Q. After the compact was submitted, how many days elapsed before it was actually signed?—A. Some 4 or 5 days elapsed, during which time we were attempting to dispose of this Gila River matter.

"Q. At the time the draft was submitted, and you testify that it was several days before it was signed, did that draft include paragraph (b) of article III, of the Colorado River compact?—A. No. The draft merely included the Gila as part of the Colorado River system. It did not contain the provision now known as III (b) which made provision for the allocation of the extra million acre-feet to the lower basin.

"Q. Do you have the copy of the proposed contract which did not contain the provision with reference to the million acre-feet, to which you have referred?—A. Yes.

"Q. Is this the original copy that you had at the meeting in Santa Fe?—A. Yes; except that there are some notes that I made in this copy at or during the meeting November 22, or in the succeeding days.

"Q. I hand you a document and ask you if that is the original.—A. Yes. It is.

"Q. It shows the date of November 18, 1922. Is that the date that you first received it.—A. It would indicate that it was first handed in at that time, and we then began the discussion.

"Q. You refused to sign that draft of the compact?—A. Yes.

"Q. Why?—A. Because it included the Gila River and made no provision for compensation to Arizona.

"Q. You had that draft before you, and you declared Arizona's position before the Conference?—A. Yes.

"Q. After that a new compact was prepared which did contain a provision for compensation to Arizona, known at paragraph (b) of article III?—A. Yes.

"Q. That compact was consented to by you and executed on November 24, 1922?—Yes.

"Q. Who prepared paragraph (b) of article III of the Colorado River compact as signed?—A. Judge Sloan and Stephen B. Davis, and one other whom I do not recall.

"Q. What discussion was had relating to the said paragraph (b) of article III and its meaning and purpose?—A. I had steadfastly refused to agree to the original draft that merely included the Gila River and after several days of discussion and argument, during which the conference refused to exclude the Gila and I refused to accept the draft which included the Gila, a compromise was reached in the form of article III (b) which provided the extra million acre-feet to compensate Arizona for the inclusion of the Gila River in the Colorado River system. It was fully understood by all that this million acre-feet was for the sole and exclusive use of Arizona, although the language used provided for its use by the lower basin. I have explained why such wording was used.

"Q. Was the answer that you have given of the meaning and purpose discussed at the full meeting of all the delegates at this conference, including California and Nevada?—A. Yes. All the delegates, including California and Nevada, understood and agreed that this additional water was for Arizona's use.

"Q. Will you state if you made any statement to the Colorado River Commission with reference to the definition given to the Colorado River system and the Colorado River Basin, and the meaning of paragraph (b), article III?—A. Yes. I did make a statement. I asked the conference if it was the understanding of the Commission that the million acre-feet of water set out in article III (b) was for the sole and exclusive use of Arizona and stated that if that was the understanding I would sign the compact, if it was not the understanding I would refuse to sign. The unanimous reply was that this million acre-feet was for Arizona alone. With that understanding I signed the compact for Arizona.

"Q. Were these statements which you made stated to the open conference?—A. All delegates and representatives were present. We were having a final meeting preparatory to the signing of the compact.

"Q. What response did delegates from the other States, including California and Nevada, make in regard to your statements?—A. They agreed in the understanding which I have just stated. Mr. McClure, of California, stated to me and to the conference that he, as the California representative at the conference agreed to the understanding that this water of article III (b) was for the exclusive use of Arizona.

"Q. What response did Mr. Hoover make?—A. Mr. Hoover did not take part in the discussion, did not state his views on any part, as I remember. He urged us to agree, and sometimes referred us to a former agreement, or purported agreement.

"Q. Was there any statement made at that time contrary to the explanations that had been given us as to the meaning and intent of paragraph (b) article III of the compact?—A. None whatever; there was a full accord and agreement by all delegates.

"Q. At that time, what, if anything, was said in reference to a tri-State agreement between the representatives of California and Nevada and Arizona and Mr. Hoover?—A. It was several times suggested that there should be no difficulty for the three lower States to agree to a division of the waters allocated to the lower basin.

"Q. Were these statements, with reference to a tri-State agreement, made prior to the time the compact was actually signed?—A. Yes, and Mr. Squires made some statements afterward. Mr. McClure, Mr. Scrugham, and Mr. Squires expressed their willingness to enter into such a compact. It seemed very feasible.

"Q. Did each and every one signing the Colorado River Compact know of the discussion with reference to the supplemental tri-State compact to be executed by California, Nevada, and Arizona?—A. Yes. It had been discussed in the open conference and Mr. Hoover made several suggestions regarding such a tri-State compact.

"Q. Was there ever any statement made by anyone at the conference that the waters of the Gila River were to go to anybody except the State of Arizona?—A. None whatever.

"Q. Was any claim ever made at that time that any other State had any interest in the waters of the Gila River?—A. No.

"Q. Was there a universal agreement by each and every one of the delegates that the Gila River belonged to the State of Arizona?—A. That was the agreement upon which I consented to sign the compact for Arizona.

"Q. In addition to the waters of the Gila River, was Arizona to participate in the division of the waters in the main stream of the Colorado River?—A. Yes. Arizona was to share in the main stream waters.

"Q. Were these matters discussed at the time of the conference?—A. Yes. To the extent that Arizona, Nevada, and California were to all share in the main stream waters and Arizona was to have the exclusive use of the waters of the Gila.

"Q. Did you make any statement that if the Colorado River had any different meaning from what you have testified, you would not sign the compact?—A. I stated that I would absolutely refuse to sign the compact if it had any other meaning.

"Q. Did the representatives of the other States and the chairman agree to your statement?—A. Yes. All, including California and Nevada, agreed.

**"TESTIMONY OF MR. C. C. LEWIS GIVEN BEFORE THE ARIZONA-COLORADO
RIVER COMMISSION**

"Q. State your name, residence, and profession.—A. C. C. Lewis, Phoenix, Ariz., statistician.

"Q. How long have you been in Arizona?—A. Twenty-four years.

"Q. In 1922, what, if any, was your official position in Arizona?—A. Assistant State water commissioner.

"Q. By reason of your being deputy water commissioner, did you attend the meetings held under the Federal Enabling Act, respecting the division of the waters of the Colorado River?—A. Yes; except the first meeting held at Washington, D. C.

"Q. Did the conference convene in Santa Fe, N. Mex., in November 1922?—A. Yes.

"Q. Was the meeting in Santa Fe, N. Mex., in November 1922 a continuation of the Washington meeting, with the same persons present and the same States represented?—A. Yes; as I recall it, the same persons were representatives.

"Q. Was Mr. Hoover present?—A. Yes.

"Q. Did Mr. Hoover preside as chairman and did Mr. Stassen serve as secretary?—A. Yes.

"Q. Were the minutes of that meeting taken down stenographically?—A. Yes.

"Q. Have you a copy of those minutes?—A. No.

"Q. Have you ever seen a transcript of the stenographic record?—A. No.

"Q. Did you at that meeting agree to divide the waters of the Colorado River between two groups of States, designated as the upper and lower basins?—A. Mr. Norviel, Arizona State water commissioner, did.

"Q. Why was that done, rather than divide the waters among the several States allocating to each State a definite amount?—A. Because of the impossibility of ever agreeing on an apportionment among the seven States. It was not practical. Further, there was a point provided by nature for the division line between the upper and lower basins.

"Q. In the compact that was finally signed, in paragraph (a), article II, the Colorado River system is defined, and in paragraph (b), article II, the Colorado River Basin is defined, which terms include the Gila River and its tributaries. Why was the Gila River included in the Colorado River compact?—A. The Gila River was included, because it was determined that the drainage area should include all tributaries of the Colorado River in all of the seven States, and that it was inadvisable to make any exceptions. Arizona objected to the inclusion of the Gila River because of the fact the waters could be applied to beneficial use only by Arizona.

"Q. Is it true that in November 1922 the Gila River was then in use, or had been appropriated completely?—A. Yes. That which was not being used had been appropriated.

"Q. Is it not a fact that the Gila River enters the Colorado River below the point where all interested parties contemplated the (dam) would be built?—A. Yes.

"Q. At the November 1922 conference, what was the consensus of opinion as to where the first dam would be built in the river?—A. Boulder Canyon.

"Q. Was this point not above the point where the Gila River enters the Colorado River?—A. Yes.

"Q. Could any States benefit by the fact that the Gila was included in the Colorado River system?—A. Not by the use of the Gila waters because the Gila enters at a point that would prevent the use of same in the United States.

"Q. Were those matters discussed at this meeting?—A. Yes. It was contended that Arizona only could use the Gila waters, and it being entirely appropriated, it should be excluded.

"Q. Did Mr. Norviel point out that the definition 'Colorado River system' included the Gila River system in the division of the waters?—A. Yes. On this point he was firm.

"Q. What position did Mr. Norviel and the Arizona delegation take on the inclusion of the Gila River in the compact?—A. That it should be excluded and did not yield until a million acre-feet additional was granted the lower basin States with a definite understanding by all that this additional million acre-feet was for Arizona's use and not to be considered in the final apportionment of the Colorado River water.

"Q. Was the draft of the compact prepared and submitted to the conference before it was finally signed up?—A. Yes.

"Q. After the compact was submitted, how many days elapsed before it was actually signed?—A. I do not remember, but a few days on account of Gila River matters.

"Q. At the time the draft was submitted, and you testify that it was several days before it was signed, did that draft include paragraph (b) of article III, of the Colorado River compact?—A. No.

"Q. Did you see the copy of the proposed contract which did not contain the provision with reference to the million acre-feet, to which you have referred?—A. Yes.

"Q. This instrument which I hand you. Is this the original copy which you and Mr. Norviel had at the meeting at Santa Fe?—A. Yes.

"Q. It shows the date of November 18, 1922. Is that the date that you first received it?—A. I could not say, but it seems the date thereon would so indicate.

"Q. Mr. Norviel refused to sign that draft of the compact?—A. Yes.

"Q. Why?—A. Because of the inclusion of the Gila River.

"Q. This draft was before the Arizona delegation and Arizona's position was made known to the conference?—A. Yes. It was contended that the Gila River water was not only all appropriated, but if it were never appropriated no other State could possibly use it because of the physical situation obtaining.

"Q. After that a new compact was prepared which did contain a provision for compensation to Arizona known as paragraph (b) of article III?—A. Yes.

"Q. That compact was consented to by Mr. Norviel and the Arizona delegation and executed on November 24, 1922?—A. Yes.

"Q. Who prepared paragraph (b) of article III of the Colorado River compact, as signed?—A. Judge Sloan, Judge S. B. Davis, and Frank C. Emerson.

"Q. What discussion was had relating to the said paragraph (b) of article III and its meaning and purpose?—A. Due to Mr. Norviel's firm refusal to sign the compact with the Gila River included there were several days' delay and the final result was paragraph (b) of article III, with the definite understanding that this million acre-feet belonged to Arizona in compensation for inclusion of the Gila River in the Colorado River system.

"Q. Was the answer that you have given of the meaning and purpose discussed at the full meeting of all the delegates at this conference, including California and Nevada?—A. Yes.

"Q. Will you state if Mr. Norviel and the Arizona delegation made any statement to the Colorado River Commission with reference to the definition given to the Colorado River system and the Colorado River Basin, and the meaning of paragraph (b), article III?—A. Yes. Mr. Norviel made it very clear that he would sign the final draft of the compact only on the full and complete understanding by all that the additional million acre-feet was for the use of Arizona alone. To this Mr. McClure, representing California, agreed and all others joined in and agreed to this understanding.

"Q. Were these statements made to the open conference?—A. Yes.

"Q. What response did delegates from the other States, including California and Nevada, make in regard to these statements?—A. They all agreed, Mr. McClure making a statement to this effect, all other agreeing, including Nevada."

Mr. CARSON. Now then, subsequent to the signing of the Colorado River compact, various efforts were made between Arizona and California to work out an agreement. During that interval Arizona thought that she was entitled to the exclusive beneficial consumptive use of the Gila River and half the water flowing in the main stream in the lower basin other than that required by Nevada, to be divided equally between California and Arizona. You see, that would have resulted in Arizona securing 3,600,000 acre-feet of the main-stream water allocated to the lower basin, and it should not seem such an unreasonable request when you consider that that is the sole supply of water for Arizona, which contains in excess of 100,000 square miles of land.

California contains 4,000 square miles of land—and this area that I am describing is within the basin in California—and in California there are no streams of any consequence feeding the Colorado River, and California wanted to take the great bulk of her water outside of the natural drainage area of the Colorado River Basin and over into the Imperial Valley from which no return flow whatever can reach the Colorado River, and over to the Los Angeles area from which no return flow whatever can reach the Colorado River.

Mr. FERNANDEZ. Where is Lee Ferry?

Mr. CARSON. This dotted line [indicating at map] is the division between the upper and lower basins, as made by the compact. You will notice that all of Arizona is within the basin of the compact except this very small area [indicating] in the southeast corner of the State. The State is square at that point.

Mr. ROCKWELL. Where is Lee Ferry compared to Boulder Dam?

Mr. CARSON. This is Lee Ferry, and Boulder Dam is down here [indicating] on the State line between Nevada and Arizona. The thread of the stream there is the boundary between Arizona and Nevada.

Those efforts thereafter made during that period to reach an agreement were not successful, and no agreement was reached.

In the meantime, the California financiers were pressing for the construction of Boulder Dam and the Swing-Johnson bill had been introduced and further efforts were made to reach an agreement on the division of the main stream of the river. Those efforts finally resulted in a governors' conference in Denver, Colo., in the fall of 1927. It had been postponed from consideration by Congress that spring at our request, to see whether or not we could by further efforts compose our difference.

At Arizona's request a governors' conference was held in Denver, Colo., in the fall of 1927 in two sessions; one lasted from August 22 to September 1, and one from September 19 to October 4. At that meeting the governors of the seven river basin States were present. For Arizona, Governor Hunt; California, Gov. C. C. Young; Colorado, Governor Adams, William H. Adams; New Mexico, Gov. Richard G. Dillon; Nevada, Gov. F. B. Balzer; Utah, Gov. H. Dern; Wyoming, Gov. Frank B. Emerson. They were each accompanied by various advisers.

California and Arizona stated their positions. They were unable to agree. Governor Young stated there, as has been stated here in the hearing, that Cali-

fornia would be willing to submit the controversy to any impartial tribunal. It was not a binding agreement. I do not want to be misunderstood; it was not in any way binding, but the four governors of the upper basin States constituted themselves as such an arbitration committee and called in separately California and Arizona and finally made this recommendation which I would like to read into the record:

"Suggested basis of division of water between the States of the lower division of the Colorado River system submitted by the governors of the States of the upper division at Denver conference, August 30, 1927.

"The governors of the States of the upper division of the Colorado River system suggested the following as a fair apportionment of water between the States of the lower division subject and subordinate to the provisions of the Colorado River compact insofar as such provisions affect the rights of the upper basin States:

"1. Of the average annual delivery of water to be provided by the States of the upper division at Lee Ferry, under the terms of the Colorado River compact.

"(a) To the State of Nevada, 300,000 acre-feet.

"(b) To the State of Arizona, 3,000,000 acre-feet.

"(c) To the State of California, 4,200,000 acre-feet."

You will note that is a reduction in Arizona's contention that she was entitled to half the water, from 3,600,000 acre-feet to 3,000,000 acre-feet.

"2. To Arizona, in addition to water apportioned in subdivision (b), 1,000,000 acre-feet of water, to be supplied from the tributaries of the Colorado River flowing in said State and to be diverted from said tributaries before the same empty into the main stream. Said 1,000,000 acre-feet shall not be subject to diminution by reason of any treaty with the United States of Mexico, except in such proportion as the said 1,000,000 acre-feet shall bear to the entire apportionment in 1 and 2 of 8,500,000 acre-feet.

"3. As to all waters of the tributaries of the Colorado River emptying into the river below Lee Ferry, not apportioned in paragraph 2, each of the States of the lower basin shall have the exclusive beneficial consumptive use of such tributaries within its boundaries before the same empty into the main stream, provided the apportionment of the waters of such tributaries situated in more than one State shall be left to adjudication or apportionment between said States in such manner as may be determined upon by the States affected thereby.

"4. The several foregoing apportionments to include all waters necessary for the supply of any rights which may now exist, including water for Indian lands for each of said States.

"5. Arizona and California each may divert and use one-half of the unapportioned waters of the main Colorado River flowing below Lee Ferry, subject to further equitable apportionment between the said States after the year 1933, and on the specific condition that the use of said waters between the States of the lower basin shall be without prejudice to the right of the States of the upper basin to further apportionment of water, as provided by the Colorado River compact."

That was in the fall of 1927.

Then the Swing-Johnson bill came up again the following year in Congress.

I might state before leaving this that when these findings were presented the Arizona delegation said they would accept the recommendations made and California refused to accept the recommendations made. Then the matter came on before the Congress in the consideration of the Boulder Canyon Project Act, which was enacted in December of 1928, and Congress undertook to give effect to this recommendation of the four upper State Governors, and did it in several ways in that act.

I am now reading from the Boulder Canyon Project Act, section 4 (a), at the beginning of the second paragraph of that act:

"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"—I call your attention there to the fact that Congress again reduced Arizona's claim, as approved by the upper basin governors, from 3,000,000 to 2,800,000 acre-feet—"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.

"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 Nevada and Arizona 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 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."

Even though Arizona was at that time, perhaps, somewhat in the doghouse, which I have always considered to be partially due to the fact that Mr. Harry Chandler, who is now deceased, the owner of the Los Angeles Times, and perhaps Mr. Hearst—and I am not certain but that Mr. Hearst was the owner of lands in Mexico—but during this period after the Colorado River compact was signed, the press of the country tried to indicate that Arizona was a dog in the manger and should have agreed without anything further to the Colorado River compact and without division between California and Arizona.

Now, remember if you please, that Arizona was a very young State, not a strong State, and was going up against the financial power of the most powerful men in southern California, so Congress, in order to see that this provision would be carried out by California, provided further—

"This Act shall not take effect * * * 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 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 want to call your attention specifically to the fact that under this limitation with California enacted by an act of its legislature in 1929, in exact compliance with this requirement, III (b) water is not mentioned. California cannot lawfully use any water of the Colorado River system except 4,400,000 acre-feet of III (a) water, plus not more than one-half of any excess or surplus waters unapportioned by said compact.

So now the question comes, Is III (b) water apportioned water? If it is, California by her limitation act has excluded herself from making any claim to it.

In that connection, let me go further into what Congress was trying to do in this. This is section 11 of the act.

"That the Secretary of the Interior is hereby authorized to make such studies, surveys, investigations and to do such engineering as may be necessary to determine the lands in the State of Arizona that should be embraced within the boundaries of a reclamation project, heretofore commonly known and hereafter to be known as the Parker-Gila Valley reclamation project, and to recommend the most practical and feasible method of irrigating lands within said project, or units thereof, and the cost of the same, and the appropriation of such sums of money as may be necessary for the aforesaid purposes, from time to time is hereby authorized. The Secretary shall report to Congress as soon as practicable, and not later than December 10, 1931, his findings, conclusions, and recommendations regarding such project."

Now, at that time, the Parker-Gila project included not only the 585,000 acres that was later mentioned in the Porter J. Preston report, but also an

additional 100,000 acres in the vicinity of Parker, Ariz., which is up the river from all projects here involved. It is in this vicinity up here [indicating at map] above the Palo Verde Valley and in the town of Blythe, and a bit more of it is right in here. At that time the project included this land and this land down here to the extent of 585,000 acres [indicating] of which 585,000 acres this mesa division of the Yuma project and the Wellton-Mohawk area are a very small part.

Now, to go back again a minute to the compact on whether or not III (b) water is apportioned water, I would like to read into the record here these provisions of the Colorado River compact. I am reading article 3 (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) and this is important, in my estimation, in considering this bill—"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 recognized 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 first day of October next succeeding the ratification of this compact.

"(e) 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.

"(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)."

It is clear there, to my mind, that (b) water is apportioned water, and that (c) water, to Mexico, when and if the quantity is determined, is likewise apportioned water.

Let me emphasize that again:

"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 * * *."

So, back there in 1922, when this contract was signed, all the States of the basin recognized the possibility and the desirability, if you please, of a treaty with Mexico, which would fix the limits of Mexico's rights, and went so far as to provide in this contract in 1922 how that supply would be furnished and who would furnish it.

Then, coming on down—and I will be through with this historical background shortly—in 1933 I was at that time employed as a special assistant attorney general and counsel for the Arizona and Colorado River Commission, and continued until the spring or the summer of 1935. They submitted to me questions concerning the construction which I have just referred to you, and I gave it as my legal opinion then, and do now, that under those provisions of the California Limitation Act, as required by the Boulder Canyon Project Act, California can make no successful claim whatever to any use of the water of the Gila River, or to a claim of an equal amount, or any portion of that amount in the main stream of the river. The Commission knew, of course, what had occurred at the Santa Fe Conference in 1922, so they requested that I bring a bill into the United States Supreme Court rights to perpetuate testimony of what occurred at Santa Fe in 1922, some evidence of which I have already placed in this record. I did file such a bill in the Supreme Court of the United States.

The Supreme Court of the United States took jurisdiction of the case and said that it was properly brought, but they refused the right to perpetuate testimony; one of the grounds being it was immaterial and could never become material. I would like to read to you now part of paragraph 6 of the Supreme Court's opinion appearing in volume 292, United States, at page 359.

"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," 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)"—now, this is the part—" * * * does not contradict the intent clearly expressed by 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."

Now, can there be any doubt that under that language and under the language of this compact that III (b) water is apportioned to the lower basin? Can there be any doubt that California, by adopting its limitation act, has excluded herself from claiming any part of the III (b) water?

Mr. PHILLIPS. My recollection is not very clear on that. Will you read section 7, please?

Mr. CARSON. Yes. That is another ground for the dismissal. California filed briefs in opposition to this. They did not want this evidence preserved, which is now in this record and, among others, there was the question raised that it was not in proper form and was not relevant because it had not been communicated back. And in that connection they also raised this other ground that it was immaterial and irrelevant. The committee said it was not material or relevant because California has excluded herself from claiming III (b) water [reading]:

"Seventh. 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 paragraph 4 (a) of the 1928 act to exclude California entirely from the waters allotted by article III (b) to the States of the lower basin and to reserve all of those waters to Arizona. The evidence sought to be perpetuated is not documentary. It is testimony as to what divers persons said 6 years earlier while negotiating a compact with a view to preparing the proposal for submission to the legislatures of the seven States and to Congress for approval—a proposal which Arizona has not ratified and which the six other States and Congress did ratify, as later modified, by statutes enacted in 1928 and 1929. The Boulder Canyon Project Act rests, not upon what was thought or said in 1922 by negotiators of the compact, but upon its ratification by the six States."

I think I have pretty well covered that. Now, following the enactment of the Boulder Canyon Project Act by Congress and this decision, we tried to secure a contract from the United States for our share of this water. We were opposed by California on the ground, among others, that we had not ratified the Colorado River compact. So, in 1939 the Arizona Legislature enacted chapter 33 (ch. 33, Session Laws of Arizona, 1939) in which it provided, and the compact set out in here in terms is as nearly as we could draw it taken from the Boulder Canyon Project Act in paragraph 4 (a) of the Boulder Canyon Project Act, with the addition of the necessary definitions to make it clear:

"SECTION 1. TRI-STATE COMPACT.—The State of Arizona, desiring to enter into a compact with the States of California and Nevada under the authority of and in accordance with the provisions of the act of Congress of the United States of America approved December 21, 1928, proposes the following compact or agreement between the States of Arizona, California, and Nevada."

Then it sets it out. Section 2 of the act, after setting out the proposed compact, provides:

"SEC. 2. ACCEPTANCE BY ARIZONA.—The proposed agreement between the States of Arizona, California, and Nevada as set forth in section 1 of this act is approved

and accepted for the State of Arizona, and the Governor of the State of Arizona is authorized and directed to sign said agreement for the State of Arizona and to give notice of its approval as in said agreement provided.

"SEC. 3. CONDITIONAL APPROVAL OF COLORADO RIVER COMPACT.—If the agreement set forth in section 1 of this act be approved by the Congress of the United States and the States of California and Nevada within 1 year after the effective date of this act, or within a period of one additional year thereafter, provided the Governor of the State of Arizona shall by proclamation so extend the period for such approval, the Colorado River compact shall thereupon be and become by the terms of this act ratified for and on behalf of the State of Arizona."

Now, following the passage of that act, it is my understanding there were numerous meetings between the Colorado River Commission of Arizona and the representatives of California to try to work out this compact, on which Commission at that time Senator Hugo Farmer was a member, who is now here. That was rejected by California and no agreement could be made.

Now, I have to go back again a little to the physical situation. Boulder Dam was built and filled. I might be in error on this date, but it became full by some time in 1938 or 1939, so that it was no longer able to hold back the flow of the river which came down, and in 1941 12,000,000 acre-feet of Colorado River water went across the border into Mexico. In 1942 something in excess of 11,000,000 acre-feet, and 1943, in excess of 10,500,000 acre-feet went across the border into Mexico. Now, when Boulder Dam began to regulate the flow of the Colorado River through Mexico, it enabled a much greater development of Mexico below the United States border. In its natural state, as I understand the picture, in the late summer when water was needed for irrigation it was not in the river. Boulder Dam operated to equate that flow so that the flow here [indicating] that I have called attention to went through Mexico in an equated condition. It benefited Mexico in many ways. It eliminated the danger of floods and seasonal floods in the lower delta of Mexico and assured them a full supply of water there when they needed it for irrigation purposes.

Now, during that period, from the time we tried to get a contract in 1934 and an agreement, the uses in Mexico were rapidly expanded and built up to use a great deal more water in Mexico. It has been variously estimated by the engineers as to the quantity of land in Mexico that could be irrigated by water from the river, and I think a conservative estimate was approximately 1,000,000 acres which could establish a right to the use of water in Mexico, with a possibility of Mexico's increasing its use of water to 5,000,000 or 6,000,000 acre-feet, if we permitted that development to proceed without the Mexican Treaty limiting their right in advance of the development of the river basin in the upper States as well as in the lower States.

Then we found the Imperial Irrigation district of California, as soon as the All-American Canal was in operation, increased its supply of water to Mexico through that canal and we found that the Imperial Irrigation district of California owned, and I believe still owns, all of the stock of the Mexican corporation which delivers water through the Alamo Canal in Mexico to Mexican land. So that by 1943 and again in 1944 Mexico actually diverted and used on her lands from the Colorado River, with the aid and support of the Imperial Irrigation district of California, 1,800,000 acre-feet of water in the year 1943 and again in the year 1944.

So, remembering now the history of this initial development and the fight made against Arizona for the use of any water in the main stream [and that fight, by the way, if I can read the signs right, will be made against every other project in the Colorado River Basin, in whatever State located] we went to work.

It has been intimated here that the Mexican Treaty was negotiated behind California's back.

When I got back into this picture early in 1943 the first meeting I attended was here in Washington with the then legal adviser of the State Department and the legal advisers of all the other States, at which California was very well represented. I am informed that even before that, since about 1937, the danger of the loss forever by use in Mexico had been rather generally recognized in the Colorado River Basin and there had been many repeated earlier meetings considering the question of Mexico's claims to the water of the Colorado River, and from the first meeting I attended early in 1943 the California representatives were present at every meeting at which I was present in the discussion of this river until, through the committee of 16, we reached the parting of the ways—California opposing the treaty; Colorado, Utah, Wyoming, New Mexico, and Arizona supporting the treaty because of the benefit to the United States, as we saw it, in having an over-all, all-time limit on Mexico's claim of right to the water of the river which was being

rapidly increased. California opposed it. Nevada at that time passed, at that meeting at which a formula was adopted, and later came to the support of California in opposing the treaty.

Mr. Dowd made one statement with which I wish to take direct issue. If I understood him correctly, he said, while the State of Arizona supported the treaty that, without exception, all the users of water in Arizona joined with California in opposing it.

Mr. PHILLIPS. I do not think he said all of them.

Mr. CARSON. Was not that your statement?

Mr. Dowd. No; I said the Salt River Valley Water Users' Association, which is the largest irrigation district in Arizona, and projects using water around Florence and San Carlos, and the largest users of water in the Yuma Valley and other similar organizations, not only supported California and Nevada but had representatives in Washington who appeared against the treaty.

Mr. CARSON. I still want to take direct exception. It reminds me of the story of the three tailors of Threadneedle Street—"We, the people of England." What actually happened was that California organized a meeting which had for its purpose objecting to this treaty and invited a few people from Arizona and other States out there. I imagine there were not very many from Arizona. But actually this whole treaty matter was explained in detail to the Legislature of the State of Arizona, which represents all of the farmers of the State and includes, among its membership, members of the boards of directors of some of these various organizations, and in the Legislature of Arizona they passed a memorial urging the ratification of the treaty—the Senate unanimously, and the House of Representatives by 48 to 1. And the people who met in Las Vegas, as I understand it, were called up there, and there had been no previous instruction to them by their organizations in opposition to the treaty, and they fell under the very persuasive power of Mr. Dowd and Mr. Northcutt Ely, or whoever was there.

Mr. ELY. Since my name has been mentioned, may I say the board of governors of the Salt River Valley water users went on record as opposing the treaty, and later proposed reservations to the treaty which I suggest be incorporated in the hearings at this point—their resolution and their proposed reservations to the treaty as presented by the members of the boards of governors and the chief counsel at the hearing on the treaty before the Foreign Relations Committee of the United States Senate.

Chairman MURDOCK. The 16-page booklet offered as evidence is too long to interject here. The resolution on page 16 will suffice at this point and the entire document may appear later. Was that prior or subsequent to the meeting in Las Vegas?

Mr. ELY. The resolution of the board of governors approved the action taken by four members of the board at Las Vegas, and ratified it with proposed reservations to the treaty.

"RESOLUTION

"Whereas this board of governors of Salt River Valley Water Users' Association authorized the following of its members:

"V. L. Corbell, J. A. Sinnott, H. C. Dobson, and J. H. Evans to represent the said association at the meeting held in Las Vegas, Nev., on January 12 and 13, 1945, in opposition to the proposed treaty with Mexico relating to the allocation of the waters of the Colorado River; and

"Whereas there was adopted at said Las Vegas meeting a resolution in opposition to the proposed treaty with Mexico, which said resolution was supported by the aforesaid members of this board of governors: Therefore be it

"Resolved, That the action of the aforesaid members of this board of governors in voting at the Las Vegas meeting for the adoption of the resolution in opposition to the proposed treaty with Mexico be, and it hereby is, declared ratified."

* * * * *

"CERTIFICATE

"I, F. C. Henshaw, the duly appointed and acting secretary of the Salt River Valley Water Users' Association, hereby certify that the above and foregoing is a true, correct, and complete copy of a resolution duly adopted at a meeting of the board of governors of said association duly and regularly held on the 5th day of February 1945, at which said meeting a quorum was present.

"[SIGNED]

F. C. HENSHAW, Secretary."

Chairman MURDOCK. The Chair holds the entire 16-page booklet pertaining to this discussion but directs that it appear in an appendix at the end of the published hearings. (See pp. 763-769.) Only the closing resolution on page 16 is necessary at this point.

Mr. CARSON. That was later. But at that time you were employed, were you not, by the State of California?

Mr. ELY. Yes. Mr. Chairman, do you wish to go into that? I shall be very happy at the appropriate time, if you wish, to do so.

Mr. WHITE. Could not you give a simple answer to a simple question?

Mr. ELY. What is the question?

Mr. WHITE. Whether at that time you were employed—yes or no?

Mr. ELY. I was employed by the department of water and power of the city of Los Angeles and had been for many years, as both clients of course knew. If the committee desires me to go into that question. I will be very happy to do so. I represented then, and now, the California Water Project Authority in Central Valley, and now represent the Colorado River Board of California.

Mr. WHITE. I do not think that calls for anything but a yes or no answer to the question.

Chairman MURDOCK. Yes; that is properly and adequately answered.

Mr. CARSON. But they did fall under the persuasive power and influence of the representatives of California at that meeting—those few individuals.

Now, to go back again to the construction of this contract, article III of the Colorado River compact under the Boulder Canyon Project Act, as to III (b) water the Department of the Interior, in regulations approved by the then Secretary of the Interior, Ray Lyman Wilbur, promulgated regulations offering a contract to the State of Arizona for 2,800,000 acre-feet annually from the main stream of the Colorado River.

Chairman MURDOCK. When was that?

Mr. CARSON. In 1933. The regulation was dated February 7, 1933. The proposal was brought to Phoenix, as I understand it—and again I want to be corrected if I am incorrect—by Mr. Ely, who was then an Assistant Secretary; but it was brought out there right in the last days of February 1933, before the change of administration which was occurring on March 4 following; so that the negotiations were not concluded and the contract was not at that time signed. But it is significant in this, that in the proposed contract, in the regulations of the Secretary, the water to be delivered was described as follows:

"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"—

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."

Now, this was offered at a time when Arizona had not ratified the Colorado River compact and this did not contemplate that it would; so that there can be no question on that.

Mr. FERNANDEZ. This was offered as an administrative interpretation of the act?

Mr. CARSON. Yes; by the Bureau of Reclamation and the Interior Department at that time. Then, as the years passed and this increase in the use in Mexico became so apparent to us in Arizona, we again became very much concerned about any possible water from Arizona from the main stream of the Colorado River in view of those developments; so, again, the legislature passed an act, in view of the failure of California to agree, authorizing the negotiation of a contract with the Secretary of the Interior for 2,800,000 acre-feet of main stream water and agreed when that was done Arizona would ratify the Colorado River compact, and we went into lengthy negotiations upon a contract. And whereas California representatives had formerly based their main opposition, as I understood it, on the fact Arizona had not ratified the Colorado River compact, they opposed the recent effort to get a contract, even though it contained a provision that it should not become effective unless and until Arizona ratified the compact. At the same time, that effort to negotiate a contract had not been made by me until after I had attended this State Department conference with the legal adviser, when all of

this treaty matter had come up and it became apparent that, for the benefit of the United States, it was necessary that the treaty be made. And I told them at that meeting, before we adjourned that day, that in my judgment Arizona must now proceed to get a contract, as we wanted it to be effective in advance of the Mexican treaty; because we did not want this group of California men to continue to block developments in Arizona and for them to be able to say, "Too bad, Arizona, but that is your water that is going to Mexico" either under or without a treaty. And that has been our whole position.

We started then, in 1943, and on February 9, 1944, we secured a contract from the United States, acting through the Secretary of the Interior, for 2,800,000 acre-feet of main stream water.

Mr. PHILLIPS. When you say "contract," what was the form of it?

Mr. CARSON. I will put a copy in the record, if I may. I do not think it is necessary for me to read it all, but I will put a copy in the record; but the provisions as to the water supply I would like to read.

Chairman MURDOCK. With objection, it will be admitted to the record at this point.

Mr. CARSON. This is headed "Delivery of water."

"7. (a) Subject to the availability thereof for use in Arizona under the provisions of the Colorado River compact and the Boulder Canyon Project Act, the United States shall deliver and Arizona, or agencies or water users therein, will accept under this contract each calendar year from storage in Lake Mead, at a point or points of diversion on the Colorado River approved by the Secretary, so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet.

"(b) * * * The United States also shall deliver from storage in Lake Mead for use in Arizona, at a point or points of diversion on the Colorado River approved by the Secretary, for the uses set forth in subdivision (a) of this article, one-half of any excess or surplus waters unapportioned by the Colorado River compact to the extent such water is available for use in Arizona under said compact and said act, less such excess or surplus water unapportioned by said compact as may be used in Nevada, New Mexico, and Utah in accordance with the rights of said States as stated in subdivisions (f) and (g) of this article.

* * * * *

"(d) The obligation to deliver water at or below Boulder Dam shall be diminished to the extent that consumptive uses now or hereafter existing in Arizona above Lake Mead diminish the flow into Lake Mead, and such obligation shall be subject to such reduction on account of evaporation, reservoir, and river losses, as may be required to render this contract in conformity with said compact and said act.

"(e) This contract is for permanent service; subject to the conditions stated in subdivision (c) of this article, but as to the one-half of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) of article III of the Colorado River compact, such water is subject to further equitable apportionment at any time after October 1, 1963, as provided in article III (f) and article III (g) of the Colorado River compact."

Those are the things I want particularly to emphasize:

"(f) 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 like use of one twenty-fifth of any excess or surplus waters 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 article III (g) of the Colorado River compact.

"(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.

"(h) 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."

(The contract above referred to is, in full, as follows:)

**"UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION—
BOULDER CANYON PROJECT, ARIZONA-CALIFORNIA-NEVADA**

"CONTRACT FOR DELIVERY OF WATER

"THIS CONTRACT made this 9th day of February 1944, pursuant to the Act of Congress approved June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplemental thereto, all of which acts are commonly known and referred to as the Reclamation Law, and particularly pursuant to the Act of Congress approved December 21, 1928 (45 Stat. 1057), designated the Boulder Canyon Project Act, and acts amendatory thereof or supplementary thereto, between THE UNITED STATES OF AMERICA, hereinafter referred to as "United States," acting for this purpose by Harold L. Ickes, Secretary of the Interior, hereinafter referred to as the "Secretary," and the STATE OF ARIZONA, hereinafter referred to as "Arizona," acting for this purpose by the Colorado River Commission of Arizona, pursuant to Chapter 46 of the 1939 Session Laws of Arizona,

"WITNESSETH THAT—

"EXPLANATORY RECITALS

"2. WHEREAS for the purpose of controlling floods, improving navigation, regulating the flow of the Colorado River, providing for storage and for the delivery of stored waters for the reclamation of public lands and other beneficial uses exclusively within the United States, the Secretary acting under and in pursuance of the provisions of the Colorado River Compact and Boulder Canyon Project Act, and acts amendatory thereof or supplementary thereto, has constructed and is now operating and maintaining in the main stream of the Colorado River at Black Canyon that certain structure known as and designated Boulder Dam and incidental works, creating thereby a reservoir designated Lake Mead of a capacity of about thirty-two million (32,000,000) acre-feet; and

"3. WHEREAS said Boulder Canyon Project Act provides that the Secretary under such general rules and regulations, as he may prescribe, may contract for the storage of water in the reservoir created by Boulder Dam, and for the delivery of such water at such points on the river as may be agreed upon, for irrigation and domestic uses, and provides further 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 stated in said Act; and

"4. WHEREAS it is the desire of the parties to this contract to contract for the storage of water and the delivery thereof for irrigation of lands and domestic uses within Arizona; and

"5. WHEREAS nothing in this contract shall be construed as affecting the obligations of the United States to Indian tribes;

"6. NOW, THEREFORE, in consideration of the mutual covenants herein contained, the parties hereto agree as follows, to wit:

"DELIVERY OF WATER

"7. (a) Subject to the availability thereof for use in Arizona under the provisions of the Colorado River Compact and the Boulder Canyon Project Act, the United States shall deliver and Arizona, or agencies or water users therein, will accept under this contract each calendar year for storage in Lake Mead, at a point or points of diversion on the Colorado River approved by the Secretary, so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet.

"(b) The United States also shall deliver from storage in Lake Mead for use in Arizona, at a point or points of diversion on the Colorado River approved by the Secretary, for the uses set forth in subdivision (a) of this article, one-half of any excess or surplus waters unapportioned by the Colorado River compact to the extent such water is available for use in Arizona under said compact and said act, less such excess or surplus water unapportioned by said compact as may be used in Nevada, New Mexico, and Utah in accordance with the rights of said States as stated in subdivisions (f) and (g) of this article.

"(c) This contract is subject to the condition that Boulder Dam and Lake Mead shall be used: First, for river regulation, improvement of navigation, and

flood control; second, for irrigation and domestic uses and satisfaction of perfected rights in pursuance of article VIII of the Colorado River compact; and third, for power. This contract is made upon the express condition and with the express covenant that the United States and Arizona, and agencies and water users therein, shall observe and be subject to and controlled by said Colorado River compact and the Boulder Canyon Project Act in the construction, management, and operation of Boulder Dam, Lake Mead, canals and other works, and the storage, diversion, delivery, and use of water for the generation of power, irrigation, and other uses.

"(d) The obligation to deliver water at or below Boulder Dam shall be diminished to the extent that consumptive uses now or hereafter existing in Arizona above Lake Mead diminish the flow into Lake Mead, and such obligation shall be subject to such reduction on account of evaporation, reservoir and river losses, as may be required to render this contract in conformity with said compact and said act.

"(e) This contract is for permanent service, subject to the conditions stated in subdivision (c) of this article, but as to the one-half of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) of article III of the Colorado River compact, such water is subject to further equitable apportionment at any time after October 1, 1963, as provided in article III (f) and article III (g) of the Colorado River compact.

"(f) 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 like use of $\frac{1}{25}$ (one twenty-fifth) of any excess or surplus waters 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 article III (g) of the Colorado River compact.

"(g) Arizona recognizes the rights of New Mexico and Utah to equitable share 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.

"(h) 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 (Chapter 16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

"(i) Nothing in this contract shall preclude the parties hereto from contracting for storage and delivery above Lake Mead of water herein contracted for, when and if authorized by law.

"(j) As far as reasonable diligence will permit, the water provided for in this contract shall be delivered as ordered and as reasonably required for domestic and irrigation uses within Arizona. The United States reserves the right to discontinue or temporarily reduce the amount of water to be delivered, for the purpose of investigation and inspection, maintenance, repairs, replacements, or installation of equipment or machinery at Boulder Dam, or other dams heretofore or hereafter to be constructed, but so far as feasible will give reasonable notice in advance of such temporary discontinuance or reduction.

"(g) The United States, its officers, agents, and employees shall not be liable for damages when for any reason whatsoever suspensions or reductions in the delivery of water occur.

"(l) Deliveries of water hereunder shall be made for use within Arizona to such individuals, irrigation districts, corporations, or political subdivisions therein of Arizona as may contract therefor with the Secretary, and as may qualify under the Reclamation Law or other Federal statutes or to lands of the United States within Arizona. All consumptive uses of water by users in Arizona, of water diverted from Lake Mead or from the main stream of the Colorado River below Boulder Dam, whether made under this contract or not, shall be deemed, when made, a discharge pro tanto of the obligation of this contract. Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this contract.

"(m) Rights-of-way across public lands necessary or convenient for canals to facilitate the full utilization in Arizona of the water herein agreed to be delivered will be granted by the Secretary subject to applicable Federal statutes.

"POINTS OF DIVERSION: MEASUREMENTS OF WATER

"8. The water to be delivered under this contract shall be measured at the points of diversion, or elsewhere as the Secretary may designate (with suitable adjustment for losses between said points of diversion and measurement), by measuring and controlling devices or automatic gauges approved by the Secretary, which devices, however, shall be furnished, installed, and maintained by Arizona, or the users of water therein in manner satisfactory to the Secretary; said measuring and controlling devices or automatic gauges shall be subject to the inspection of the United States, whose authorized representatives may at all times have access to them, and any deficiencies found shall be promptly corrected by the users thereof. The United States shall be under obligation to deliver water only at diversion points where measuring and controlling devices or automatic gauges are maintained, in accordance with this contract, but in the event diversions are made at points where such devices are not maintained, the Secretary shall estimate the quantity of such diversions and his determination thereof shall be final.

"CHARGES FOR STORAGE AND DELIVERY OF WATER

"9. No charge shall be made for the storage or delivery of water at diversion points as herein provided necessary to supply present perfected rights in Arizona. A charge of 50¢ per acre-foot shall be made for all water actually diverted directly from Lake Mead during the Boulder Dam cost-repayment period, which said charge shall be paid by the users of such water, subject to reduction by the Secretary in the amount of the charge if it is concluded by him at any time during said cost-repayment period that such charge is too high. After expiration of the cost-repayment period, charges shall be on such basis as may hereafter be prescribed by Congress. Charges for the storage or delivery of water diverted at a point or points below Boulder Dam, for users, other than those specified above, shall be as agreed upon between the Secretary and such users at the time of execution of contracts therefor, and shall be paid by such users; provided such charges shall, in no event, exceed 25¢ per acre-foot.

"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, 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.

"DISPUTES AND DISAGREEMENTS

"11. Whenever a controversy arises out of this contract, and if the parties hereto then agree to submit the matter to arbitration, Arizona shall name one arbitrator and the Secretary shall name one arbitrator and the two arbitrators thus chosen shall meet within ten days after their selection and shall elect one other arbitrator within fifteen days after their first meeting, but in the event of their failure to name the third arbitrator within thirty days after their first meeting, such arbitrator not so selected shall be named by the Senior Judge of the United States Circuit Court of Appeals for the Tenth Circuit. The decision of any two of the three arbitrators thus chosen shall be a valid and binding award.

"RULES AND REGULATIONS

"12. The Secretary may prescribe and enforce rules and regulations governing the delivery and diversion of waters hereunder, but such rules and regulations shall be promulgated, modified, revised, or extended from time to time only after notice to the State of Arizona and opportunity is given to it to be heard. Arizona agrees for itself, its agencies and water users that in the operation and maintenance of the works for diversion and use of the water to be delivered hereunder, all such rules and regulations will be fully adhered to.

"AGREEMENT SUBJECT TO COLORADO RIVER COMPACT

"13. This contract is made upon the express condition and with the express covenant that all rights of Arizona, its agencies and water users, to waters of the Colorado River and its tributaries, and the use of the same, shall be subject to and controlled by the Colorado River Compact signed at Santa Fe, New Mexico, November 24, 1922, pursuant to the Act of Congress approved August 19, 1921 (42 Stat. 171), as approved by the Boulder Canyon Project Act.

"EFFECTIVE DATE OF CONTRACT

"14. This contract shall be of no effect unless it is unconditionally ratified by an Act of the Legislature of Arizona, within three years from the date hereof, and further, unless within three years from the date hereof the Colorado River Compact is unconditionally ratified by Arizona. When both ratifications are effective, this contract shall be effective.

"INTEREST IN CONTRACT NOT TRANSFERABLE

"15. No interest in or under this contract, except as provided by Article 7 (1), shall be transferable by either party without the written consent of the other.

"APPROPRIATION CLAUSE

"16. The performance of this contract by the United States is contingent upon Congress making the necessary appropriations for expenditures for the completion and the operation and maintenance of any dams, power plants or other works necessary to the carrying out of this contract, or upon the necessary allotments being made therefor by any authorized Federal agency. No liability shall accrue against the United States, its officers, agents, or employees by reason of the failure of Congress to make any such appropriations or of any Federal agency to make such allotments.

"MEMBER OF CONGRESS CLAUSE

"17. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

"DEFINITIONS

"18. Wherever terms used herein are defined in article II of the Colorado River Compact or in Section 12 of the Boulder Canyon Project Act, such definitions shall apply in construing this contract.

"19. IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed the day and year first above written.

"THE UNITED STATES OF AMERICA,

"By (Signed) HAROLD L. ICKES,

"Secretary of the Interior.

"STATE OF ARIZONA, acting by and through
its COLORADO RIVER COMMISSION,

"By (Signed) HENRY S. WRIGHT, *Chairman,*

"By (Signed) NELLIE T. BUSH, *Secretary.*

"Approved this 7th day of February 1944.

"(Signed) SIDNEY P. OSBORN, *Governor of the State of Arizona.*"

Mr. CARSON. This is a contract between the United States and the State of Arizona, signed on behalf of the United States on the 7th day of February 1944, by Harold L. Ickes, Secretary of the Interior, and signed on behalf of the State of Arizona by its Colorado River Commission, by Henry S. Wright, chairman, and Nellie T. Bush, secretary, and by Sidney P. Osborn, Governor of the State of Arizona. I might add that this contract required ratification by the Arizona Legislature, and it was ratified before the end of February 1944, and the Colorado River compact was also ratified before the end of February 1944.

Mr. WHITE. Did such a contract by the Secretary of the Interior require the ratification by the Congress?

Mr. CARSON. No, sir.

Mr. PHILLIPS. The other day Mr. White asked, and I am a little confused at this point, about the right of the Secretary of the Interior to apportion the waters of the Colorado, and it seemed to me the answer was "No." I am not questioning it; I just do not understand how he can apportion the water. I think the answer to Mr. White's question the other day was, it had to be an agreement between the three lower basin States.

Chairman MURDOCK. As I understand this apportionment, if it can be called that, is under the law; it is in conformity with the act of 1923, the Boulder Canyon Project Act. I think that probably is the Secretary's authority for entering into such a contract.

Mr. PHILLIPS. Well, Mr. Carson, did not the Secretary, in the statement you just read or the agreement you just read, say something about the quality of the water?

Mr. CARSON. No, sir; none of them, so far as I know, say anything about the quality of the water.

Mr. PHILLIPS. Was not there a memorandum, then, from the Secretary which accompanied it at the same time and, to all intents and purposes became a part of it, that should be put in the record right here, which might be called an explanatory memorandum regarding this contract you have just read?

Mr. CARSON. Not so far as I know. This is the entire contract between the United States and the State of Arizona.

Mr. PHILLIPS. I think there is a memorandum, Mr. Chairman; and, if there is such, I think we ought to put it in at this point, so that it can be read in connection with this contract.

Chairman MURDOCK. If there is such a memorandum from the Secretary of the Interior, it may be incorporated.

Mr. CARSON. There is a provision here that we all have to comply with, including California.

Mr. PHILLIPS. If I may pursue that, I think maybe I was wrong in my question. I think what I had in mind was the reference to whether it was III (a) or III (b) water, and I think the Secretary did say something about that.

Mr. CARSON. No. It does not specify.

Mr. PHILLIPS. It does not say definitely, but does not he specify that he cannot decide that?

Mr. WHITE. Let us turn back to III (a) and III (b). I distinctly remember three different references to the contract referred to in the agreement.

Mr. CARSON. No; not in the water to be supplied to us.

Mr. WHITE. I mean in the document you read there.

Mr. CARSON. Let me say that it is not Arizona's contention that by this contract the Department of the Interior has undertaken to settle any dispute between Arizona and California. They felt they should not do that.

Mr. WHITE. Read that language you read before.

Mr. CARSON. Let me go back here for a minute to Mr. Phillips' prior question. The Boulder Canyon Project Act provides that contracts respecting water for irrigation and domestic uses shall be for permanent service and shall conform to paragraph (a) of section 4 of this act—"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 hereinafter stated."

And the claim of right by every California agency to the water from Lake Mead is based upon contracts with the Secretary of the Interior, as is our right, and on that basis they are all in an equal status.

Chairman MURDOCK. Are those firm contracts?

Mr. CARSON. No, sir; they are just exactly the same as ours are. I will refer to that question in a minute. They are not firm contracts, and there is no firm commitment on the part of the United States to deliver any specified quantity of water to California. It is always subject to its availability for use in Cali-

fornia, under the Colorado River compact and the Boulder Canyon Project Act.

Mr. PHILLIPS. I think maybe Mr. White has asked a very important question there. I have the memorandum I referred to in my hand.

Mr. CARSON. What was that—a press release or something?

Mr. PHILLIPS. Yes; a press release which accompanied the memorandum. This press release had three paragraphs and then contained in full the memorandum of February 2; but, evidently, there was some question of authority which Mr. White asked about. Is not there something in the contract where he reserves to the States the right to contract?

Mr. CARSON. Oh, surely; but he does not undertake to settle these questions. But let me go back to what I said. I did not undertake to say that by this contract the Department of the Interior has agreed to deliver to Arizona or specifically named III (a) water. They do not name III (a) water, but they do provide that this water is to be delivered from Lake Mead. That is the only authority that the Secretary has, as I understand it, to make contracts for the water of the Colorado River, that water which can be stored in Lake Mead created by Boulder Dam. I want to call your attention to the location again on that. Here [indicating] is Boulder Dam away up here. Now, the way we construe all of these documents and statutes and contracts is that the upper basin States are required to deliver at Lee Ferry an average of 7,500,000 acre-feet each year. That water comes on down and is augmented by the Little Colorado River out of Arizona and some small streams out of northern Arizona and one, I believe; going into Utah until it reaches Boulder Dam where it is there stored.

Now, the Secretary's authority to make contracts for the delivery of water is limited to water stored behind Boulder Dam or as may be later stored by any dam authorized by Congress. Generally speaking, I will agree that the Secretary of the Interior does not own the water of the Colorado River; that it is owned by the States and is subject to appropriation in accordance with their respective laws, and in the Colorado River Basin all of us have the right of prior appropriation. But under the act of Congress which I have read, the Secretary is authorized to make contracts for the delivery of water stored in Lake Mead, and that is what our contract provides—that from the water stored in Lake Mead, which is up here [indicating], the Secretary shall deliver so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet; again, however, subject to its availability for use in Arizona under the provisions of the compact and the Boulder Canyon Project Act. So that clearly excludes from this contract any part of the Gila River water and relates to water that is delivered at Lee Ferry, which is subject to all of those applications.

Chairman MURDOCK. You could not call that a firm contract, then?

Mr. CARSON. No, sir; we do not. It is a contract for delivery in Arizona of a quantity of water, subject to its availability, for use in Arizona under the compact and the act.

Chairman MURDOCK. But you do assert that it is on a par with all other contracts of such a character?

Mr. CARSON. Yes.

Mr. WHITE. I wonder if the witness could not proceed down to where the three provisions were mentioned, the B and A were mentioned in the contract. I would like to get that in the record. That was in the contract.

Mr. CARSON. I think, Mr. White, that what I was referring to in this contract was the provisions of paragraph 7 and in this paragraph the language is also divided into A and B. But I will also refer to the part that concerns the reservations.

Mr. WHITE. The gentleman from California asked the question.

Mr. CARSON. Yes. This is one of the reservations that I think you wanted brought out.

Paragraph 10 of this Arizona contract reads:

"Neither article seven, 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."

Chairman MURDOCK. In other words, that simply means the contract is made subject to the Boulder Canyon Project Act.

Mr. CARSON. Yes; and the Colorado River compact.

Chairman MURDOCK. Exactly.

Mr. FERNANDEZ. Mr. Chairman, since the contract is in evidence in aid to a proper understanding of the Boulder Canyon Act and its interpretation by the Department, should we not also have whatever is contained in the press release, as a part of the record?

Chairman MURDOCK. I think that is pertinent.

Mr. PHILLIPS. I think it would be helpful if we did put in this Bureau of Reclamation release of February 10, 1944, and following the three preliminary paragraphs is found the statement that Secretary Ickes issued in the following memorandum, and this is the paragraph I had in mind, and I quote:

"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 a 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 water 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."

In other words, that just says again that this committee cannot determine the allocation of the water.

Mr. CARSON. I am not asking the committee to determine the allocation of the water, and I will make that clear before I have finished.

Mr. WHITE. Why not have the entire memorandum made a part of the record.

Chairman MURDOCK. You wish the entire memorandum in the record?

Mr. PHILLIPS. I think that will be all right. I only read the one paragraph. And I did not read the entire release.

(The statement referred to follows:)

"DEPARTMENT OF THE INTERIOR—INFORMATION SERVICE—BUREAU OF RECLAMATION

"For immediate release Thursday, February 10, 1944 W

"Secretary of the Interior Harold L. Ickes announced today he had signed, on behalf of the United States, a contract to deliver to the State of Arizona annually 2,800,000 acre-feet of Colorado River water from storage in the Bureau of Reclamation's Boulder Dam Reservoir, subject to its availability for use in Arizona under the provisions of the Colorado River compact and the Boulder Canyon Project Act.

"Commissioner of Reclamation Harry W. Bashore said the contract would become effective when ratified by the Arizona Legislature and when this body unconditionally ratifies the Colorado River compact. The legislature, on March 25, 1943, voted to ratify the compact, provided a contract for the delivery of water from Lake Mead was executed between the United States and Arizona.

"The Secretary signed the contract after considering fully the objections presented by the State of California in a hearing on February 2 and representations made by the State of Arizona in reply. The contract had previously been ap-

proved by the committee of fourteen, which is composed of two representatives of each of the seven Colorado River Basin States. All members of the committee except those from California approved the agreement which the Secretary has now signed.

"In announcing his decision, Secretary Ickes issued the following memorandum:

"Memorandum re hearing February 2 on California's objections to the proposed contract between the United States and Arizona for the delivery of water from Lake Mead.

"There has been submitted to me for approval and execution a proposed contract between the United States and the State of Arizona for the delivery of water from Lake Mead for use in Arizona. Section 5 of the Boulder Canyon Project Act authorizes me to contract for the storage and delivery of water impounded by Boulder Dam. Under subdivision (a) of article 7 of the proposed contract the United States agrees to deliver annually from storage in Lake Mead for use in Arizona a maximum of 2,800,000 acre-feet of water, subject to its availability for use in Arizona under the provisions of the Colorado River compact and the Boulder Canyon Project Act, and under subdivision (b) of article 7 of the United States agrees to deliver one-half of any excess or surplus water unapportioned by the compact to the extent such water is available for use in Arizona under the compact and act. The contract is conditioned upon the unconditional ratification of the compact by Arizona.

"The proposed contract was drafted by the committee of fourteen after the Arizona Legislature last spring passed an act contingently ratifying the compact—the contingency being the execution and ratification by the legislature of a contract for the delivery of water from Lake Mead. Representatives of the Bureau of Reclamation worked closely with the committee and made a number of modifications which were accepted by the committee and Arizona. Bureau representatives, under my instructions, have taken the position throughout the negotiations that any contract proposed should not commit the Department as to any controversial issue regarding the amounts of water available to Arizona, or to any compact State, under the compact and the act. The proposed contract has been approved by the representatives of each of the Colorado River States, except California.

"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.

"It is my opinion that I have authority under section 5 of the act to execute such a contract as is proposed to be made with Arizona. The Department has made contracts with California and Nevada for the delivery of waters from Lake Mead subject to its availability under the compact and act. Now that Arizona has agreed to ratify the compact, it is my opinion that Arizona is entitled to be accorded the same consideration that the Department has accorded to California and Nevada. Accordingly, I have decided to approve and execute the proposed contract with Arizona.

"HAROLD L. ICKES,

"Secretary of the Interior.

"FEBRUARY 9, 1944."

"California and Arizona have been at odds for more than 20 years over the division of the waters of the Colorado River system. The fundamental controversy between the two States concerns the amount of water to which each State is entitled under the compact and the Boulder Canyon Project Act.

"The dispute dates back to 1922 when six of the seven States in the Colorado River Basin agreed to the Colorado River compact which apportioned the waters from the main river and its tributaries to the upper and lower basins. Arizona was the lone objector. Subsequently, the legislatures of all States, except Arizona ratified the compact.

"In 1928 the Congress passed the Boulder Canyon Project Act, which provided that the act would not become effective until the California Legislature agreed to limit its use to 4,400,000 acre-feet of water apportioned in article III (a) of the compact, plus one-half of the excess or surplus unapportioned water. California passed such a limitation act in 1929."

Mr. CARSON. That does not specify that it is III (a) water, of course.

Mr. PHILLIPS. No.

Mr. CARSON. Nor does the California contract specify that. I want to read now from the water contract of the metropolitan water district, which contains a clause similar to the other contracts. I am reading from page 300 of what we call the "Hoover bible," "The Hoover Dam Contracts—Wilbur and Ely," coming down to the part of the contract dealing with "Delivery of water by the United States," under explanatory recitals, number (6), is found this language:

"The United States shall, from storage available in the reservoir created by Hoover Dam, deliver to the district each year at a point in the Colorado River immediately above the districts' point of diversion (at or in the vicinity of the proposed Parker Dam) so much water as may be necessary to supply the district a total quantity, including all other waters diverted by the district from the Colorado River, in the amounts and with priorities in accordance with the recommendation of the chief of the division of water resources of the State of California, as follows (subject to the availability thereof for use in the State of California under the Colorado River compact and the Boulder Canyon Project Act) : "

That is exactly the same provision that is in the Arizona contract, as far as that is concerned. And then it goes ahead and says:

"The water of the Colorado River available for use within the State of California under the Colorado River compact and the Boulder Canyon Project Act shall be apportioned to the respective interests below named and in amounts and with priorities therein named and set forth, as follows"—

That is, waters of the Colorado River available for use within the State of California under the Colorado River compact [continuing]:

"SECTION 1. A first priority to Palo Verde irrigation district for beneficial use exclusively upon lands in said district as it now exists and upon lands between said district and the Colorado River, aggregating (within and without said district) a gross area of 104,500 acres, such waters as may be required by said lands."

Then, continuing with the priorities, and coming down to section 7, we find this language:

"A seventh priority of all remaining water available for use within California, for agricultural use in the Colorado River Basin in California, as said basin is designated on map No. 23000 of the Department of the Interior, Bureau of Reclamation."

All that these so-called California contracts amount to, as I see, are merely agreements between the State of California agency as to priority of rights in the use of such water as may be available for use in California under the compact and the act, and the Secretary agrees to deliver whatever water is available in accordance with those priorities.

So that I do not want any inference to be drawn one way or the other that there is any distinction between the availability of water to California and to Arizona. The Department has not undertaken to determine or to settle questions as between them. But my contention is that California, by her limitations act, required to be passed by the Boulder Canyon Project Act, has definitely and permanently, if the good faith of the State of California means anything, precluded herself from claiming any part of III (b) water. There cannot be any mistake about that; 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"—and the other basin States—

Chairman MURDOCK. From what are you reading now?

Mr. CARSON. From the Boulder Canyon Project Act, section IV.

Mr. PHILLIPS. Mr. Chairman, we are about to recess, and I just want to say, Mr. Carson, that I am not quite clear with regard to the letter of Mr. Hoover, and I was going to ask you if you would care to comment on the comparison between the statements in that letter—and I have not had an opportunity to read them—and the letter which Mr. Hoover wrote on January 25, 1923, when the matter was still very fresh in his mind, apparently, to Senator Hayden. You are familiar with that, are you not, in which he set out definitely in reply to Senator Hayden's questions, the understanding arrived at in conferences in connection with the compact?

Mr. CARSON. I am not prepared to answer now as to what Mr. Hoover said, whether there are any conflicts.

Mr. PHILLIPS. I am not sure that there are.

Mr. CARSON. I do not know; I am not familiar with all of the statements.

Chairman MURDOCK. Gentlemen of the committee, the House is now in session. Anxious as I am to continue the hearings and to conclude them as soon as possible, I am wondering about a session this afternoon.

Mr. WHITE. Mr. Chairman, the debates in the House this afternoon are of paramount importance to all the people of the United States.

Chairman MURDOCK. They certainly are.

Mr. WHITE. And I personally will not be able to be here.

Mr. PHILLIPS. It is my desire to be on the floor, Mr. Chairman. We have a conference report coming up this afternoon.

Chairman MURDOCK. Without objection, the committee will stand adjourned until 10 o'clock tomorrow morning.

(At 12:10 p. m., the hearing was adjourned to meet at 7:30 o'clock the following evening, Tuesday, July 9, 1946.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON IRRIGATION AND RECLAMATION,
Washington, D. C., Tuesday, July 9, 1946.

The committee met at 7:30 p. m., Hon. John R. Murdock (chairman) presiding.

Chairman MURDOCK. The committee will come to order, please. This is a little unusual for this committee, to hold an evening session, but in view of the crowded legislative program we thought that it would be the best thing to do.

This hearing is a continuation of the hearings on H. R. 5434. Mr. Carson, of Arizona, was on the stand at the close of our last session.

Mr. Carson, you had not completed your statement?

FURTHER STATEMENT OF CHARLES A. CARSON

Mr. CARSON. No.

Chairman MURDOCK. Would you like to continue perhaps without interruption for a while?

Mr. CARSON. Yes. I would like to get my testimony as clear and concise in the record as I can, and then I will be glad to answer questions.

When the committee adjourned yesterday, I had just stated that the Arizona Legislature had ratified the contract and the Colorado River compact, and I would like to put into the record the reference to the act, chapter 4 of the session laws of the first special session of the 1944 legislature, printed in the 1945 Session Laws of Arizona, which ratified the contract between the United States and the State of Arizona and was approved by the Governor on February 24, 1944. That is the contract that is now in the record of this committee which was signed on February 9, 1944.

Chapter 5 of the same session laws of that special session ratified the Colorado River compact. That was likewise approved by the Governor on February 24, 1944.

Chapter 6 appropriated \$200,000 for a cooperative survey with the Bureau of Reclamation, which survey has progressed rapidly but has not yet been completed. That act likewise was approved by the Governor on February 24, 1944.

So, with these acts, the Colorado River compact became fully effective between all the States of the Colorado River Basin and the contract between the United States and the State of Arizona became fully effective.

Now, I would like to correct myself in one particular. We have discussed this basin so many times and have always talked about the upper-basin States being composed of Wyoming, Colorado, Utah, and New Mexico. Part of Arizona is

also in the upper basin—this dotted line being the dividing point [indicating at map]. We have talked about the lower basin being California, Arizona, and Nevada, but a part of Utah, the southwest corner of Utah, is also a part of the lower basin, as is the western part and southwestern part of New Mexico, this [indicating at map] being the dividing line in New Mexico.

We have been talking also of the 2,800,000 acre-feet of water to be delivered to Arizona by this contract. That is not the exact amount; it is subject to reductions by virtue of the use in those portions of Utah and New Mexico which are in the lower basin, and by some other matters that will be discussed by Mr. Baker, our engineer, when he gives the figures on the water supply.

Then, I would like to go back a moment to the statement that California agencies were required to underwrite and guarantee the cost of Boulder Dam. That is not accurate in the ordinary acceptance of the term "underwrite and guarantee." Actually, the dam was built by appropriations by Congress, and the California agencies contracted to buy power at so much a kilowatt-hour, which, in the judgment of the Secretary of the Interior, was sufficient to assure repayment of the cost, but they never did underwrite or guarantee that cost in the ordinary acceptance of the term. They merely buy electrical energy at a very favorable rate and pay for whatever they receive.

There was at that time reserved for Arizona 18 percent of the power at Boulder Dam, which has now been reduced, which Arizona is trying to get at the same rate California gets and which California is fighting. So there never was any underwriting or guaranty. If Boulder Dam were destroyed tonight, California would owe the United States nothing at all; it would be the United States loss.

That, in the main, is the sole source of revenue for the repayment of the dam's cost, except that the metropolitan water district and the city and county of San Diego agree to pay 25 cents per acre-foot in storage for the delivery of water to them for domestic purposes, and the State of Nevada agreed to pay 50 cents per acre-foot for the diversion directly from Lake Mead.

Now the present situation of the use of water in the basin.

The upper-basin States are at this time using a little less than 2,500,000 acre-feet. California, under its priority system, is using—

Mr. PHILLIPS. What was that word that you used?

Mr. CARSON. Priority system—under its priority system.

Mr. WHITE. Does that mean superior water rights?

Mr. CARSON. I mean under their domestic priority, in California, to total delivered to California, as I understand it, is approximately 2,600,000 acre-feet, or perhaps 2,700,000 acre-feet now.

The metropolitan water district, under the California system of priorities, has 1,100,000 acre-feet ultimate, of which they had diverted up to last year not more than 60,000 acre-feet in any one year, according to my understanding.

Arizona, out of the main stream, used—including those on the Little Colorado system, which is entirely within Arizona—has been using, consumptively using, between 400,000 and 500,000 acre-feet, the exact figures as to which Mr. Baker will give you.

That is the draft in the United States on the river which has not yet reached any close approximation of the ultimate apportionment of rights to any of the States.

It was suggested here that Arizona needed an underground water code. We know that we need an underground water code. The legislature at a special session in September appropriated \$40,000 for a cooperative survey with the United States Geological Survey of the underground water resources of Arizona upon which to base an intelligent and workable underground code. It is hoped that will be presented to, and result in a law at the next session of, the legislature. But that is not any of California's business as to whether or not we have an underground code. We need it for our own protection and the protection of existing developments, and that is the reason that we are adopting it.

It has also been suggested here that we should, prior to the diversion of any water into Arizona, establish, as California did, a schedule of priorities. Bear in mind, please, that of the 2,800,000 acre-feet of water we are now using between 400,000 and 500,000 acre-feet only.

The surveys of the Bureau of Reclamation, and the location for the use of the balance of our water are not yet determined. The central Arizona bill is not yet ready for hearing because the Bureau's reports are not ready or available. We will in all respects abide by, without question, our agreement with the United States that we agree that California can use water up to the limit avail-

able to it under its own Limitation Act, and we do not propose to infringe in any way whatsoever upon that. We do figure that out of the 2,800,000 acre-feet there is ample water for the irrigation of the Wellton-Mohawk area, that part of the Yuma Mesa which is to be reauthorized and the central Arizona diversion, and we intend to confine those diversions to the quantities of water which are good for all time and firm without any regard at this time to the use in Arizona of any of the surplus water of the river. That we propose to take up and work out at a later date.

Now it has also been suggested here that all developments in the basin should cease until water is allocated as between the States. I respectfully call the committee's attention to the Colorado River compact which makes a division of the water from the Colorado River between the upper basin and the lower basin which all of us are now parties to, including Arizona and California. I respectfully call the attention of the committee again to the California Limitation Act which, together with the Arizona contract, has by agreement of California and Arizona effected a division between them of the water allocated to the lower basin. It is true it is not a direct agreement between the two States, but if California lives up to her commitments and Arizona to her commitments, the commitments are made.

California agreed with the United States, for the benefit of Arizona, that the uses in California should never exceed 4,400,000 acre-feet of III (a) water plus not more than one-half of the surplus, or water unapportioned by the compact. They made that limitation agreement irrevocably and unconditionally and expressly for the benefit of Arizona. Arizona likewise made an agreement with the United States under which Arizona agreed that she recognizes the right of the United States to contract and deliver to California water, to the extent of the water available for use in California under its Limitation Act, and Arizona at any rate proposes to live up entirely to its agreement.

If California would live up to the letter and spirit of the agreement, this controversy would not have been raised here, as we see it.

California's position, as we understand it here, is: Of course, you will not interfere with us, our use of 4,400,000 acre-feet of water apportioned to the lower basin by article III (a) of our compact, or to our right to use one-half of the surplus, but we will see—and this, to me, seems to be California's position—as far as we are able that you are not able to use the 2,800,000 acre-feet which we have agreed we will never use, and which, if not used in Arizona, cannot lawfully be used anywhere else in the United States, including California.

So all that we ask of California is, if they cannot help us, to see that they maintain the position now and all the rest of the time that they will live up to the agreements they have already made under the Colorado River compact and the California Limitation Act.

Mr. PHILLIPS. I have not understood that from the testimony so far, but I do not want to interrupt the witness.

Chairman MURDOCK. We will continue.

Mr. CARSON. May I continue and try to make that plain again, Mr. Phillips?

California has ratified and is bound by the Colorado River compact, which divides the water between the upper and lower basin. California is bound by the Limitation Act of the California Legislature, which in express terms limits use in California to 4,400,000 acre-feet, plus not more than half of the surplus. The compact apportions the lower basin 8,500,000 acre-feet. Now, the 2,800,000 acre-feet which we are claiming in this hearing cannot lawfully be used in California under the California Limitation Act, and you have agreed for our benefit that it cannot; yet the apparent attempt here is to prevent its being used in Arizona. We can only come to one conclusion on that, that the spokesmen for California agencies are now trying to lay the groundwork to avoid the Colorado River compact and the California Limitation Act.

It seems to me that their attitude is this: Of course, we signed the Colorado River compact; we ratified it. Of course, we passed the California Limitation Act, but we got for those acts of ours the construction of Boulder Dam and our California contracts. We have received all of the considerations that would ever possibly come to us; therefore, those compacts and the Limitation Acts are of no further use to us, so we will seek some way to avoid them and stop Arizona from using the water which we have agreed that we cannot use and which cannot lawfully be used anywhere else in the United States.

Now that position, taken in conjunction with the question of the Pilot Knob power plant and the development of lands in Mexico, seems to us to indicate

that there is still in the back of the minds of the California spokesmen the thought that some day somehow they either might avoid these limitations on California use or aid in the development of Mexico at the expense of the United States and Arizona.

There has been a lot of free advice given to Arizona. I would just like to give a little to California—that they recognize now the sanctity and the validity of the Colorado River compact and the California Limitation Act, and that the State of California in its sovereign capacity and the good people of California see that its spokesmen do not take any action which would involve the breach of either of them and involve the good faith and the integrity of the commitments of the sovereign State of California, made in the most solemn way known to man—by compact with the other States and by agreement with the Government of the United States.

Now, I have one further statement, that if this Pilot Knob question and the question of the Mexican lands could be eliminated from California's consideration, or ours, I think that it would be very helpful in creating better relationships between California and Arizona.

After all, we are a part of the same trade territory and economic section of the United States, and we should be helping one another; we should not always be fighting one another.

Mr. PHILLIPS. Of course, Mr. Chairman, that is the way that we felt when the Mexican Water Treaty was under consideration.

Mr. CARSON. Now, I will have to go into that again for a moment—the Mexican Water Treaty.

The Imperial irrigation district was delivering water to Mexico and being paid for the delivery of the water to Mexico and increasing the use of the water in Mexico to where in 1943 and 1944 Mexico had used 1,800,000 acre-feet of water, and that use was rapidly expanding. As we see it, as we saw it then, and we see it at present, it was necessary for the benefit of all the States of the Colorado River Basin, including California, insofar as she wanted to use water within the borders of California, that there be fixed on Mexico for all times an over-all all-time limit on its claim of right of water from the Colorado River and stop that development. That was our purpose, our sole purpose, in supporting the treaty.

Now, the treaty makes these provisions that are necessary, as we see it, in order that we, and all the States of the basin, can get credit for the return flow in the main stem of the river, limiting Mexico's claim for water through the All-American Canal and Pilot Knob power plant to 500,000 acre-feet a year to 1980, and thereafter to 375,000 acre-feet.

Our engineers have estimated that with the desilting water that is necessary to flow through the Imperial Dam and the return flow, mainly from Arizona projects, there will be in the main stream of the river approximately 1,000,000 acre-feet.

Mr. PHILLIPS. From what source?

Mr. CARSON. From the return flow from the Arizona projects, and the desilting water that must pass through the Imperial Dam.

Mr. PHILLIPS. One million acre-feet?

Mr. CARSON. Approximately 1,000,000 acre-feet. That is the reason for the limitation through the All-American Canal to 500,000 acre-feet. The two together make the 1,500,000, and they played safe by cutting that down after 1980 to 375,000 acre-feet, figuring that by that time there might be 1,125,000 acre-feet of return flow available in the main stream of the river under the Mexican schedules set out.

Mr. PHILLIPS. May I ask you something there? Will you point out these other projects in Arizona that you have been talking about at various times? Will you point out the Salt River project? I thought that while you were at the map it might be a wise thing if you did that.

Mr. CARSON. That has not been worked out in detail, Mr. Phillips. The plan of the Bureau and of Arizona has not yet been worked out.

Mr. PHILLIPS. You have spoken of the San Carlos and Salt River as parts of the Gila system; is that right?

Mr. CARSON. Yes.

Mr. PHILLIPS. Could you just put your finger on it for me?

Mr. CARSON. Let me make a little more general statement.

The present plan is to build Bridge Canyon Dam on the main stream of the river, and from there divert through this tunnel and canal water to the Salt River

above the Granite Reef Dam, and on over to the Gila River above the town of Florence.

Mr. PHILLIPS. That is what we call the central Arizona project?

Mr. CARSON. Yes.

Mr. PHILLIPS. What are the ones there now in the Gila system?

Mr. CARSON. The ones that are there now, the Yuma Mesa and the Wellton-Mohawk, all of which return flow enters the river below the Imperial Dam.

Mr. PHILLIPS. Where is San Carlos?

Mr. CARSON. Over here [indicating].

Mr. PHILLIPS. And where is Salt River?

Mr. CARSON. In the central part of the State.

Mr. WHITE. While the witness is at the map, I wish that he would indicate where the Central Valley is in Arizona. Is it north or south of the present Salt River project?

Mr. CARSON. It is the same thing. We just call it the Bridge Canyon central Arizona project. We hope to get a workable project to present to this committee for the bringing of the main stream water from Bridge Canyon Dam through a tunnel and canal to the Salt River, and to the Gila River, to furnish supplemental supplies for these presently irrigated lands in those valleys which are very short of water.

Mr. PHILLIPS. How would you bring it over?

Mr. CARSON. By aqueduct. It is indicated here on this map. We hope also, by an exchange of water to these lower lands, to release Gila River water for use upstream in the Safford and Duncan Valleys and over into the Virden Valley of New Mexico, so that all those valleys will have an adequate supply of water that will be there in the late summer when they need it. The engineers are now investigating and making detailed surveys to report on the Hooker Dam site in New Mexico as a storage site for the benefit of the lands below it on the Gila in New Mexico, and in Arizona above the Coolidge Dam.

Chairman MURDOCK. Before you leave there, is that part of New Mexico considered within the lower basin, and does that share in the 2,800,000 acre-feet of water?

Mr. CARSON. Yes. Mr. Fernandez, you were not here a minute ago. I wanted to explain to you for just a moment that we have been using rather loosely here the term "upper basin" as referring to Wyoming, Utah, Colorado, and New Mexico. That, in the main, is correct, and through the course of years we have all been talking that way, but actually the upper basin also includes a part of Arizona above this dotted line [indicating]. That is in the upper basin under the definition of the compact. We have been talking about the lower basin as California, Nevada, and Arizona, but actually the lower basin includes the western part of New Mexico from this line [indicating] down. Also, it includes the southwest corner of Utah from this line over to the Nevada line [indicating].

Our contract with the United States recognizes the rights of those portions of those States in the lower basin to an equitable share of the water apportioned to the lower basin, and we deduct that share as calculated by the Bureau of Reclamation's engineers from 2,800,000 that will otherwise be deliverable to us at Lake Mead. There are certain other deductions that show that the 2,800,000 is a rough figure, but Mr. Baker, when he comes to the stand, will have the figures to show the reduced amount that we think we are entitled to under that contract.

Mr. FERNANDEZ. You spoke about bringing the water down the Colorado River through a tunnel to the Gila River land. That appears to be hundreds of miles.

Mr. CARSON. It is.

Mr. FERNANDEZ. There is no land closer to the source of supply?

Mr. CARSON. There is, but the lands, in the lower Gila Valley, around Florence, Casa Grande, and Coolidge are very short of water and so are the lands in the Safford and Duncan Valleys, by reason of the vested rights in the Florence, Casa Grande, and Coolidge area.

This year, for instance, in the Casa Grande, Florence, and Coolidge area those lands, from surface flow and pumping, will have less than nine-tenths of 1 acre-foot of water per acre this year, and the shortage extends clear up into Safford, Duncan, and the Virden Valley of New Mexico.

Mr. FERNANDEZ. That diversion is not involved in this bill?

Mr. CARSON. It is involved in the central Arizona bill, which is not yet ready for report, but which has been discussed by California as one reason for opposing this bill. But then out of that 2,800,000 acre-feet there will be, according to our figures, ample water to supply the central Arizona project and the Wellton-

Mohawk Yuma Mesa project out of firm water, good for all time, involving no parts of the surplus, and part of that water we plan to give to the lower users on the Florence, Casa Grande, and Coolidge area, so they will exchange upstream Gila water for use in the Safford, Duncan, and Virden Valleys.

Mr. PHILLIPS. Where are those—farther east than where we are talking about now? I mean those valleys?

Mr. CARSON. Yes; one is in New Mexico.

Mr. PHILLIPS. Did I understand you to say that this dam in New Mexico is a part of the central Arizona project?

Mr. CARSON. Yes.

Mr. PHILLIPS. Is that New Mexico water III (a) water?

Mr. CARSON. Yes; and deductible from our 2,800,000 acre-feet.

Chairman MURDOCK. That is New Mexico water by virtue of the fact that part of New Mexico is in the lower basin; is that right?

Mr. CARSON. Yes.

Mr. PHILLIPS. If that is III (a) water, how about the uses on the Gila westward; is that also III (a)?

Mr. CARSON. I will come to our theory of that later.

Coming back, then, to this Pilot Knob Mexican land question, if the United States paid the Imperial irrigation district for a proportionate cost of the Imperial Dam and of the All-American Canal down to and including Pilot Knob and its power plant adequately and fairly, then it would seem to me that we might avoid this thought of the Imperial irrigation district persuading the other California agencies to fight other States in order to maintain that proposition. And it would be fair and the United States contemplated that in its treaty with Mexico.

I would like to read into the record in that connection a portion of article XIV of the treaty between the United States and Mexico on the water question:

"In consideration of the use of the All-American Canal for the delivery to Mexico in the manner provided in articles XI and XV of this treaty, of a part of its allotment of the waters of the Colorado River, Mexico shall pay to the United States (a) a portion of the cost actually incurred in the construction of the Imperial Dam and the Imperial Dam-Pilot Knob section of the All-American Canal; this proportion and the method of terms of repayment to be determined by the two governments, which for this purpose shall take into consideration proportionate uses of these facilities by the two countries, these determinations to be made as soon as Davis Dam and Reservoir are placed in operation."

That was contemplated in the treaty, and if there was any aid that Arizona could give to the Imperial irrigation district in getting adequate compensation for that, we would be glad to do that.

Mr. PHILLIPS. Getting money for water is not always the kind of exchange that you want. I thought that the principal discussion here was on the quantity of water and, under the compact, what part was being charged against III (a) and III (b).

Mr. CARSON. This would involve the Imperial irrigation district surrendering not one drop of water that can be utilized in the United States. This would be only surrendering its right, or claimed right, which it had before the treaty was signed, to permit water to run through the All-American Canal and Pilot Knob into Mexico, which it was then selling to Mexico for money.

Mr. PHILLIPS. I think perhaps we are at cross purposes. The argument that I have heard here, and have been hearing every day, is whether there is enough water. Now the unanswered question still is, "What is the usable quantity of the water," and it seems to me that we have been rather disregarding the quantity of the water available. It seems to me that the people of California have not been attempting to tell the people of Arizona what they can do, but are attempting to find out how much water there is to do it with; is that not right?

Chairman MURDOCK. You are right about quantity of water being involved, but the main question is how much water is lawfully available, both in California and Arizona, and the point I think the witness is now trying to make is that so long as the Imperial irrigation district has an oversized canal with a sufficiently large capacity there is a strong temptation to deliver water to Mexico, which it was doing before the treaty was made, but which the treaty now modifies.

Now, our point is that if the United States Government would pay the Imperial irrigation district a certain cost of that canal down to the Pilot Knob plant and remove the temptation to furnish an overdue amount of water to Mexico for pay, for consideration, and with the same produce power at Pilot Knob, it would un-

doubtedly release more water in the basin within the United States for diversion.

Mr. CARSON. And I think that it would take away a lot of this fight.

Mr. Down. The Imperial irrigation district has received not one penny for any water that has been run through the All-American Canal and delivered to Mexico. Those arrangements have been made directly between the State Department of the United States and the Ministry of Foreign Affairs of Mexico. The financial arrangements are made between the two countries, and the Imperial district has not received one penny from any water run through the All-American Canal and delivered to Mexico.

Mr. PHILLIPS. I was just making a note to bring that up later so as to not interrupt the witness, because that was not a deal with the Imperial irrigation district; it was a deal with the State Department.

Mr. CARSON. I will answer that right now. It was brought out in the hearings on the Mexican water treaty before the Senate Foreign Relations Committee, and it is printed in the record, that the financial transactions were between the Imperial irrigation district and its wholly owned subsidiary in Mexico, which owns all of the Alamo canal that serves Mexican lands, and it is all a matter of record in the hearings of the Senate committee. I do not want to get into too much argument here about it.

Chairman MURDOCK. Will you give the exact Senate hearing so that we may have that for the record? This record should show those references to the Senate hearings.

Mr. Down. The Imperial irrigation district has been delivering water through the old head gate that has served Mexico and also used to serve the Imperial Valley for many years.

Mexico has been paying the district for the rental of those works, but I repeat and the record will show that the Imperial district has not received 1 cent from the delivery of water through the All-American Canal to Mexico. It has been completely under the control of the United States Government and would be under the control of the United States Government, under the All-American Canal contract, when we take over the control of the canal.

Mr. CARSON. The hearings to which I referred are entitled "Water Treaty With Mexico, Hearings Before the Committee on Foreign Relations, United States Senate, Sixty-ninth Congress, First Session, on Treaty With Mexico Relating to the Utilization of Waters of Certain Rivers."

Chairman MURDOCK. Will you supply the page reference also?

Mr. CARSON. I will be glad to do so.

(The information requested is as follows:)

"Pages 401, 402, 438, volume 2, testimony of Phil Swing, of California; page 713, volume 3, testimony of M. J. Dowd, of California; pages 1644 to 1652, volume 5, testimony of Evon T. Hewes, of California, president of Imperial irrigation district."

Mr. WHITE. From reading the testimony I got the impression that the Pilot Knob project has not yet been constructed, and I did not know that there was any water being delivered through that source.

Mr. Dowd. May I clear that up? When the United States built the All-American Canal a spillway was necessary at Pilot Knob, and according to the plans worked out with the district, that spillway was constructed from the All-American Canal to the old Alamo Canal which diverts from the river at Pilot Knob. The plan was that the district would install a power plant alongside the spillway, and the discharge from that power plant, as well as from the spillway, could either go into Mexico or back to the river and down the river into Mexico, depending upon the treaty, or whatever arrangements the United States wanted to make.

The Imperial irrigation district did not have, does not now have, and would not in the future have, the control of the water that goes to Mexico by means of the All-American Canal and the old Alamo canal.

Mr. WHITE. You keep mentioning the Imperial irrigation district. It is clear from the testimony that some district has been selling water to Mexico. I do not know whether it is the Imperial district or some other district.

Mr. Dowd. The Imperial irrigation district has been diverting water at the old heading called the Rockwood Gate, which was the diversion point for Mexico and the Imperial Valley from 1900 to 1942. Since the latter date, the water for the Imperial Valley has come through the All-American Canal. The old heading, which is owned by the Imperial irrigation district, has continued to be used with the sanction and at the request of the State Department for the delivery of water to Mexico.

Mexico got into trouble because the river surface dropped. The river eroded its bottom, and the district could not divert the Mexican demands through the old heading from the river, and by arrangements made between the United States Government and the Mexican Government, the United States diverted water into the All-American Canal, carried it down the canal to Pilot Knob and there turned it back into the old Alamo canal through the Pilot Knob wasteway.

Mr. WHITE. What does Mexico pay for the service?

Mr. DOWN. Mexico, as far as I know, may have made a payment, but whatever payment Mexico makes for use of the All-American Canal will be paid directly to the United States Government.

Ask the representative of the Bureau of Reclamation right now. The Bureau of Reclamation made the recommendation to the United States of the amount of money that Mexico should pay for the use of the All-American Canal and that money paid by Mexico will be paid to the United States Government; is that not right?

Essentially is that not right? Has not the Bureau of Reclamation made the recommendation to the United States as to what Mexico should pay for the use of the All-American Canal? You refused to take into account Imperial district's wishes.

Mr. EATON. I hesitate to answer that without examining Bureau files.

Chairman MURDOCK. We will ask you to supply that information from the Bureau for the record.

Mr. EATON. The chairman requested the Bureau to supply information concerning whatever arrangements have been made by the Bureau of Reclamation relative to payments by the Government of Mexico for water delivered to Mexico through the All-American Canal by means of releases into the Pilot Knob wasteway and those into the Alamo canal.

Article 27 of the treaty of February 3, 1944, with Mexico provides that, pending regular scheduled deliveries to Mexico subsequent to completion of Davis Dam, the United States will cooperate with Mexico in measures for meeting certain Mexican irrigation requirements. By request of the State Department of the United States, the Bureau of Reclamation delivered in 1944 and 1945 and is delivering in 1946 water through the All-American Canal for release into the Alamo canal. The Secretary of the Interior has recommended to the Secretary of State the amounts which the Mexican Government should be requested to pay for such deliveries of water and the formula on which those payments are calculated.

Correspondence relative to the initiation of deliveries in 1944 is set forth at pages 1731-1736 of part 5 of the printed hearings before the Senate Committee on Foreign Relations on the treaty of February 3, 1944. Deliveries in 1945 and the current deliveries are being made on conditions in general similar to those set forth in the 1944 correspondence referred to, particularly in Secretary Ickes' letter of August 14, 1944, to Secretary of State Hull.

The amounts which the Department has recommended to the State Department as payment by Mexico for this service are based primarily on (1) a "capital charge," consisting of a payment, on the basis of the proportionate part of each year in which the canal was in part devoted to serving Mexican needs of the pro rata share of the annual amount necessary to amortize the construction cost of the works involved over a 40-year period with interest at 3 percent, the pro rata share being based on Mexico's portion of the total canal discharges during the period of use to serve her needs, and (2) on an "operation and maintenance charge," covering all costs of operation and maintenance properly allocable to the delivery of water for Mexican use. Whatever other costs and expenses that are entailed by the Bureau in connection with this special use of the canal have been included in the Department's recommended charges. For the year 1944, the Department recommended a payment by Mexico of \$51,471.06, and for the year 1945, a payment of \$106,885.92 was recommended. Determination of the amount to be recommended for 1946 awaits completion of deliveries.

Mr. PHILLIPS. I would like to support Mr. White's motion again, that this subcommittee go out and look at all of this. I am learning something every day, and I represent one of the areas involved.

Mr. WHITE. The present testimony is somewhat confused. I am under the impression that the All-American Canal was built for and financed by these California irrigation districts, and that the United States built it and they paid the costs, to be repaid by these California water users. Now they are talking about revenue to the United States from Mexico for the use of this All-American Canal. If these districts financed the construction of the canal, why do they not get the charges that are made against Mexico?

Mr. Dowd. The United States says that this money that it receives, if and when it receives any money from Mexico for this past service during 1944, 1945, and this year, some part of it will be credited against the All-American Canal. But you make the very point that we have made.

This canal was built under a contract between the United States and the Imperial district and the Coachella district, whereby those districts guaranteed the repayment of every dime of cost to the United States, but when it came to utilizing that canal that those districts were obligated to pay for, for the benefit of Mexico, the Imperial district and the Coachella district were given no consideration whatsoever.

Mr. CARSON. The point that I am trying to make here, that by that statement it seems to me that if the United States pays the Imperial district a proportionate part of the cost of the Imperial Dam and the All-American Canal to Pilot Knob, and for the power privilege at Pilot Knob if necessary, then this question of the Imperial irrigation district getting California to fight the other States will be largely eliminated. It seems to me it would be further eliminated if the Imperial irrigation district, which now owns all of the stock, as I understand it, of a Mexican subsidiary corporation incorporated under the laws of Mexico, which owns and operates the Alamo Canal that comes off of here [indicating] and irrigates the Mexican lands, could, with the help of the State Department, get paid for that Alamo Canal out of Mexico and entirely divorce itself from any financial interest in transporting water across the border into Mexico. If that were done, I believe that a great deal of this controversy would be eliminated and that the Imperial irrigation district would be in no manner financially hurt.

I do think when the United States takes over the delivery of water through the All-American Canal to Pilot Knob for the benefit of Mexico, limited as it is to 500,000 acre-feet a year by this treaty, that the United States should pay the Imperial irrigation district for a proportionate part of the cost of the Imperial Dam and the canal down to a point including perhaps the power privilege at Pilot Knob itself, and if that were done and the Imperial irrigation district completely divorced itself from the ownership of the canal system in Mexico for which its subsidiary has always been paid—and the stock of which is owned by the Imperial irrigation district—and get away from the idea of having to salvage or save any part of its investment in old Mexico by the sale of water to Mexico, or the delivery of water to Mexican lands, that a great deal of this controversy could be avoided without any financial injury to the Imperial irrigation district. The United States could well afford to do that. All it would have to do would be to give the Imperial district credit upon the amount which it otherwise would owe, which has not yet been paid.

Chairman MURDOCK. You said a moment ago that that was contemplated, and you were reading from the treaty.

Mr. CARSON. From the treaty itself.

Chairman MURDOCK. What do you mean by "contemplated"? Is it not in the treaty?

Mr. CARSON. Yes; it is in the treaty that Mexico should pay the United States. Let me read it again, article XIV, to make it clear:

"In consideration of the use of the All-American Canal for the delivery to Mexico in the manner provided in articles XI and XV of this treaty, of a part of its allotment of the water of the Colorado River, Mexico shall pay to the United States, (a) a portion of the cost actually incurred in the construction of the Imperial Dam and the Imperial Dam Pilot Knob section of the All-American Canal; this proportion and the methods of terms of repayment to be determined by the two Governments, which for this purpose shall take into consideration proportionate uses of these facilities by the two countries, these determinations to be made as soon as Davis Dam and reservoir are placed in operation."

Mr. PHILLIPS. It does not say how much should be paid.

Mr. CARSON. No, but I should think certainly that the Imperial irrigation district, if it made up its mind to comply with the terms of this treaty, could work that out with the United States Government and that the United States would be amply fair to the Imperial irrigation district.

Mr. PHILLIPS. It seems to me that might have been settled before the treaty was signed, do you not think so?

Mr. CARSON. It could not have been settled before the treaty was signed.

Mr. Dowd. I do not want to take the committee's time right now, but I do believe, regarding the unfair accusations against the Imperial irrigation district that Mr. Carson has made, I should be given the time and opportunity to answer them. Moreover, may I say just one thing? He has talked about the sanctity of contracts

and how they should be observed. The farmers of the Imperial Valley think the same thing; that their contracts with the United States should be sanctified: should be observed by the United States and should not be considered a scrap of paper to be torn and tossed to one side as it sees fit.

Chairman MURDOCK. What the committee wants to find out are the facts in the case, and I think all of us agree that contracts are sacred and should be so regarded.

Mr. HOWARD. May I say a word in behalf of the metropolitan water district? The metropolitan water district has no interest whatever, direct or indirect, in the Pilot Knob power plant, or in the deliveries of water to Mexico, except that we think the Mexican water treaty was unduly liberal.

The elimination of the Pilot Knob power plant from consideration would in no wise affect the attitude of the metropolitan water district to overappropriation or to the overselling of the Colorado River. I just want the record to show that the statement that the elimination of the Pilot Knob plant would go toward solving the problem, so far as the metropolitan water district is concerned, is without foundation.

Mr. WHITE. Since the old Alamo Canal has been mentioned, is water being delivered to Mexico through that canal?

Mr. DOWD. Not at the present time, because the river has scoured down to where water cannot be diverted from the river at the old Alamo Canal. It has been delivered by the United States through the All-American Canal and then back into the Alamo Canal into Mexico.

Mr. WHITE. Then it gets into the Alamo Canal at some point at the present time.

Mr. DOWD. It comes back into the Alamo Canal just inside the United States and then goes into Mexico.

Mr. WHITE. In what volume?

Mr. DOWD. As much as about 4,000 second-feet has been delivered through the All-American Canal and into the Alamo Canal into Mexico.

Mr. WHITE. Translate that into acre-feet.

Mr. DOWD. 4,000 second-feet running continuously would be somewhere around 3,000,000 acre-feet a year—if you run that amount continuously—but, of course, in the wintertime Mexico uses practically no water at all. They reach a peak for a few weeks in the summertime.

Mr. WHITE. If Pilot Knob comes into use, that same water could be delivered through Pilot Knob?

Mr. DOWD. That is correct, through the Pilot Knob power plant.

Mr. WHITE. And incidentally make power?

Mr. DOWD. Absolutely. It would help the farmers of the Imperial Valley to repay the cost of the canal to the United States.

Mr. WHITE. Who would get the power?

Mr. DOWD. The power could go to the Imperial irrigation district's power system to be sold to the people of the Imperial and Coachella Valleys.

Mr. WHITE. And the Imperial irrigation system would get the revenue?

Mr. DOWD. Yes. The net proceeds come back to the United States to help pay the cost of the All-American Canal.

Mr. WHITE. Do you mean that with the application of the power revenue it would pay out that much sooner and it would really be for the benefit of that irrigation district?

Mr. DOWD. For the benefit of the people who have guaranteed to repay the cost of the canal to the United States.

Mr. WHITE. When the United States is paid off they will get the benefit of the revenue?

Mr. DOWD. Yes.

Mr. WHITE. I understand from the previous testimony, and I think this is very important, that any water that went through Pilot Knob would be that much taken away from the water users in California.

Chairman MURDOCK. Not from water users in California.

Mr. DOWD. No, sir; there would not be 1 acre-foot taken away from any water user in the United States because it is water, up until the time that the surplus is used up, that would not be used in the United States.

Mr. WHITE. The Imperial irrigation district has quite a profit to make there by the power revenue as between the two plans of getting the water to Mexico, or against the three plans of getting the water to Mexico. There is the plan for the return flow from the Wellton-Mohawk to go into Mexico as a credit; the water going down the main river as a credit, or that the water that goes through the Pilot Knob power plant as a credit, and Pilot Knob would be a winner for the

California district in a big way in power revenues. Is that not one of the issues?

Mr. DOWD. No, sir. All the water that the lower basin has a right to would be utilized. Our point is that there is not enough water to go around. It is not a question of having a surplus to put through Pilot Knob. The tabulation that I gave the committee the other day shows that; that under final development there is not one drop to go through Pilot Knob except perhaps water which the treaty requires to go to Mexico.

Mr. WHITE. It is a very simple equation, as I see it. If the water goes to Wellton-Mohawk and the return flow goes down the Gila and into Mexico, then the other irrigation districts over in California are that much the losers by failing to get the water to go through and generate power at Pilot Knob. That is one of the main issues here.

Mr. DOWD. That is not the point at all.

Chairman MURDOCK. I feel that is an important point.

Mr. CARSON. That enters into it. I do not know whether or not that is the basis for their objection. If the Imperial irrigation district could be made whole on account of that proportionate investment in the Imperial Dam and the All-American Canal from Imperial to Pilot Knob, and the Pilot Knob power plant, made clear to them, they would have no further question or attack upon this treaty, provided they could further be divorced from their ownership of the canal system, or property in Mexico. If that were done, it seems to me that it would be fairer to the people of the Imperial Valley and they would not in the long run lose anything.

Chairman MURDOCK. Are there not other drops on the All-American Canal beyond Pilot Knob which would permit this irrigation company to produce power and pay for the canal while using their own irrigation water?

Mr. CARSON. It is my understanding there are six other drops on the canal; two of them have been partially developed and four have not been developed at all, although when they built the canal they built in the necessary foundations. But no plants have been installed, and they would have those drops upon which they could make power with water going into the Imperial Valley and into the Coachella Valley in California, to which none of us would have any objection.

Mr. PHILLIPS. It seems to me that every time we have a hearing about water the first thing we know we are talking about power. I still think that we should be talking about water. I think that a great deal of this about the production of power is interesting, but it is not what we are talking about in connection with our bill. I think that we are talking about how much water there is.

Mr. CARSON. You brought it up.

Chairman MURDOCK. That is only part of it. Yes; we must know how much water there is. Then how best to use it. Power is involved secondarily.

Mr. PHILLIPS. I did not bring up the question of power. I think yesterday Mr. Dowd introduced into the record a list—you have it before you—which is headed "Annual water supply in critical periods and demands of existing projects in lower basin."

Now, I think this is about the most important thing that is under discussion right here, and I would like to make this formal request through you, Mr. Chairman, that the Bureau of Reclamation give us a statement as to whether or not they agree with that analysis of water and requirements against the water under the various demands; in other words, take this list and say whether or not the Bureau of Reclamation agrees with it; and if they do not agree with it, have them give us a complete statement of why they do not. It seems to me that we could save a lot of days of hearings if we could get material like that into the record instead of a discussion as to whether there is going to be power made at Pilot Knob or somewhere else.

Chairman MURDOCK. No; Congressman Phillips, the matter of having more than 500,000 acre-feet of water pass through a power plant at Pilot Knob to produce power has a very definite connection with the quantity of water which may be used for irrigation in the United States.

I have that compilation mentioned, and I have one here from an engineer from Arizona, and I notice some difference. I would like to have engineers take the two statements and give us the facts.

Mr. PHILLIPS. That would be fine.

Chairman MURDOCK. I agree with you, Mr. Phillips, that water is the subject here, and I have no reason for mentioning power unless it be that the production of power at some place takes away some of the water from the United States of America, and that is the thing that we must get very clearly in our minds.

Mr. PHILLIPS. It was brought out in the previous hearings, and I think that you should read them—I have read them all—that there would not be any water that would even reach Pilot Knob, if that is what you have in mind, unless it is water that is not used in the United States. If it is taken up and used in the United States it will never get to Pilot Knob and there would not be any power made. The control of the amount of water that gets to Pilot Knob does not rest with the Imperial District nor any other district, but with the United States.

Mr. WHITE. Does the gentleman from California overlook the fact that 1,500,000 acre-feet has to go to Mexico through some channel?

Mr. PHILLIPS. I do not overlook it, and I have been trying to impress that upon other States for the past year.

Mr. WHITE. Do you recognize the fact that in falling water power is inherent and if you utilize that power you can have the power and the water at the same time? I think that is one of the motivating influences in the whole reclamation program.

Mr. PHILLIPS. And I want to know, if we are going to give that much water to Mexico, exactly where we are going to get it and who is going to give it up.

Mr. WHITE. It will come out of the Colorado River, and in the second place, we are going to deliver them 1,500,000 acre-feet. Whether it goes down the main Colorado River and makes no power, or whether it goes over and is used by the Wellton-Mohawk and the return flow goes in as a credit, or whether it goes down the All-American Canal and through the Pilot Knob and generates an income for the California irrigation district, is a matter definitely before this committee.

Chairman MURDOCK. Here is a pertinent fact that I would like to establish. Did the witness say that in 1943 and again in 1944 that 1,800,000 acre-feet of Colorado River water were used to irrigate land in Mexico?

Mr. CARSON. Yes; that was the report by the International Boundary Commission and the Bureau of Reclamation.

Chairman MURDOCK. Well, then, only two things would prevent that happening—or even more being used—in the following years, as I see it. One is a treaty that will prevent it, and another is that there just is not water in the river. Am I right or wrong about that?

Mr. CARSON. If it had not been for the treaty, we fear that Mexican use would rapidly increase to where eventually it might be as much as 5 or 6 million acre-feet a year, because there is 1,000,000 acres of land immediately below the border in Mexico, so we are informed, irrigable from the Colorado River, and they were rapidly increasing their rights.

Since Boulder Dam has filled, there has been up until 1944 not less than 10,000,000 acre-feet going across the border into Mexico. That would have continued for many years with a great deal of water going across the border into Mexico, because, as I have tried to point out, the States of the Colorado River Basin now are using out of the Colorado River nothing like their ultimate consumptive use that will be made in the basin. I suppose that the total consumptive use now—and I do not have the figures clearly in mind—would be somewhere around 7,000,000 acre-feet in the whole basin.

Until the upper basin, and we in Arizona and California likewise, can make use of the proportions of the water to which they are entitled, the excess will of necessity go across the border into Mexico.

Mr. FERNANDEZ. Regardless of the treaty?

Mr. CARSON. Regardless of the treaty, but without the treaty Mexico could have built up a claim of right. Now, we have with Mexico an inter-American treaty of arbitration signed in 1929 and ratified in 1935 under which we would have been required to arbitrate at Mexico's request a division of the water of the Colorado River which, in our judgment, Mexico could have invoked 50 or 100 years from now and then be awarded whatever water she was at that time using, so it was essential to the benefit of us all, including those that want to use water in California, that an over-all time limit be placed upon Mexico at the lowest possible quantity just as soon as possible, and that was the effect of the treaty.

There has been so much discussion about the treaty by California witnesses here as if that imparted some new consideration into this matter, that I would like to file with the committee—and I know that you can get it—a copy of the treaty.

Now, the question was asked as to where the water is coming from.

Mr. PHILLIPS. I do not object at all to rehearing the treaty because I have been trying to get some of you gentlemen to listen to the conditions involved in that treaty for a long time, and if the chairman will permit me, you asked if 1,800,000 acre-feet of United States water was being credited to Mexico, or could be credited to Mexico.

Chairman MURDOCK. Had been used in Mexico.

Mr. PHILLIPS. I want to say that as a good illustration of what I am talking about, the chairman will remember those were the figures given in the hearing before our Senate committee. They were not the figures given before the Mexican Senate, and in the data furnished the Mexican Senate by its representatives, that data did not show that much water will be used. The only way that amount of water could be built up, for the Senate hearings in the United States, was by including every bit of water that flowed into Mexico, including the water which, at the request of the State Department, was put through the canal and into Mexico to save the Mexican crops, and which at the time the State Department said would no be credited as Mexican use.

Now, I mean to say it is a very complicated matter and I do not want to retry the hearings, but I want to point out there are details in the Mexican treaty which are going to require considerable argument between the United States and Mexico from now on. I would like to say to my friend from Idaho, Mr. White, that I really do not agree with you entirely that the matter before this committee is the amount of water that goes through and makes power. I understand what you mean and agree with part of it, but I think what this committee is discussing, under the bill, is the amount of water in the Colorado River available for all the projects which are being proposed for the use of Colorado River water.

Now, does not the gentleman from Idaho think that is really the issue before us; that the Colorado River is not a miraculous pitcher that you can keep pouring water out of, as you could from the pitcher in the old fable.

Mr. WHITE. The main issue that has been raised before the committee is the division of the water between the three lower basin States.

Mr. PHILLIPS. That is right.

Mr. WHITE. Incidental to that there comes along with it the problem that we have to take into consideration that Mexico has a draft on the water to the extent of 1,500,000 acre-feet. You said that they had been delivered 1,800,000 acre-feet.

Mr. CARSON. In '43 and '44.

Mr. WHITE. They have been delivered more than under the treaty.

Mr. CARSON. That was before the treaty was signed.

Mr. WHITE. If they are already limited to 1,500,000 acre-feet they do not have any chance to expand. They are using up the full limit of that water right now.

Mr. CARSON. In that connection I would like to call the committee's attention to H. R. 5944, which was a bill introduced by Mr. Hinshaw of California, which in my judgment would have the effect of conflicting with the treaty to such a degree that there might be a danger of an abrogation of the treaty by legislative action, so if that ever comes up we certainly would want to be heard upon it, and it certainly is designed to permit the continued flow of water through the Pilot Knob power plant, which I tried to explain, and I am not sure that I made it clear.

It was necessary in the treaty to limit strictly the quantity of water that could go in Mexico through the Pilot Knob power plant to 500,000 acre-feet until 1980, and thereafter to 375,000 acre-feet, and it was necessary to do that in order that the United States, for the benefit of all the States in the basin, could get the benefit of the return flow which enters the Colorado River below the Imperial Dam, which is the take-out point for the All-American-Pilot Knob route of delivery, and this treaty provides that for the return flow entering the river below Imperial Dam the United States gets credit on the total obligation of 1,500,000 acre-feet which would have been lost if the continued flow through Pilot Knob had been permitted, or if the treaty permitted any greater draft through the Pilot Knob power plant.

So I come back to the same proposition, that if the United States compensates the Imperial Irrigation district for a proportionate share of the cost of the Imperial Dam and All-American Canal down to Pilot Knob, and the prospective Pilot Knob power production, if necessary, the Imperial irrigation district would be in no sense hurt, and we would have avoided a lot of this questioning and argument.

The treaty provides further, in article XIV of the treaty that Mexico should pay to the United States those same amounts. While I am certain that the United States will reduce the debt of the Imperial irrigation district by a proper and reasonable amount, then the treaty goes ahead and requires that Mexico pay a proportionate part of the operation of the All-American canal down to Pilot Knob.

Mr. PHILLIPS. Since Mr. Carson has brought that bill in as an issue, I think—while I have not talked to Mr. Hinshaw—that I will now formally request that he be permitted to appear as a witness and say what the points at issue really were in that bill. I am quite sure that the chairman agrees with me that that is a wrong

impression of the bill. I will make that as a formal request on behalf of the California delegation for whom Mr. Hinshaw was speaking when he introduced that bill.

Mr. CARSON. I just pointed that out now because it is not up for hearing, and I call attention to the fact that if it does come to a hearing Arizona wants to be heard in opposition.

Mr. PHILLIPS. You made a statement, Mr. Carson, that it would cause conflict between the two nations.

Mr. CARSON. I did not say that, Mr. Phillips. What I meant to imply was that in my judgment it conflicts with the terms of the treaty, and you can, by a legislative act of Congress, as I understand it, nullify and abrogate a treaty. I think this bill goes that far, and we want an opportunity to be heard in opposition to it if it ever comes up for hearing.

Mr. PHILLIPS. The point that I am making now is that the bill was introduced by Mr. Hinshaw at the request of the California delegation, and he was acting for the California delegation. The intent was to prevent further conflict with Mexico, because we are fully convinced that there are unsettled details of the treaty which will eventually provide a very serious argument between the United States and Mexico. Therefore, I would like to make a formal request that Mr. Hinshaw be permitted to come before the committee. He may not want to come.

Chairman MURDOCK. The bill has been referred to this committee, has it not?

Mr. CARSON. I do not know.

Mr. DOWD. Yes.

Chairman MURDOCK. In that case, both parties here have given formal notice that they want to be heard on the bill, one maintaining that it might disrupt the treaty and the other maintaining that it was intended to lead to better cooperation between the two countries. Both parties should be heard at the proper time. We shall be glad to hear Congressman Hinshaw on this bill.

Mr. WHITE. The provision of that bill is in no way binding upon this committee. It has simply been introduced, and it is within the discretion of the chairman whether to take it up or not.

Chairman MURDOCK. That is right.

Mr. CARSON. Proceeding then, we figure that out of our share of the main stream water there is ample water for this Wellton-Mohawk and Yuma Mesa division and also for the central Arizona project within the firm water, good for all time, without any draft, as contemplated in these bills, upon the surplus, one-half of the surplus to which Arizona is entitled.

If these projects are found feasible and the bills are passed and authorized—and I have no doubt of the feasibility of the Mohawk and the Yuma Mesa division, nor of the central Arizona project, although the reports on the central Arizona project are not yet ready—and we begin to approach the limit of 2,800,000, with the deductions that are made, after these projects are constructed and it appears there is still surplus available for use in the lower basin under these agreements that are now effective, but which later may be withdrawn by the upper basin States, we might at that time consider whether or not we could, on less expensive projects, use that water under some system of priority. But until 2,800,000 is used, we have no necessity for any system of priority on this water in Arizona.

Chairman MURDOCK. Mr. Carson, I want to ask you a few questions. We are approaching the hour for closing. You can be here tomorrow morning at 10 o'clock?

Mr. CARSON. Yes.

Chairman MURDOCK. It has been suggested by witnesses, and it is a suggestion within the recent report of the Bureau of Reclamation on the Colorado River development, that there ought to be an apportionment of water to each State which the Santa Fe compact did not make.

Mr. CARSON. Yes.

Chairman MURDOCK. Especially is that desirable among the lower basin States, I believe.

Mr. CARSON. Yes.

Chairman MURDOCK. It has been suggested here that there ought to be steps immediately taken to authorize a tri-State compact. How do you feel about that?

Mr. CARSON. There is plenty of authority in the Boulder Canyon project act for a tri-State compact. We have tried to make it. Failing to get an agreement

with California, we have now arrived at the point where we have agreed with California, according to the terms of the Colorado River compact, and California has agreed with the United States expressly for the benefit of the State of Arizona, as to its limit of use, and we, for Arizona, have agreed for the benefit of California with the United States that we concede California's right to use water up to the extent of her limitation, so the division has been made in the lower basin States just as effectively as though we had been able to make a compact straight across the table between us. It is now made in the lower basin. If California will live up to the Colorado River compact and the California Limitation Act, and we live up too, as we will, in Arizona, to our commitments, then an interstate agreement between California and Arizona is not necessary to a division of the water in the lower basin because we in Arizona recognize that the right of Utah and New Mexico, who are in the lower basin, to come out of our share, and we both recognize the right of Nevada.

Mr. WHITE. What is Nevada's tentative share?

Mr. CARSON. 300,000 acre-feet. She has a contract for that which the Secretary of the Interior, to which we have all agreed, and we expressly in our contract agree to that for Nevada.

Chairman MURDOCK. We might as well dispose of this one idea, that it is not necessary for the Congress now to pass a law to permit the lower basin States to enter into compacts. It is constitutionally necessary for Congress to pass such a law for State compacts, but in this case that was authorized by the act of 1928; was it not?

Mr. CARSON. Under the act of 1928. Under that act the upper basin States are going to have a meeting on the 22d to work out another compact.

Mr. WHITE. What is the amount covered by the California limitation?

Mr. CARSON. 4,400,000 acre-feet of III (a) water, plus a part of the surplus or water unapportioned by the compact.

Mr. WHITE. Then under the terms of the contract how much for Arizona?

Mr. CARSON. 2,800,000.

Mr. WHITE. Did you say 300,000 for Nevada?

Mr. CARSON. Yes; the total would be 7,500,000.

Mr. WHITE. Where is this 1,000,000 extra?

Mr. CARSON. It was apportioned to the lower basin. We figure that we are using it in Arizona on the Gila River.

Mr. WHITE. I understand that half of the water that is coming into the lower basin is 7,500,000 acre-feet.

Chairman MURDOCK. Half of the apportioned water at Lee Ferry by article IIIa of the compact.

Mr. WHITE. I am talking now about the original compact.

Mr. CARSON. That is right.

Mr. WHITE. That is divided, in turn, into 4,400,000 feet. That is the limitation California sets for itself.

Mr. CARSON. Yes.

Mr. WHITE. Then by contract between Arizona and the Secretary of the Interior, 2,800,000 feet go to Arizona?

Mr. CARSON. Yes.

Mr. WHITE. And 300,000 feet to Nevada?

Mr. CARSON. Yes; or a total of 7,500,000 feet.

Mr. PHILLIPS. I am not so sure but what I could not clear up this argument by continuing your question right there, Mr. Chairman. May I ask the witness something?

Now, Mr. Carson, do you consider the Gila and the tributaries to the Gila as part of the Colorado River system?

Mr. CARSON. Yes; they are in the definition of the compact.

Mr. PHILLIPS. I would like for you to classify these things for me. Perhaps it will help me. Do you classify, under the Colorado River compact, the perfected rights on the Gila River system—the Salt River that I asked about and the San Carlos and other projects—do you classify those as part of the 7,500,000 acre-feet of III (a) water?

Mr. CARSON. No, sir; because you are overlooking entirely III (b) water, an additional 1,000,000 acre-feet. The apportionment to the lower basin made by the compact is not 7,500,000 acre-feet; it is 8,500,000 acre-feet. III (a) water is 7,500,000 acre-feet, and III (b) water is 1,000,000 acre-feet, so we have a total apportionment of 8,500,000 acre-feet.

California has limited itself to 4,400,000 acre-feet of III (a) water and one-half the surplus, and has excluded herself from III (b) water.

Mr. PHILLIPS. Then, if you do not classify that as III (a) water, you are classifying it as III (b) water. If it is not III (a) water, how do you classify it? You said that you did not classify it III (a).

Mr. CARSON. III (b).

Mr. PHILLIPS. All right, now. Arizona claims 2,800,000 acre-feet. How much of that do you claim from the main stream?

Mr. CARSON. 2,800,000 acre-feet.

Chairman MURDOCK. Some of that goes to Utah and some to New Mexico.

Mr. CARSON. With the deductions that we will show by the engineers.

Mr. PHILLIPS. How much do you claim? You spoke of a court case that you had. How much of the use of the water from the Gila River did Arizona claim in the litigation against California?

Mr. CARSON. I do not know which case you are talking about, Mr. Phillips.

Mr. PHILLIPS. The only one I know about is the first case, the one you spoke about.

Mr. CARSON. That is not the first case. I am glad that you brought that up. Let me explain that to you.

According to my view of the flow of the Gila River under natural virgin conditions, it is reported by all the engineers to be 1,270,000 acre-feet. Part of that water is used over here in New Mexico, part in Arizona.

At the time that the compact was written the consumptive uses on the Gila River were figured to be 1,000,000 acre-feet. Now then we have increased our use in Arizona, the last reports indicate, to where we have a use of 1,135,000 acre-feet.

Mr. PHILLIPS. How do you classify the uses of the Gila in excess of 1,000,000?

Mr. CARSON. We deduct them from the 2,800,000 of the main stream, as the engineer will show you. We are dealing now with firm water. We are excluding surplus.

Mr. PHILLIPS. Well now, this 75,000,000 acre-feet that I think Mr. Dowd spoke about that accumulates every 10 years, is that not all III (a) water?

Mr. CARSON. We think it is III (a) water. California says it is not. Under III (d), the upper basin States are required to deliver 75,000,000 acre-feet each 10 years at Lee Ferry.

Mr. PHILLIPS. You call it III (a) water?

Mr. CARSON. We do not classify it in our contract with the Secretary, but the California contract and our contract are exactly on the same basis, made by the same authority and with the same source of water supply—Lake Mead.

Now, it so happens that Lake Mead's supply of water comes from this delivery at Lee Ferry, with the addition of some water by tributaries between Lee Ferry and Boulder Dam, so that in practical effect the water stored at Lake Mead is the 75,000,000 acre-feet delivered every 10 years at Lee Ferry.

Then the 1,000,000 acre-feet of III (b) water was never in Lake Mead; it was always utilized in Arizona and New Mexico through the Gila River.

Mr. PHILLIPS. If that is so, why would not the upper basin States then have to contribute half of the 1,500,000 acre-feet to Mexico, if you have it all accounted for?

Mr. CARSON. Because the contract between the States, the compact by which California is bound and by which Arizona is bound, all of these contracts were made in expectation of the treaty, and the contracts went so far as to provide how that supply to Mexico would come, first, out of the surplus, and if there was a deficiency in the surplus, then half out of the upper basin and half out of the lower basin.

Mr. WHITE. Is the upper basin ever mentioned in any of the treaties or compacts?

Mr. CARSON. Yes; they agree to the same thing. That is article III (c) of the Colorado River compact.

Mr. WHITE. I would like to get the water straight now in the State of Arizona. You said 1,135,000 acre-feet down there in the Gila River.

Mr. CARSON. Yes.

Mr. WHITE. That is the Salt River Valley.

Mr. CARSON. That is included.

Mr. WHITE. That is 1,135,000?

Mr. CARSON. Yes; 1,135,000 acre-feet.

Mr. WHITE. How much is proposed to be taken on the Wellton-Mohawk under this bill?

Mr. CARSON. 600,000 acre-feet, consumptive use. That is all consumptive use.

Mr. WHITE. Anything that you do not consume goes back to Mexico?

Mr. CARSON. Yes.

Mr. WHITE. Now then, you have a siphon that is bringing some water into the State of Arizona. How much water comes in there?

Mr. CARSON. Mr. Baker will have all of those figures accurately. My figures are from recollection, but I think 204,000 acre-feet.

Mr. WHITE. How much is proposed to be diverted for Central Valley by that long canal?

Mr. CARSON. Consumptive use, 1,065,000 acre-feet, which will mean a larger diversion than that.

Mr. WHITE. The only thing that counts in the Gila River is an excess over 1,000,000 feet, which would be 135,000 feet.

Mr. CARSON. That is right.

Mr. WHITE. That is charged against the 2,800,000 feet. Now, you have shown where 4,400,000 acre-feet goes to California, 2,800,000 to Arizona, and 300,000 feet to Nevada, which makes the even half of the river, but Mexico comes in with a draft of 1,500,000 feet of the Colorado River. How are you going to fill that?

Mr. CARSON. Out of the surplus water that is in the river.

Mr. WHITE. Surplus. I thought that the upper and lower basins took all the water.

Mr. CARSON. No, sir; that was not all the water. There is still, according to the reports of the engineers, the 7,500,000 acre-feet for use in the lower basin and in the upper basin. There comes to Lee Ferry approximately 1,500,000 feet extra, surplus, that is apportioned neither to the lower basin nor to the upper basin.

Mr. WHITE. Then the Colorado compact did not take into consideration all the water and you find just about enough to satisfy Mexico's demand?

Mr. CARSON. Yes.

Chairman MURDOCK. Section 3 (c) in the compact covers that. The historical flow of the Colorado River is much greater than the computed average of 15,000,000 acre-feet divided half and half between the two basins.

Mr. WHITE. I am just trying to get this thing straightened out.

Mr. CARSON. That is right.

Mr. PHILLIPS. According to some of the water engineers out there, there is not that surplus.

Mr. CARSON. If there is not, why, we have already agreed where we will get the water. Article III (c)—I am reading now from the Colorado River compact:

"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)"—that is the 16,000,000 acre-feet—"7,500,000 to the upper basin and 7,500,000 to the lower basin, with an additional 1,000,000 acre-feet to the lower basin, 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 recognized in addition to that provided in paragraph (d)."

Mr. PHILLIPS. How much would California get under your computation?

Mr. CARSON. 4,400,000 acre-feet, and half of the surplus, whatever the surplus was.

Now, Mr. Phillips, the surplus cannot now be accurately measured. It will be variable from year to year, and there will be available to California and to Arizona whatever surplus is available in the lower basin with deductions from our share for that part that can be utilized in Nevada, Utah, and New Mexico. Now, for instance, at the present time, of the upper-basin apportionment there is still coming down the river 5,000,000 acre-feet approximately annually.

Mr. PHILLIPS. I was just going to ask you about that.

Mr. CARSON. Of which you could use half and we could use half.

Mr. PHILLIPS. But right now the upper basin is not using the full allotment.

Mr. CARSON. No. That is surplus so far as we in the lower basin are concerned, and we could annually use it with this reserved right to withdraw it.

Mr. PHILLIPS. And they are fixing to use it with some rather large projects. Right now I do not think that the lower basin is using all its water. I think they are going to use it up with these things that we are talking about now. Suppose the upper basin had all of these projects developed for the past 15 or 16 years and that the lower basin had been using up the water with the projects

that we are talking about, would there have been any water to give to Mexico?

Mr. CARSON. I think so. I think so, because we do not utilize all of the water of the river.

Mr. PHILLIPS. We do not now.

Mr. CARSON. I mean we would not. When the upper basin reaches its utilization of the apportionment, and we in the lower basin fully utilize ours, there will still be in the river—figured upon the dependable long-time mean average flow, more than enough water to supply Mexico, and the answer is—storage. We will need more storage on the upper basin than in the lower basin to take us over low flow.

Mr. PHILLIPS. I think the chairman said that Mr. Baker was coming in. I will not take your time to ask questions. I will just point out that from the questions that were asked of Mr. Dowd and others it was then shown that there would be a deficit.

Mr. CARSON. Mr. Baker will handle that.

Mr. PHILLIPS. You spoke several times about Arizona being willing to sign a compact, and so forth, and California not being willing to sign a compact.

Will Arizona right now sign a tri-State compact in the words of section 4 (a) of the Boulder Canyon Project Act, the second paragraph?

Mr. CARSON. I do not think that California will.

Mr. PHILLIPS. I asked you if you will.

Mr. CARSON. Well—

Mr. PHILLIPS. Will you sign a three-State compact? You have said before this committee that Arizona has sort of wanted to sign a compact but California would not. Will Arizona sign a compact in the exact words of the second paragraph of section 4 (a) of the Boulder Canyon Act?

Mr. CARSON. We cannot sign it in the exact words because we have to have some definitions.

Mr. PHILLIPS. Is not that the whole kernel in the nutshell? In other words, you want to change the Boulder Canyon Act before you sign a compact?

Chairman MURDOCK. It is now 9:15.

Mr. CARSON. No; I do not think that I do.

Chairman MURDOCK. Mr. Carson will be our first witness, and we will continue our questioning at 10 o'clock in the morning.

The committee will stand adjourned until 10 o'clock in the morning.

(The statement of Salt River Valley Water Users' Association expressing its attitude toward the Mexican-Colorado River Treaty referred to earlier, is as follows:)

"RESOLUTION

"Whereas this board of governors of Salt River Valley Water Users' Association authorized the following of its members:

"V. I. Corbell, J. A. Sinnott, H. C. Dobson, and J. H. Evans to represent the said association at the meeting held in Las Vegas, Nev., on January 12 and 13, 1945, in opposition to the proposed treaty with Mexico relating to the allocation of the waters of the Colorado River: and

"Whereas there was adopted at said Las Vegas meeting a resolution in opposition to the proposed treaty with Mexico, which said resolution was supported by the aforesaid members of this board of governors: Therefore, be it

"Resolved. That the action of the aforesaid members of this board of governors in voting at the Las Vegas meeting for the adoption of the resolution in opposition to the proposed treaty with Mexico be and it hereby is declared ratified.

"CERTIFICATE

"I, F. C. Henshaw, the duly appointed and acting secretary of Salt River Valley Water Users' Association hereby certify that the above and foregoing is a true, correct, and complete copy of a resolution duly adopted at a meeting of the board of governors of said association duly and regularly held on the 5th day of February 1945 at which said meeting a quorum was present.

"[SEAL]

F. C. HENSHAW, *Secretary.*"

(Whereupon, at 9:15 p. m., the committee adjourned to reconvene the next day, Wednesday, July 10, 1946, at 10 a. m.)

HOUSE OF REPRESENTATIVES,
COMMITTEE ON IRRIGATION AND RECLAMATION,
Washington, D. C., Wednesday, July 10, 1946.

The committee met at 10 a. m., Hon. John R. Murdock (chairman), presiding. Chairman MURDOCK. The committee will come to order, please. We find it necessary to use all the time that we can use because of the early meeting of the House these days, and I have just been informed the House will meet at 10 o'clock tomorrow morning, which will mean we will have to forego a committee meeting at that hour tomorrow.

Mr. CARSON was on the stand at the close of our last session. This meeting is a continuation of the hearings on H. R. 5434 and, Mr. Carson, we would like to have you take the stand again. I think you had completed your statement, but there were questions reserved.

FURTHER STATEMENT OF CHARLES A. CARSON—Resumed

Chairman MURDOCK. I should like to lead off with a few questions which I have been holding in reserve, Mr. Carson. It was suggested at one time in the hearings that there ought to be a tri-State agreement among the States of the lower basin. It was suggested that we might authorize by act of Congress such an agreement. Do I understand you to contend there has already been such an authorization and, hence, there is no need for a further authorization?

Mr. CARSON. Yes, sir; under the Boulder Canyon Project Act.

Mr. WHITE. Let me ask a question at that point. Is it inferred from the terms of the Colorado River compact that these States have authority under the provisions of that compact to enter into an arrangement for the distribution and division of that water in the lower basin States; is that the idea?

Mr. CARSON. Yes.

Mr. WHITE. But, in this case, the Congress has specifically authorized by legislation compacts of certain States, authorized the entering into compacts, for the division of water.

Mr. CARSON. Yes; and that authorization here is contained in the Boulder Canyon Project Act that was passed in 1928.

Mr. WHITE. Would a bill authorizing a compact now strengthen the program and call attention of the States, at least call the attention of the people in the States, to the fact they should enter into such a compact if the Congress proceeded to pass a bill specifically authorizing such negotiations or arrangements commonly called a compact between the three lower-basin States? Would it not be a step for the division of the Colorado River water in advance in getting these States together and getting them to agree?

Mr. CARSON. Not in my judgment.

Mr. WHITE. You are speaking now of the sentiment, or position, or attitude of the several States?

Mr. CARSON. No.

Mr. WHITE. Of those three States; that is the officials' position; but now the people themselves ought to exert some influence to get a compact.

Mr. CARSON. No; it would not, in my judgment, Mr. White. Efforts have been made for many, many years. In 1939 the Arizona Legislature passed a bill authorizing the execution of the tri-State agreement under the terms of the Boulder Canyon Project Act.

Mr. WHITE. Do you have the exact text of the authorization that is contained in this bill, can you put that in the record at this point?

Mr. CARSON. Section 19 of the Boulder Canyon Project Act reads:

"That the consent of Congress is hereby given to the States of Arizona, California, Nevada, New Mexico, Utah, and Wyoming to negotiate and enter into compacts or agreements supplemental to and in conformity with the Colorado River compact and consistent with this act for a comprehensive plan of development * * *."

And, again—

Mr. PHILLIPS. Do you want him to read the whole article?

Mr. WHITE. I just want the citation of the authorization. I think that language he has just read certainly answers the question.

Mr. CARSON. Yes. And there is another provision also in this act. In section 4 of the act it specifically authorized a compact between Arizona, California, and

Nevada in this language:

"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 the 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 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 be reasonably 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 ratification of the Colorado River compact by Arizona, California, and Nevada."

Mr. WHITE. That is the master agreement made in Santa Fe?

Mr. CARSON. No; this that I just read is the authorization of Congress for the States of Arizona, California, and Nevada to enter into a three-State compact, or tri-State compact, between themselves, subject to the Colorado River compact, which is a different instrument and which was signed at Santa Fe, N. Mex., on November 24, 1922.

Mr. WHITE. Well, that language is in the bill passed by Congress?

Mr. CARSON. Yes, sir.

Mr. WHITE. And pursuant to that authorization California, Arizona, and Nevada have never signed?

Mr. CARSON. Have never signed.

Mr. WHITE. Have never entered into or signed such a compact?

Mr. CARSON. That is right. Now, the Arizona Legislature in 1939—

Mr. WHITE. What is the date of that instrument you read?

Mr. CARSON. That is the Boulder Canyon Project Act approved December 21, 1923. In 1939 the Arizona Legislature enacted chapter 33 of the 1939 session laws of Arizona which I referred to previously offering to enter into the compact as set out here. That was a complete failure. I was told here that California considered we had made a change in the language set out in the Boulder Canyon Project Act; but, as I understand it, that was not their reason given for refusal to sign. But I did not participate in those negotiations after the passage of this act. They would strike out the word "and" after the third clause of the Boulder Canyon Project Act where it provides—"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."

Mr. PHILLIPS. Who would strike that out?

Mr. CARSON. The California contention, as I understand it, and their argument would be that this amount from the Gila River must come out of the 2,800 acre-feet.

Mr. PHILLIPS. Mr. Chairman, I do not think that is quite clear in the record. It sounded as if Mr. Carson was saying that California would strike that out. Arizona would strike that out and insert in place of it the words "in addition to."

Mr. CARSON. Yes.

Mr. PHILLIPS. That is the interpretation which Arizona wants to make in the compact?

Mr. CARSON. And which, we submit, the Congress made. And you do not have to go anywhere but to this act to see that that was the intent—that the Gila River should be used exclusively in Arizona and it should be in addition to the

2,800,000 acre-feet of main-stream water; because Congress required that the State of California agree irrevocably and unconditionally for the benefit of Arizona that its total consumptive use should not exceed 4,400,000 acre-feet of III (a) water, plus not more than one-half of the surplus. That completely estops California from claiming any part of the Gila River water, either out of the Gila River or out of the main stream of the Colorado, and says that the Gila must be deducted. I want to say, then, further, that this compact was refused by California. Now, our position is that the intent of this compact is now binding upon California by virtue of its Limitation Act, passed by the California Legislature in 1929, and by virtue of its ratification of the Colorado River compact. So that our contention, as we view it, is that it has already been agreed to by California and is now binding upon California. We just have not got a contract signed between us right across the table on this particular phase. We have on the compact phase; and on this phase California has agreed with the United States irrevocably and unconditionally and for the benefit of Arizona to this construction of this agreement.

Chairman MURDOCK. Mr. Carson, you as an attorney have done the proper thing by reading from those basic laws. I am not an attorney, so I just wanted to get the thing down in plain, simple language so that I can be sure to understand it.

Mr. CARSON. Yes.

Chairman MURDOCK. You have read appropriately almost the entire Santa Fe compact, at least the pertinent parts, and you have read most of the Boulder Dam Project Act and quoted from it quite liberally.

Mr. CARSON. Yes.

Chairman MURDOCK. Do you regard the Santa Fe compact as a binding treaty between the basin States?

Mr. CARSON. Yes, sir.

Chairman MURDOCK. You regard the Boulder Canyon Project Act, an act of Congress, as the law of the river?

Mr. CARSON. As one of the instruments which together make the law of the river; yes.

Chairman MURDOCK. You regard the California statute of limitation passed in 1929 as a condition leading up to the enactment of the Boulder Canyon Project Act as more than a statute; that it is a solemn pledge of a sovereign State in regard to this whole transaction?

Mr. CARSON. Yes, sir.

Mr. FERNANDEZ. Mr. Chairman, nobody contends otherwise.

Chairman MURDOCK. But they might contend otherwise, and I see a possibility of such contention looming on the horizon. Is it not true that an act of the legislature can be superseded and repealed by a subsequent act?

Mr. CARSON. Not in this particular instance; I think not in this instance, because by its terms it was made irrevocable and unconditional with the United States, for the benefit of the State of Arizona and the other basin States in consideration of the passage of the Boulder Canyon Project Act, which was passed. California has already received the consideration and I think can never avoid its limitation act.

Chairman MURDOCK. Now, to go a little further, you spoke of apportioned water under the Santa Fe compact and surplus water.

Mr. CARSON. Yes, sir.

Chairman MURDOCK. What sections of the compact apportion water?

Mr. CARSON. Articles III (a), III (b), and III (c).

Chairman MURDOCK. III (a) making an apportionment between the upper and lower basins?

Mr. CARSON. Yes.

Chairman MURDOCK. III (b) adding an extra million to the lower basin?

Mr. CARSON. Yes.

Chairman MURDOCK. And III (c) having reference to Mexico?

Mr. CARSON. Making apportionment to Mexico in an amount to be determined by treaty.

Chairman MURDOCK. You maintain, then, that III (b) water is apportioned water to the lower basin?

Mr. CARSON. Yes, sir.

Chairman MURDOCK. And can never be regarded as surplus; therefore, it cannot be divided under the terms of the compact and the California Limitation Act?

Mr. CARSON. Yes, sir. You have stated it as I see it.

Chairman MURDOCK. Your contention is, then, that there are 8,500,000 acre-feet of water annually apportioned to the lower basin?

Mr. CARSON. Yes, sir.

Chairman MURDOCK. And California has limited her use of that apportioned water by a statute which cannot be revoked?

Mr. CARSON. Yes.

Chairman MURDOCK. To 4,400,000 acre-feet annually?

Mr. CARSON. Yes, sir.

Chairman MURDOCK. And that precludes California from asking for or having any part of the apportioned water apportioned to the lower basin other than within her limitation?

Mr. CARSON. Other than that that is within her limitation.

Chairman MURDOCK. Of course, she has one-half of any surplus water.

Mr. CARSON. Yes. And that surplus water is by the compact defined and by the California Limitation Act defined as water which was unapportioned by the Colorado River compact.

Chairman MURDOCK. If there is any shortage of water, then, it must be due to the fact that the original computations were not quite accurate and the water simply is not there.

Mr. CARSON. That is right.

Chairman MURDOCK. I think that suffices for my purpose just now.

Mr. PHILLIPS. Mr. Chairman, you are not suggesting that was a one-sided contract, are you?

Mr. CARSON. No; but—

Mr. PHILLIPS. The answer apparently is "No; but."

Chairman MURDOCK. The "but" means that California got something for her act of limitation. Let us have the other side brought out. I am interested in knowing what Arizona can expect to get out of the 8,500,000 acre-feet allotted to the lower basin.

Mr. PHILLIPS. I think that is what the whole committee is interested in. Last night, just before we adjourned, I had asked Mr. Carson if Arizona would sign a three-State compact in the exact words of that part of the Boulder Canyon Project Act which he this morning read, and I take it the answer is "Yes, but," just as his reply to my question regarding a "one-sided contract" was "No, but." In other words, Arizona does not want to sign it in the terms of that paragraph, but wants to change several words in the paragraph which is already signed, sealed, and delivered.

Mr. CARSON. Only by virtue of this fact—

Mr. PHILLIPS. In other words, it is a matter of interpretation between the two parties to the contract.

Mr. CARSON. No.

Mr. PHILLIPS. And I do not know who can settle that controversy, except a court or a board of arbitration.

Mr. CARSON. No.

Chairman MURDOCK. As I understood Mr. Carson's earlier testimony, he indicated that the Santa Fe compact, as first approved, was unsatisfactory to the Arizona delegation. Gov. Tom Campbell and Mr. Norviel were there, and some others, but the Arizona delegates refused to sign the compact until something was done about the Gila River.

Now, the compact, in its text, does not say that that 1,000,000 acre-feet was in lieu of the Gila River. I think it is unnecessary to prove that such in real truth was the case; it is unnecessary to do that; but I think certainly we have plenty of evidence to show from the letter from Secretary Hoover to Mr. Norviel, together with the picture of Mr. Hoover with his notation on it, and from the testimony of Governor Campbell and others, what the intent was in adding (b) to article III of the compact. Now, whether that would hold up in a court of law and be admitted as evidence is beside the question. The point I am trying to clinch here is this: There is not any doubt about the lower basin having apportioned to it 8½ million acre-feet of water annually, if it is in the river.

All right. Now, California has limited herself to 4,400,000 acre-feet of that water. California passed her Limitation Act to get the Boulder Canyon Project Act from Congress with all its benefits. Now, I cannot see how anybody has any claim to any other part of that water apportioned to the lower basin except Arizona and Nevada. So that it does not make any difference whether that million acre-feet pertained to the Gila River or not.

Mr. PHILLIPS. The other day, before we recessed, I think Mr. Carson had read from a letter from Mr. Hoover, and I would like, in order to complete the record, whenever the chairman will let me have the time, to read from Mr. Hoover's letter, which was dated January 21, 1923, when the matter was still very fresh in his mind, addressed to Senator Hayden, then Congressman Hayden, questions 6, 7, and 8, which were the ones I had in mind. I do not know whether we should put the entire letter in, but question 6 is this, quoting from the letter from Mr. Herbert Hoover to Mr. Carl Hayden of January 21, 1923, which appears in this little book [exhibiting], entitled "Colorado River and the Boulder Canyon Project":

"Question 6. Are the 1,000,000 additional acre-feet of water apportioned to the lower basin in paragraph (b) of article III"—which is III (b) water—"supposed to be obtained from the Colorado River or solely from the tributaries of that stream within the State of Arizona?"

Mr. Hoover's answer was:

"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."

That did not seem to be quite in accord with what has been said.

"Question 7. If more than 1,000,000 acre-feet of water are beneficially used and consumed annually on the tributaries of the Colorado River in Arizona, will the excess above that amount be charged against the 75,000,000 acre-feet of water to be delivered at Lee Ferry during any 10-year period, as provided in paragraph (d) of article III? In other words, will the use of any amount of water from the tributaries of the Colorado below Lee Ferry in any way relieve the States of the upper division from their obligation not to cause the flow of the river to be depleted below 75,000,000 acre-feet in any period of 10 consecutive years."

Mr. Hoover replied:

"I can see no connection between the use of waters in Arizona from Colorado River tributaries and the obligation of the upper States to deliver the 75,000,000 acre-feet each 10 years at Lee Ferry. Their undertaking in this respect is separate and independent and without reference to place of use or quantity of water obtained from any other source. On the face of this paragraph this amount of water must be delivered even though not used at all. The obligation certainly cannot be diminished by the fact that Arizona obtains other water from another source. The contract is to deliver a definite amount of water at a definite point above the inflow of various important tributaries—and so forth."

Then the third question:

"Question 8. As a matter of fact, more than 1,000,000 acre-feet of water from the tributaries of the Colorado below Lee Ferry are now being beneficially used and consumed within the State of Arizona. Will the excess above that amount be accounted for as a part of the 7,500,000 acre-feet first apportioned to the lower basin from the waters of the "Colorado River system" as provided in paragraph (a) of article III?"

And Mr. Hoover said:

"By the provisions of paragraphs (a) and (b), article III, the lower basin is entitled to the use of a total of 8,500,000 acre-feet per annum from the entire Colorado River system, the main river and its tributaries. All use of water in that basin, including the waters of tributaries entering the river below Lee Ferry, must be included within this quantity. The relation is reciprocal. Water used from these tributaries falls within the 8,500,000 acre-feet quota. Water obtained from them does not come within the 75,000,000 acre-feet 10-year period flow delivered at Lee Ferry, but remains available for use over and above that amount."

It seems to me we have this question you have just raised a moment ago and our problem is how much water there is and whether it is III (a) or III (b). And I want to say to Mr. Carson, if I can continue at this point, that I am not wholly clear on what he said last night, because I do not see how water developed in one State can be III (a) water.

Chairman MURDOCK. Before we go to that, may I interrupt for just a moment? We can weigh the testimony of Mr. Hoover in the two letters referred to but I think it is immaterial right now as to whether III (b) water actually was supposed to be Gila water or not, as I said before. The only material thing is that it is allocated to the lower basin States.

One reason I want to bring that out here at all is to show the intent of the Arizona delegates at the Santa Fe meeting. They were doing their best to

safeguard the Gila River system, because it had already been put to beneficial use. But it is immaterial whether that III (b) means Gila River water or means Colorado River system water.

Mr. PHILLIPS. Well, the question of whether there is or is not available to California half of the surplus depends on whether or not the Gila users are charged as consumptive users in Arizona.

Chairman MURDOCK. I cannot see how either III (b) water or Gila River water could possibly be surplus water under the terms of the compact.

Mr. PHILLIPS. Now, coming back to this question I asked Mr. Carson last night: As I get it, Mr. Carson, you say that the users of Gila water in New Mexico are using III (a) water, and the users of Gila water in Arizona are using III (b) water. Is that right?

Mr. CARSON. They are using apportioned water in Arizona, New Mexico, Utah, and I think Nevada—they use very little water—and California, out of the 8,500,000 acre-feet. In Arizona we are using a little in excess of the 1,000,000 acre-feet apportioned to the lower basin by article III (b) of the Colorado River compact. That means, then, as I see it—and this is the only place this has any application, as I say again—of the over-all basin use in the entire lower basin, we are limited by the compact to 8,500,000 acre-feet. We having used 1,000,000 acre-feet of III (b) water, or any other water of this apportioned water out of the Gila in Arizona, then it must follow, it seems to me, that the uses in the other States are part of the apportioned water; whether you call it III (a) water or III (b) water, it limits the use in the lower basin of the apportioned water. Therefore, as Mr. Baker will show you, when we are figuring our water supply in Arizona, we deduct from that which is deliverable to us as a firm right at Boulder or Lake Mead any excess over 1,000,000 acre-feet that we ourselves use of the Gila, that which is used in Utah and New Mexico, and our 2,800,000 acre-feet is reduced to that extent.

What that means in that reduction is that the water is delivered at Lee Ferry and Lake Mead, which we have said is our firm commitment is reduced, and the amount of water deducted then becomes part of the surplus, part of which could be utilized in California and part in Arizona, and the only bearing it has on this question, as I understand it—

Mr. PHILLIPS. May I ask one of those "true and false" questions like school teachers like to ask in high-school examinations?

Chairman MURDOCK. And which are rather tricky.

Mr. PHILLIPS. Mr. Carson, is this true, and I quote:

"Said compact, referred to as the Colorado River 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 apportioned and put to beneficial use prior to June 25, 1929, in Arizona and New Mexico."

Mr. CARSON. No, sir; that is not true.

Mr. PHILLIPS. That is not true?

Mr. CARSON. Let me explain that again, if I may. I want to explain the point on that as I see it. The virgin flow of the Gila River at its mouth is 1,271,000 acre-feet. We divert in New Mexico and Arizona water of the Gila, and divert, divert, and divert to where now we have reduced the flow of the Gila by use in Arizona by the amount of 1,135,000 acre-feet. Our consumptive use of the water of the Gila, therefore, is the amount by which the virgin flow is reduced at the mouth. The term "consumptive use" is not defined in the Colorado River compact; however, it is defined in the Boulder Canyon Project Act, and applies to California as well. I take it, the same rule that would apply to us here. In the California Limitation Act and in the Boulder Canyon Project Act it is defined in this way:

"That the aggregate annual consumptive use (diversions less returns to the river) of water by and from the Colorado River for the use of the State of California"—in other words, that means the net river depletion; so when we reduce the flow of the Gila at its mouth it is our net consumptive use.

To illustrate, suppose in the upper basin we will just assume the Fraser River, for instance, up in Colorado, and assume it would in its natural state flow into the Colorado River 100,000 acre-feet, but the people along that stream, we will assume, divert, divert, and divert, and use up that 100,000 acre-feet that would otherwise have reached the main stream of the Colorado River; their consumptive use would be 100,000 acre-feet. You would not go and add up all of the diversions and reuses, which might bring you up to

300,000 or 400,000 or 500,000 acre-feet—probably not that much, but 200,000 or 300,000 acre-feet—by reuse and redirection. And that is what has happened on the Gila River; we have redirected.

Mr. PHILLIPS. You mean you take water out of here and measure it down there [indicating], and the difference between the two is the consumptive water?

Mr. CARSON. In reaching the main stream of the Colorado River, you cannot consume more water of the tributaries of the Colorado River than there is there.

Mr. PHILLIPS. Let me ask this other question; this is another "true or false" question. Is this true, and I quote:

"Of the appropriated water"—that is the Colorado River and its tributaries—"diverted below Lee Ferry, $3\frac{1}{2}$ million acre-feet are annually diverted, used, and consumed in Arizona; 2,900,000 acre-feet are diverted from the Gila and its tributaries. All of the water of the Gila River and its tributaries was apportioned to and for the beneficial use of Arizona and New Mexico prior to June 25, 1929, and there was not on said date, nor has there been since, nor are there now, any unappropriated waters of the Gila River or its tributaries."

Mr. CARSON. No; that is not exactly true. There is some water that now reaches the main stream of the Colorado River from the Gila River. It is not a dependable supply, but comes from flash floods and otherwise. The total quantities there, if you are trying to apply them to the beneficial consumptive use and stream depletion, are greatly in excess of what is actually used, as I have tried to explain.

Mr. PHILLIPS. I rather had in mind the question of contractive use, and so forth, Mr. Carson, in the contracts.

Mr. FERNANDEZ. What are you quoting from?

Mr. PHILLIPS. These are quotations from Arizona's bill of complaint of October 1930, in the case against California.

Mr. FERNANDEZ. How much water is in the Gila River?

Mr. CARSON. There are 1,271,000 acre-feet at its mouth where it flows into the Colorado River, under virgin conditions; that is, before any at all is used in upstream areas.

Mr. FERNANDEZ. How much has been appropriated and put to beneficial use?

Mr. CARSON. Mr. Baker would have those exact figures, but it is 1,135,000 acre-feet reduction by use in Arizona, and I think now 16,000 acre-feet in New Mexico, and provision is made for some expansion in New Mexico.

Mr. PHILLIPS. This is what I had in mind. Mr. Carson read this compact which became binding on Arizona in 1944. Now, at that time the users from the Gila—and that is the only thing I referred to yesterday—the Salt River Valley and the San Carlos had developed to their present extent, had they not?

Mr. CARSON. Yes.

Mr. PHILLIPS. All right; their water rights were then perfected.

Mr. CARSON. On what date?

Mr. PHILLIPS. 1944.

Mr. CARSON. Yes; pretty well perfected.

Mr. PHILLIPS. Now this act you read—I do not know whether you read this one this morning, but this is the compact, and I quote:

"There is hereby apportioned from the Colorado River system"—which you have already said, Mr. Carson, includes the Gila—"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."

Now, water rights on the Gila being in existence at the time of which the compact speaks, how can that water be charged to anything but III (a) water?

Mr. CARSON. Under (b):

"In addition to the apportionment made 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."

You have to read the whole thing together.

Mr. PHILLIPS. I do not know whether we do. Did not you say something about an increase there?

Mr. CARSON. Yes.

Mr. PHILLIPS. Well, "increase" does not include present use of water contracted for, or water contracted for as of that date.

Mr. CARSON. Yes.

Mr. FERNANDEZ. Does not the word "increase" refer to the quantity apportioned?

Mr. CARSON. Yes.

Mr. FERNANDEZ. They may increase the quantity apportioned, where it is appropriated or put to beneficial use?

Mr. PHILLIPS. Read that again.

Mr. CARSON (reading):

"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."

Mr. PHILLIPS. Here is what the compact says—I am trying to get it in my mind, and here is what the compact says:

"There is hereby apportioned from the Colorado River system"—that includes the Gila—"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."

Mr. CARSON. Yes.

Mr. PHILLIPS. Then how can you apply the language in (b)?

Mr. CARSON. Yes; it is just a permissive increase of the apportionment from 7,500,000 to 8,500,000 acre-feet—all of the 8,500,000 acre-feet would include all of the water necessary for the supply of any rights which may now exist.

Mr. PHILLIPS. Over and above that already used.

Mr. CARSON. No; not necessarily. This refers to the quantity of the water. In other words, these two together, Mr. Phillips, make 8,500,000 acre-feet apportioned to the lower basin, which must then include the then existing rights.

Mr. PHILLIPS. Mr. Chairman, is that clear to you?

Chairman MURDOCK. One reason why I wanted to get it down in black and white was so that I can read it 10 times and make sure I understand it.

Mr. WHITE. I think I see where the confusion is. If you will read the language I will point out the confusion to you. Read that statement again.

Mr. CARSON (reading):

"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 water by 1,000,000 acre-feet per annum."

Mr. WHITE. In that language it means "all of the water of the Colorado River system"?

Mr. CARSON. Yes.

Mr. WHITE. And that includes the Gila River?

Mr. CARSON. That includes the Gila River.

Mr. WHITE. And that extra 1,000,000 acre-feet that is in excess of the 7,500,000 acre-feet of the main Colorado is proposed to include the Gila River?

Mr. CARSON. Yes. I cannot quite see the force of Mr. Phillips' argument; because actually California could use none of it under either construction of it. If you assumed that this must include the Gila River in the first 7,500,000 acre-feet, then there is apportioned to the lower basin an additional 1,000,000 acre-feet which cannot be used in California under its limitation act. So it is just a matter of a play on words here. You are already excluded from III (b) water.

Mr. PHILLIPS. I answered that a moment ago by saying I think it does affect California through the availability of a surplus.

Mr. CARSON. That would not help you either; because either way you put it there can be no more surplus in the lower basin until the consumptive use of the lower basin has reached 8,500,000 acre-feet. So whether you figure it one way or the other, you come out at the same end, that the surplus is over and above the quantity of water apportioned to the lower basin by article III (a) and III (b).

Mr. WHITE. There is one question that arises in my mind as to States' rights governing water rights filed by applicants in the several States on the Colorado River system. I am wondering how many valid and existing water rights have been filed by these lower basin States for the use of water of the Colorado River in Nevada, Arizona, and California. California had established certain priority water rights which were recognized, and so had Arizona. What part of the waters of the Colorado River are not covered? What portion of the water allocated by the compact to the Colorado, which is 7,500,000 acre-feet, are not covered by State water rights?

Mr. CARSON. You have to distinguish there between filings, and rights put to use.

Mr. WHITE. Appropriation is what governs, is it not?

Mr. CARSON. Yes.

Mr. WHITE. You can file all the notices you want to; but, if you do not appropriate the water your filings lapse.

Mr. CARSON. That is right. Now, then, as I understand this present situation—and I am speaking without very accurate knowledge—the total present uses of Colorado River water in California which are actually in use approximate 2,700,000 acre-feet.

Mr. WHITE. That does not reach the thing I want to know. I want to know what valid water rights are in existence in the three States to the waters of the Colorado River.

Mr. CARSON. I cannot tell you that accurately.

Chairman MURDOCK. We have an engineer here who will tell us something about the water actually used in Arizona.

Mr. WHITE. It is not the water actually used; it is the water they have a right to use by reason of existing valid water rights.

Mr. CARSON. Mr. White, no matter how many filings were made in any State or how much water was actually put to use, the right in that State is limited by the limitations on that State that are effective here—in California—by the California limitation act, to 4,400,000 acre-feet plus one-half of the surplus. I have no doubt there are in the proper water authority offices in California filings for many times that amount of water, but that limitation is what governs. In Arizona there are filings for a lot more water than we can take under our limitation, and it is the limitation that should govern in the applications for water rights.

Mr. FERNANDEZ. Mr. Chairman, I think that question is very important in this way: I agree that what Mr. Carson says is true; but in the consideration of this bill it seems to me the important question is whether or not Arizona is about to reach the limit of its 2,800,000 acre-feet. If it has not reached that, then California cannot complain, because they both agree they are entitled to 2,800,000 acre-feet. Now, if they have reached 2,800,000 acre-feet or are about to reach that with this project, then the question of whether or not they are entitled to an additional 1,000,000 acre-feet is important. Therefore, that question, I think, is very important here, and I have been wanting to ask that when Mr. Baker is on the stand.

Mr. CARSON. Yes.

Mr. PHILLIPS. Should not we say, when you say "water," that you mean main-stream water?

Mr. FERNANDEZ. That is what we are dealing with here, is it not?

Mr. PHILLIPS. No; system water.

Mr. FERNANDEZ. System water. Now, you are both agreed. I think that system includes the Gila River, except Arizona claims they have 1,000,000 acre-feet in the Gila River over and above the 2,800,000 acre-feet.

Mr. PHILLIPS. When you speak about the 2,800,000 acre-feet, you are talking about system water.

Mr. FERNANDEZ. System water. You are both agreed they are entitled to 2,800,000 acre-feet of system water, and until that point is reached California cannot complain.

Mr. CARSON. If you apply system water and try to include it all in one, they have apportioned to the lower basin 8,500,000 acre-feet, not 7,500,000 acre-feet.

Mr. FERNANDEZ. That is true; that is what you contend, but they do not agree to that, but do agree that there is 7,500,000 acre-feet.

Mr. CARSON. Then their limitation is 4,400,000 acre-feet and Nevada's is 300,000 acre-feet. So if you include them all in the same system and use the same measuring stick, Arizona is entitled to 3,800,000 acre-feet, less these small quantities which are used in New Mexico and Utah.

Mr. PHILLIPS. Then if it is not established that the actual beneficial use of the Gila amounts to 2,000,000 acre-feet, the claim of Arizona in the main-stream water would be reduced to 1,800,000 acre-feet; is that right?

Mr. ROCKWELL. I would like to ask a question at that point. Maybe I will get off the track on this, but I would like to ask this question, of Mr. Carson and the others. Up in my State I have heard this water question discussed for a good many years. In fact, I was president of the Colorado Senate when this compact was signed at Santa Fe, and we have always contended that each State had the right to its own water while within the boundaries of that State. I think the

Supreme Court so held up until a decision was handed down by that body by a vote of 5 to 4, I believe it was, which changed their policy to first in time, first in right.

Mr. CARSON. That is right.

Mr. ROCKWELL. Went into effect regardless of State boundaries.

Mr. CARSON. That is right.

Mr. ROCKWELL. Now, in our State we still think that some other Supreme Court will decide the way it was originally decided and, if that should happen, what would be the situation here? I do not want to get off on another track, but that may happen at some time and might change this thing upside down.

Mr. CARSON. It would not affect this.

Mr. ROCKWELL. It would the Gila, would it not?

Mr. CARSON. No. I think it would not affect the Gila or the Colorado River compact; because, as I see it now, we have agreed to our limit in each State; not in the upper basin as between States, but between the upper basin and the lower basin where we have agreed. In the lower basin we have agreed, although not directly across the table, through a compact and the California limitation act that our total water, whatever could be used, no matter what the final court decision on that would be, would be out of firm water—ignoring for the moment surplus—3,800,000 acre-feet, and in California 4,400,000 acre-feet. Then the State law in Arizona comes into play as to where it would be used and who would have a prior right within the State, and the California law in California. So, when the State's division is once made, then it is a matter for the State jurisdiction to determine the priorities of its own users within the State. That is under the jurisdiction of the State and not under the United States. So, I think one of the cases you refer to is that of *Kansas v. Colorado* and *Colorado v. Wyoming* in which the Supreme Court added up the users in both States and in effect did apply the right of prior appropriation regardless of State lines in determining the quantity each State should have. But here we have done that by agreement.

Mr. ROCKWELL. In other words, that will not affect this question; the upper States, as I understand it, have to turn 7½ million acre-feet down.

Mr. CARSON. Yes.

Mr. ROCKWELL. Then the lower States have 8,500,000 additional between them.

Mr. CARSON. That is right.

Mr. ROCKWELL. So any decision changing that would not affect this particular controversy.

Mr. CARSON. That is right.

Mr. ROCKWELL. It struck me it might only in the case of the Gila River, where Arizona might divide with respect to that water that they had priority over any other State.

Mr. CARSON. It would under the State law in Arizona say that the Gila River and any other appropriations would have priority in the order in which they were made; so that out of our 3,800,000 acre-feet apportioned the first rights would be along the Gila River where it was first put to use, so that they can never be disturbed by anything that any of us can do, nor would any of us want to disturb those rights. So that they are all secure.

You were not here last night, Mr. Rockwell. The total water that Arizona is now using out of the main stream of the Colorado River—Mr. Baker will go into the figures, but it is somewhere in the neighborhood of a little over 400,000 acre-feet. So that under our construction we have 2,800,000 acre-feet less some deduction for the water used in Utah and New Mexico and in addition to the use of over 1,000,000 acre-feet that we use of the Gila, still in the main stream subject to our right to use and then when that is put to use by this Wellton-Mohawk and Yuma projects and the central Arizona project, the State laws apply in the determination of priority rights, depending upon the priority of appropriation.

Mr. FERNANDEZ. You read from the Boulder Dam Act one provision authorizing the entering into of a compact between the three lower States; then you also read from section 4 another provision which as I understand, undertakes to interpret the various compacts and transactions that had theretofore taken place, and to place them in a provision for a contract. If that compact, as provided by section 4, is entered into, then that becomes a compact without necessity of ratification by the Congress, because it has already authorized it in specific language?

Mr. CARSON. Yes?

Mr. FERNANDEZ. That is correct; is it not?

Mr. CARSON. Yes.

Mr. FERNANDEZ. Now, if that kind of a compact is entered into, that ends the matter.

Mr. CARSON. I do not think that necessary.

Mr. FERNANDEZ. Why not?

Mr. CARSON. Because California is now bound, as I see it, Mr. Fernandez, by its limitation act to the construction that we place upon this compact.

Mr. FERNANDEZ. Yes; but that limitation act is included in the compact which the Congress has authorized to be entered into?

Mr. CARSON. No; the limitation is effective whether or not this compact is entered into.

Mr. FERNANDEZ. That is true; but if the compact is entered into, then there is no question left?

Mr. CARSON. Yes; I think we would still have the same question.

Mr. FERNANDEZ. The difficulty is that the interpretation which the Congress tried to put into the various transactions your two States interpret differently; therefore, neither Arizona nor California want to enter into that particular compact because you do not understand it alike?

Mr. CARSON. Well, California has raised this one question and that was not raised in the course of the negotiations, so far as I know. I did not hear that until this hearing began, that the Arizona Legislature changed the meaning of this permissive compact as set out in the act.

Mr. FERNANDEZ. That is correct.

Mr. CARSON. And I submit we did not. But since they have raised that question and since in my judgment they are already bound by the limitation act which is effective whether or not the compact is made, then before we enter into any compact with them we should make it absolutely clear. I do not like to enter into compacts in behalf of a State in which there is a disagreement or failure of a meeting of minds upon the meaning of clear language.

Mr. FERNANDEZ. Well, the Arizona Legislature did change the language.

Mr. CARSON. Yes.

Mr. FERNANDEZ. And changed it so as to conform with its interpretation of the proposed compact.

Mr. CARSON. And with the provisions of the California limitation act, also.

Mr. FERNANDEZ. Well, I do not see where the California limitation act has anything to do with that particular section. The main objection of both of you is whether or not you are entitled to 2,800,000 acre-feet of water or 3,800,000 acre-feet of water.

Mr. CARSON. That is right.

Mr. FERNANDEZ. And your legislature did change the language so as to make it clear that you were entitled to 3,800,000 acre-feet.

Mr. CARSON. Yes, sir.

Mr. FERNANDEZ. And California says that is not what is meant by the language which Congress proposed.

Mr. CARSON. I think we are talking about something that would not happen.

Mr. FERNANDEZ. Anyway, that is a fact; is it not?

Mr. CARSON. Yes.

Mr. FERNANDEZ. Now, going back to the other provision, if California and Arizona would sit down together now and enter into a compact which would be in conformity with the compact dividing waters between the two basins, the upper States and the lower States, whether they use this language or other language, if they could agree between them and Nevada, then that compact could be entered into and submitted for ratification to the Congress.

Mr. CARSON. Yes.

Mr. FERNANDEZ. The point I am trying to make is that we do not have to do anything now about reauthorizing any such compact. The three lower-basin States already have ample authority to work out a compact and submit it to Congress for approval.

Mr. CARSON. That is right; that is just exactly correct.

Mr. WHITE. The only thing that appears to me is that in this authorization for a compact that has been read here the whole program was set out in the nature of a limitation: there was not much left for these States to agree upon. They had to take the authorization as it was stated, with that limitation, and the fact is I do not see much use of having a compact except to ratify what the Congress has already outlined in the authorization for a compact.

Mr. CARSON. I don't either, Mr. White, and I don't think we could ever make a compact.

Mr. WHITE. Doesn't that infringe the rights of the three States to the water of the Colorado River having a right to agree on the use of water? Didn't Congress infringe that by setting up the limitations in the authorization of the compact?

Mr. CARSON. No. Congress, at the time this Boulder Canyon Act was passed, put in this permissive clause for a tri-State compact in the lower basin and, for fear California would not enter into that compact, which was the fact, inserted this limitation to California's use, to which California, by act of its legislature, has agreed:

"* * * 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."

Mr. FERNANDEZ. May I pursue that a little?

Chairman MURDOCK. Yes.

Mr. FERNANDEZ. Will you yield?

Mr. WHITE. Yes.

Mr. FERNANDEZ. You say that because of that, California being assured 4,400,000 acre-feet of water plus one-half of the surplus, that California has no right to come in here and question whether or not Arizona is entitled to 2,800,000 or 3,800,000 acre-feet, so long as they get their water.

Mr. CARSON. That is exactly right—until there is some surplus.

Mr. FERNANDEZ. If you are correct that you are entitled to 3,800,000 acre-feet, then the surplus must be over and above that.

Mr. CARSON. That is right.

Mr. FERNANDEZ. And if they are correct that it is 2,800,000 acre-feet, then the surplus begins when that is used, and there would be 1,000,000 acre-feet of surplus water.

Mr. CARSON. If they could be correct on that.

Mr. FERNANDEZ. To which they would be entitled to one-half.

Mr. CARSON. That is right.

Mr. FERNANDEZ. Or half a million acre-feet.

Mr. CARSON. That is right.

Mr. FERNANDEZ. Then they do have a right to come in and question that provision now, do they not?

Mr. CARSON. No. The point here, Mr. Fernandez, if you take the over-all apportionment of the basin, there is 8½ million feet of water to the lower basin. California is limited to 4,400,000 acre-feet. That leaves Arizona 3,800,000 acre-feet of apportioned water, which California has agreed she can never use.

Mr. FERNANDEZ. But they say it is not 8½ million acre-feet of water, but 7½ million acre-feet. Therefore, they would be entitled to one-half a million of the surplus.

Mr. WHITE. I think that the gentleman from New Mexico is confusing the water in the main Colorado River and the tributary, the Gila River.

Mr. FERNANDEZ. I am not confusing it for this reason, that if the Gila water of 1,000,000 acre-feet that they claim from that stream is credited against what they are supposed to get from the main stream, that leaves them with a claim for much less water than they say they are entitled to, and with that much more surplus to be divided.

Mr. WHITE. The legislative limitation imposed on itself by the State of California, does that conform exactly to the limitation set up in the authorization bill?

Mr. CARSON. Yes, sir.

Mr. WHITE. It conforms exactly?

Mr. CARSON. Yes; it conforms exactly, irrevocably, and unconditionally.

Now, Mr. Fernandez, on that question of what is apportioned to the lower basin. I think that California would agree that 8½ million feet are apportioned to the lower basin. Whether they would agree or not, it is clear from this Colorado compact.

Mr. FERNANDEZ. As Congress interpreted the transactions leading up to the compact and as you interpret the interpretation made by Congress.

Mr. CARSON. No; as the compact shows in its express terms.

Mr. FERNANDEZ. Will you read those express terms?

Mr. CARSON (reading):

"(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 recognized in addition to that provided in paragraph (d)."

Now, I jump down to (f). These others do not affect this particular question.

"(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)."

So there is no question that it is apportioned water, and the Supreme Court of the United States has, it seems to me, in clear and unmistakable language, held that it was apportioned water. So then, if it is apportioned water—and I am clear that it is—then California has precluded herself from ever claiming any part of it because she has limited herself to 4,400,000 acre-feet plus half of the surplus. And, therefore, whether or not you figure it as an over-all apportionment of 8½ million feet to the lower basin, which it clearly is by this language, it leaves 3,800,000 acre-feet for use in Arizona.

The difficulty and the confusion, it seems to me, comes in this fact, that the Secretary of the Interior by this act was authorized to make contracts for the delivery of water from Lake Mead and everybody was precluded from claiming water except by contract with the Secretary. Well, now, of the 8½ million feet apportioned to the lower basin, 7½ million feet of that comes down from the upper basin and is called III (a) water, but, actually, when you get down to figure the ultimate right to water here, it does not make any difference whether you specify that that is III (a) to the exclusion of III (b); the result is the same. The water coming down from Lake Mead is the only place where the Secretary has authority to deliver water, except by act of Congress. All of these contracts relate to water in Lake Mead, where the supply is limited by the Colorado compact to 7½ million feet. Therefore, in the Arizona contract, that is why we say the Secretary agrees to deliver and we to take 2,800,000 feet. The Secretary has not any jurisdiction over the Gila River.

Mr. FERNANDEZ. Then I am wrong in my assumption and interpretation of the compact that it would result in more water?

Mr. CARSON. I think you are right in your assumption, if there should be any more than 1,000,000 acre-feet of the Gila River depletion; that might reduce our right from the main stream and the difference would be a surplus from which they could take a part.

Mr. FERNANDEZ. That is their interpretation.

Mr. CARSON. Yes. But in doing that, they run into two difficulties. They add up diversions and call them consumptive use, contrary to the language of Congress when it says "diversion less returns to the river." When we use the virgin flow of the river (if we use it entirely in the Gila River, all consumption would be 1,271,000 acre-feet because we would have prevented any return from the Gila River to the main stream. They want to apply one definition of consumptive use to us and another to themselves.

If we are correct on that, they cannot transfer, by any stretch of the imagination, any quantities of water from the Gila River by any mathematical computation to the main stream of the river, which they would attempt to do.

Mr. FERNANDEZ. Now, if no compact is entered into and no judicial determination is made which would determine who is correct, then Congress will do that as it goes along in authorizing new projects.

Mr. CARSON. I do not think so on this.

Mr. FERNANDEZ. Who is going to do it, then?

Mr. CARSON. Let me tell you my theory on this particular bill, which we have largely overlooked in this discussion. But if you could figure, under any stretch of the imagination, that California's position as to the total consumptive use in the lower basin was in any way correct, still, as you have well stated, the only effect of it would be to give them a right to half of whatever mathematical quantity they could figure from the Gila that should be deducted in order to make the consumptive use of $8\frac{1}{2}$ million feet of the lower basin, so that they could claim half.

Mr. FERNANDEZ. Therefore, in doing that, we actually determine this question for ourselves.

Mr. CARSON. No. On this bill, even if—

Mr. FERNANDEZ (interposing). Not necessarily on this bill, but as we go along.

Mr. CARSON. On future projects?

Mr. FERNANDEZ. Yes. When we approach the limit, the Congress will have to decide that for itself.

Mr. CARSON. Yes; but not on this bill, because even under their method of figuring there would be a lot more water in the river than this project would consume—in addition to all uses in Arizona would consume.

My point again is that the Congress has already determined this, Mr. Fernandez, by this limitation act, which California has accepted. California has excluded themselves from any part of apportioned water except 4,400,000 acre-feet, and that leaves 300,000 feet in Nevada and 3,800,000 feet in Arizona.

Mr. WHITE. You mean in the water system—not in the river.

Mr. CARSON. In the water system.

FURTHER STATEMENT OF CHARLES A. CARSON, SPECIAL ATTORNEY FOR THE STATE OF ARIZONA ON COLORADO RIVER MATTERS

Mr. PHILLIPS. You are Mr. Charles A. Carson?

Mr. CARSON. That is correct.

Mr. PHILLIPS. I told you I had a question to ask you that was more or less serious.

Mr. CARSON. Yes, sir.

Mr. PHILLIPS. You said the other day in your testimony that the water that was being delivered into the Salt River Valley was III (b) water. I wondered whether you do believe that is an accurate statement of that situation?

Mr. CARSON. That is more or less rhetorical, Mr. Phillips. I tried to make that clear for Mr. Rockwell's benefit, as well. The situation is something like this—and I would like to go again to the point where this division was made.

Mr. PHILLIPS. I was just asking the question if you felt that the Gila water used in New Mexico and the Gila water used in Arizona would come into that, and, if so, just how?

Mr. CARSON. I am going back to this proposal, if I may, for a moment, with Mr. Rockwell's statement in mind.

Mr. Rockwell, no matter whether you consider this III (b) water, to be Gila water, or part of this $8\frac{1}{2}$ million acre-feet in the lower basin, it is very clear in my mind that the III (b) water is apportioned to the lower basin, and was water bearing that identical relationship to the Gila River water that I mentioned before, and to which you have addressed your question. I think that is clear, now. It is apportioned to the lower basin, as is likewise the $7\frac{1}{2}$ million acre-feet of III (a) water, so it makes the apportionment to the lower basin $8\frac{1}{2}$ million acre-feet.

Now, California, by her limitation act, has agreed that her use can never exceed 4,400,000 acre-feet of this $8\frac{1}{2}$ million acre-feet, plus one-half of whatever surplus or excess is in the river over and above the $8\frac{1}{2}$ million feet apportionment to the lower basin. So, taking that view of the thing, then, Arizona is entitled to 3,800,000 acre-feet without in any way infringing upon the California limitation. That still leaves 300,000 feet for Nevada.

Of this 3,800,000 acre-feet, we take—and this is the source of the supply likewise—apply that to the Gila River 1,000,000 acre-feet which leaves us out of the main stream 2,800,000 acre-feet. But by those two quantities, 2,800,000 acre-feet, and the million acre-feet, Arizona has reached her limit of consumptive use of apportioned water under the compact, and under the California Limitation Act. California cannot be heard to complain because she agreed with the United

States by a solemn, statutory agreement made, as I say, in the most solemn way an agreement could be made involving assurances of one State to the United States, and to her sister States. That agreement was made in terms irrevocably and unconditionally for the benefit of the State of Arizona, as well as other basin States. And it is on that limitation or solemn agreement that California can never use more than 4,400,000 acre-feet of the water apportioned to the lower basin, plus not more than one-half of the surplus, that we rely, I believe.

Moreover, I think we should apprehend that it is a pure question of mathematics; $8\frac{1}{2}$ million acre-feet as your total; 4,400,000 acre-feet to California; less 300,000 acre-feet for Nevada; leaves 3,800,000 acre-feet for Arizona. If you take those three figures away from $8\frac{1}{2}$ million feet, you should come down to zero.

Then, Mr. Baker has told you that under any of these figures of flow there is ample storage in Boulder Dam to regulate the river and provide a steady flow of water to the projects that are described in this bill; that is the Gila-Wellton project, and the Yuma Mesa Wellton-Mohawk.

I can illustrate this very clearly. Even if Mr. Dowd should prevail and say we are using 2,000,000 acre-feet on Gila—which we do not admit for a moment—why, we would have to deduct a million acre-feet out of our otherwise main-stream apportionment, which would still leave 1,600,000 acre-feet for us in the main stream. This project takes 600,000 acre-feet, which still leaves us with a million acre-feet, with the use on the Indian reservations, and the water required for this project, if we utilized all of that, we would not even then have reached our limitation even under that construction on this project.

Of course, we have gone into a lot of argument about ultimate conditions that may happen in the upper basin and the lower basin, as may now or in the future take effect, but even with those ultimate conditions as projected they would not be jeopardized as to these water rights.

Again, if Mr. Dowd's theory should prevail on the consumptive use on the Gila River—which to my mind it cannot, and is not capable of being done—but even if it should prevail, if they could show that the salvage water on the Gila River—that is, if they can by salvaging the water, and the salvage I am satisfied would be less than 500,000 acre-feet, and might be as low as 400,000 acre-feet, but even if they should prevail on that, what would happen? That would merely add up on their consumptive use in the basin, and reduce our firm supply and leave a surplus in the main stream to which they would be entitled to one-half. The water would be in the main stream because we are only figuring on the water at Lee Ferry. So if we deduct that from our firm water, it is still bound to be in the main stream of the river at Lake Mead, and they could use half of that, so the most we could ever lose is 200,000 acre-feet, or 300,000 acre-feet, or thereabouts.

Therefore, in this question that they are raising here about delaying until an agreement can be made, or until all of these water questions can be settled, it seems to me that they are without any merit at all. I say that because if they are bound, and they are admitting that they are bound by the California Limitation Act, they cannot in any way be heard to complain.

On the question of the arbitration we will not, so far as I am ever authorized to speak for Arizona, ever concede that they are entitled in any way to avoid or evade their limitation act or the Colorado River compact, or the Boulder Canyon Project Act, and unless and until they can do that, then they have already now agreed, and there is no use of our trying to make any further agreement with them. They have agreed now, and they are bound.

Then as to the question of the arbitration, as I said before they are out, because this was an informal arbitration, true, but it was an arbitration, and the recommendation was made, and when it came to Congress, Congress accepted it with but a slight change, and wrote it into the Boulder Canyon Project Act.

I want to say that Congress and California obviously accepted that division, because they wrote in their own requirements in the California Limitation Act, which California adopted. So the agreement is made. The only difference is that instead of California and Arizona signing the same piece of paper, why, they signed with the United States for our benefit; we signed with the United States for their benefit, but the division is made just as squarely and as fully as if there were a different manner of doing it, and if they had gone about it the other way and signed on the same paper, that would not strengthen it in the slightest.

It is not necessary for Congress to undertake to adjudicate water rights to determine between conflicting interest for water. If Congress will read its own

act, the Boulder Canyon Project Act, the California Limitation Act, and the Colorado River Compact, it will see that all of these matters here in controversy have already been definitely settled, as definitely as they could be in any agreement or in any court decree. It is settled. It is settled now.

I do not appreciate the fact that they come in and ask this committee to postpone consideration pending the making of an agreement, an agreement by which they are already bound, or to arbitrate again, when they have already arbitrated, and they are now refusing apparently to accept it, or delay until a court can determine it, when they say that they have no way to get into a court. When, as a matter of fact, Arizona filed a suit in 1935 for an equitable apportionment of the water, the California people objected to the jurisdiction of the court, and the court dismissed it partially on the grounds that the United States was not a party to the suit; and also on the grounds that, as the attorneys say, the United States will not take jurisdiction in cases requiring declaratory relief solely. In other words, there must be a valid right, which it is alleged may be endangered, and by the very fact that they say that they are advised by their attorneys that the court will have no jurisdiction is a prime admission that they know that they will not be damaged by this project.

If they thought that this project would be a danger to them, they would say, "Yes, the Supreme Court would have jurisdiction." They say it has no jurisdiction, and the reason they say that is because they cannot make an allegation that they are damaged, before the Court.

Now, Mr. Phillips, it does not make any difference here whether you classify the Gila water as III (a) water or as III (b) water, if you keep in your mind the fact that the entire 8½ million acre-feet of III (a) and III (b) water is apportioned water to the lower basin and California has, by the California Limitation Act, limited herself to a certain amount, and as required by the Boulder Canyon Project Act has made certain commitments. That is all there is to it, as I see it.

All these other questions about these matters brought up in these arguments are, to my mind, to a very large degree, is much to do about nothing, because they fall, when you carefully consider them, of their own weight. After we have settled those, and I do believe I have covered them completely in my statement I just made, the sole question left from these arguments that we have here is what is the total consumptive beneficial use of the Gila River.

I have tried to cover, and I took some little time to do that, the points which are involved in that matter. I believe we will be consistent with the total consumptive use, as measured exactly the same in Arizona as it is in California, diversions less returns to the river, in the language of the Boulder Canyon Project Act. If that be true, then we are using now on the Gila River 1,135,000 acre-feet, and we have Mr. Baker's charts charging against ourselves on the main stream 135,000 acre-feet, which is the amount over and above the 1,000,000 acre-feet of III (b), but is part of the 1,135,000 acre-feet total figure that I gave. We have utilized the III (b) provision merely because it makes a division between the sources of supply.

In the beginning it was agreed that such a provision would be written into the tri-State contract. That was not done, it was not binding, but California, being bound by her limitation act, and excluded from the million acre-feet of III (b), it makes no difference whether you consider it in III (a) or III (b), because whatever it is, III (a) or III (b), we come to this situation: If it is III (b), and it is separated, then it means that California can claim no part of the Gila River; but if it is III (a), then you say there is an additional million acre-feet in the main stream, which California has agreed by her limitation act she cannot take.

In other words, I think the source of the water in each case is clear, and I think that the implications as to what can be done as to that particular water, whatever its source may be, are equally clear.

Mr. PHILLIPS. I should like to read a part of the act into the record; I think it can be found somewhere in here. I think in effect what we have this afternoon is that Mr. Carson is attempting by his testimony to change this statement.

Mr. CARSON. Whose statement?

Mr. PHILLIPS. Your own statement.

Mr. CARSON. I have not changed my statement, I submit.

Mr. PHILLIPS. I think the record will show it. Yesterday you did make a rather definite division between class A and class B waters.

Mr. CARSON. No, sir; I told you yesterday it made no difference which way you figured out, you came out to the same place in the end, that you cannot claim

any part of it in California under the limitation act, because this is a portion of the lower basin.

Mr. PHILLIPS. Mr. Carson, you said a minute ago that this has been arbitrated, and you also said that California had refused to arbitrate.

Mr. CARSON. I said "agreed informally to arbitrate," not binding or anything like that. I made that clear, in my opinion.

Mr. PHILLIPS. Also, I do not think you meant to emphasize the fact that California was claiming to be injured now. I do not think that is the claim, and that is the first time it has been set up, the presumption that we should not figure now on the conditions in the river at future times. It seems to me that that is exceedingly important, if the upper basin is going to be exhausted of its water rights, and the lower basin is going to be exhausted of its water rights, every State in the basin is interested in the future water supply, and particularly southern California, where all of this water has been presumably contracted for.

Now, I just would like to ask Mr. Carson in very simple language: Do I understand now that Arizona refuses to arbitrate?

Mr. CARSON. Yes, sir; you can understand that.

Mr. PHILLIPS. And yet the record will show the other day that Mr. Carson said that California refused to arbitrate.

Mr. CARSON. Yes, you did; because we tried it.

Chairman MURDOCK. I cannot see any inconsistency there.

Mr. CARSON. It was an informal matter.

Chairman MURDOCK. To my personal knowledge, there has been effort made to get Arizona and California to get together for a quarter of a century, ever since 1923, certainly since 1927, and more certainly since the Boulder Canyon Project Act was passed. Somebody, some place, has held up the agreement.

I want to make this point clear: As I understand, Mr. Carson, in order to bring an action before the Supreme Court you have to show that you are being injured?

Mr. CARSON. That is true.

Chairman MURDOCK. It is useless for us to talk about litigation to settle this thing until one or the other is placed at a disadvantage, and one or the other of the contestants can show that he is being injured. If this question cannot be brought into court, if it cannot be effectively arbitrated, and if, as some contend, it cannot and should not be determined by an act of Congress, then it cannot be settled, therefore nothing will be done. The status quo should be highly satisfactory to interest and agencies in California now getting practically all the benefits from the river.

Mr. PHILLIPS. I do not think anybody claims he is injured now. I think Mr. Dowd said there is today an excess of water, but I asked you the other day, to be consistent, if you would recommend the building of water projects anywhere which subsequently might be found not to have enough water available to them.

I will say this for the record, and I will say it categorically, that California supports and will continue to support and stand behind the compact, stand behind the California Limitation Act, and the Boulder Canyon Act, and we will arbitrate. Let Mr. Carson say what he may.

Mr. WHITE. What about the contract between the Department of the Interior and Arizona, do you accept that?

Mr. PHILLIPS. I do not know the wording of it. I would have to look into it more.

Mr. DOWD. We will accept it on the basis that the then Secretary of the Interior Ickes said he signed it. We intend to put into testimony certain parts of this contract between Mr. Ickes and the State of Arizona; we agree that there was such a contract.

Mr. WHITE. Do you not think that the contract between California and Arizona is still material and binding as to the limitation act?

Mr. DOWD. No, sir; because under the Boulder Canyon Act, Congress set up certain limitations. It said, "If you will accept these limitations, we will do so-and-so." The Secretary was under a mandate to make contracts, under that act, with California, and California within the limits of the limitation act, was in a position to make contracts with the Secretary of the Interior.

Mr. WHITE. That is undoubtedly so.

Mr. DOWD. Well, we will stand back of it.

Mr. WHITE. I believe you are qualified as a lawyer?

Mr. CARSON. Yes, sir.

Mr. WHITE. I believe you are familiar with water-right laws?

Mr. CARSON. Quite a few. I am quite familiar with them.

Mr. WHITE. State laws concerning them?

Mr. CARSON. Yes.

Mr. WHITE. Before any negotiations were undertaken by the States of California, Arizona, and Nevada; in fact, before there were any negotiations undertaken between the States of the upper basin and the lower basin with the Federal Government, the States had certain rights to the water of the Colorado River; is that a fact?

Mr. CARSON. Yes, sir.

Mr. WHITE. By authorization of Congress, the several States entered into an agreement or so-called compact with the Federal Government for certain use of the waters of the Colorado River?

Mr. CARSON. That is correct, sir.

Mr. WHITE. In making that agreement and compact, did that convert and convey certain rights to the Federal Government to the control of waters in the Colorado River?

Mr. CARSON. No; generally speaking, I think, Mr. White, that it made the agreement between the States that a portion of the water in the upper and lower basin would be apportioned. Then Congress, by the Boulder Canyon project, gave rights to the United States, and nobody claimed otherwise, so far as I know, under the United States, save that it should be controlled by the compact.

In other words, I think that that is all embodied in the compact and does not go beyond it in any case.

Mr. WHITE. Let us discuss the compact. Do the provisions of the compact convert and convey rights to the Federal Government to go in and exercise some control over the waters of the Colorado River by regulating its flow?

Mr. CARSON. I see what you mean. No, sir; but it is provided in the Boulder Canyon Act that the Secretary of the Interior was authorized to make contracts for the storage and delivery of the water in what is now known as Lake Mead, and that nobody could acquire or claim such rights except by such contract with the Secretary of the Interior, and it is under that provision that these California contracts are executed. These contracts are on that same basis, both as to the authority of the Secretary of the Interior to make them and as to the water in storage behind Boulder Dam in Lake Mead, are subject to availability to California and Arizona in exactly the same way, by virtue of the contracts in connection with the water of the Colorado River stored at Lake Mead and the Boulder Canyon Project Act, Colorado River compact, and California Limitation Act.

Mr. WHITE. Under the provisions of this compact, the Santa Fe compact, it continued to recognize the existing water rights and the existing appropriations of water?

Mr. CARSON. That is correct.

Mr. WHITE. And that was all taken care of in the provisions of the compact?

Mr. CARSON. That is correct.

Mr. WHITE. Then the Government proceeded to enter into contracts for the diversion of water to California communities, and the California so-called contractors?

Mr. CARSON. That is correct.

Mr. WHITE. To that extent that is the situation?

Mr. CARSON. I think that would be so. Of course, there are certain provisions in there.

Mr. WHITE. To that extent, the Federal Government enters into the situation?

Mr. CARSON. That is correct.

Mr. WHITE. To that extent, there was also authorization to the Federal Government to enter into an agreement with the States and the States, themselves, and at the time by themselves, and with the Federal Government agreed to devote their energies and their will to the diversion of water from the Colorado River, and the States, by that agreement, surrendered to and conferred upon the Federal Government certain rights to the control of the waters of the Colorado River?

Mr. CARSON. That is the way that this thing was carried out, so far as water stored in Lake Mead is concerned.

Mr. ROCKWELL. Is that the actual fact? I do not understand it to be quite that way. We do not confer upon the United States Government; we agree that an agency by which these compacts are carried into effect could do certain things; we had to have some agency.

Mr. CARSON. Maybe I do not understand correctly.

Mr. WHITE. But did the water users or contractors contract with the Secretary of the Interior for the use of the water?

Mr. CARSON. From Lake Mead, the United States, acting under and by virtue of that act.

Mr. WHITE. The Lake Mead water, but that is simply an enlarged place in the Colorado River.

Mr. CARSON. It is a place where water is stored in the Colorado River.

Mr. WHITE. Is it an enlarged place where all the water that comes down the Colorado River flows, all of it flows ultimately through Lake Mead?

Mr. CARSON. That is correct.

Mr. WHITE. All in the world that Lake Mead is is a plan to regulate the flow of the Colorado River?

Mr. CARSON. Yes, it stores it and holds it.

Mr. WHITE. It stores it in high-water periods and by that means regulates the flow of the Colorado River?

Mr. CARSON. That is correct.

Mr. WHITE. Laying aside the fact that there is a generation of power there, it is still the purpose of Lake Mead or Boulder Dam, as I have indicated?

Mr. CARSON. That is correct.

Mr. WHITE. To regulate the flow of the Colorado River?

Mr. CARSON. That is correct.

Mr. WHITE. By the terms of this compact with both the upper basin and the lower basin States, they transferred certain of their rights to the United States Government.

Mr. CARSON. By the Boulder Canyon Project Act and these water contracts. They surrendered their rights to control the storage of water in Lake Mead, and beyond that it would be my construction that we did not surrender any rights on the Colorado River, as a whole. You cannot get water out of Lake Mead stored there except by contract with the Secretary of the Interior, then Mr. Ickes. When we do get it in our various States then the State law governing prior appropriations enters into the picture for the first time for a determination of relative priority rights in the respective States.

Mr. WHITE. I have not made a detailed study of the language of the Colorado compact, or the contracts entered into under the terms of that compact, but it is my understanding that the Federal Government, acting under the authority conferred upon it by the Colorado River compact, which was made at Santa Fe, N. Mex., and supporting legislation, entered into a contract with the States, and with the city of Los Angeles, and with the metropolitan water users district to divert and deliver to these two contractors a certain portion of the waters of the Colorado River. Is that right?

Mr. CARSON. That is a correct statement.

Mr. WHITE. They did that under some authority.

Mr. CARSON. So they did.

Mr. WHITE. And the Federal Government, until the compact was entered into, had no authority.

Mr. CARSON. I am not sure that it necessarily arises in the compact.

Mr. WHITE. Did not the States enter into this contract thereby conveying certain rights to the Federal Government?

Mr. CARSON. That is hard to answer that directly. I think the Secretary of the Interior evidently has the right to contract for the storage and delivery of water at Lake Mead, and that nobody can get that water except by contract with the Secretary of the Interior once it is stored in Lake Mead.

Mr. WHITE. How did the Secretary of the Interior obtain that right?

Mr. CARSON. By the provisions of the Boulder Canyon Project Act, which authorized the construction of the dam.

Mr. ROCKWELL. At this point, I should like to read an excerpt from the act; I will just paraphrase it slightly, in which it says: Nothing herein shall be considered as interfering with State rights as the States now have either of the waters within their borders or to adopt such policies and enact such laws as they may deem necessary with respect to the appropriation, control, and use of waters within their boundaries, except as modified by the Colorado River compact, or other interstate agreements.

Does that in general state what you think to be the situation in that regard?

Mr. CARSON. That is true.

Mr. WHITE. That is right in harmony with what I have just said. The State did transfer certain rights to the waters of the Colorado River to the United States Government. Maybe I did not state it just that way, but it seems to me that it follows right along that very same line.

Mr. ROCKWELL. It goes on to discuss the matter of agreements or contracts in connection with the construction of the dam, and the headwaters which would be before the dam, and the necessary flood-control regulations, and so forth, and their authorizations there. I can read that, if necessary.

Mr. WHITE. Who has the authority and who does it authorize? It seems to me that would be the point in question.

Mr. ROCKWELL. Section 19, I think you might turn to. There is a reference there to negotiate and to enter into compacts or agreements supplemental to and in conformity with Colorado River compact, and consistent with this act for the comprehensive plan for the development of the Colorado River, and provide for the storage, diversion, and use of waters of the Colorado River.

Mr. WHITE. Diversion of the waters?

Mr. CARSON. I do not want to be understood here in any way as saying that the States have surrendered the control of the waters within their boundaries to the Federal Government. As I take it, authority of the Secretary of the Interior in regard to the river is limited to the waters stored in Lake Mead behind Boulder Dam, and the Secretary has authority under section 5 of the Boulder Canyon Project Act to do certain things, which I think you have reference to there.

Mr. WHITE. What did the compact say? That is what the States entered into. Congress, in the Boulder Canyon Project Act—that is the only case where the Federal Government had rights and authorities conferred on the Federal Government in that manner.

Speaking generally, the Federal Government has rights and authority conferred on it by the Constitution of the United States. Now, then, the States have granted certain rights to the Federal Government and retained all their other rights to themselves.

Mr. CARSON. That is correct, sir.

Mr. WHITE. For that reason, the State constitution is a limitation and the Federal Constitution is a grant of power.

Mr. CARSON. Speaking broadly, that is correct.

Mr. WHITE. Coming down to what happened here, the States entered into a compact with the utilization—or for the utilization of the waters of the Colorado River, and made some obligation or entered into some obligations with the Federal Government. My questions are directed to ascertaining, if possible, just what happened.

If the States in this particular instance conferred certain rights, or relinquished certain rights, to the apportionment of the water of the Colorado River, I think we should know that.

Mr. CARSON. No; not at all, in my judgment, except to the water stored in Lake Mead behind Boulder Dam.

Mr. WHITE. Then the normal flow of the Colorado River, aside from storage of water, the normal flow would still be under complete control of the States?

Mr. CARSON. In each State as effected by the Colorado River compact.

Mr. WHITE. We had this same issue on Lake Pend Oreille. The Pend Oreille River runs into Canada, and due to the international situation we could not disturb the normal flow of the river, but there was nothing to prevent us from storing back the surplus water in the lake that would otherwise run off, and utilize that for our own discretion and advantage.

Mr. CARSON. That is what the Government did, you see. They authorized the Secretary of the Interior to make contracts and to prevent individuals from getting water except by contract.

Mr. WHITE. That still leaves the question open as to the division of the waters of the Colorado River as between the three States of California, Arizona, and Nevada, unless you can convince the committee that the contracts entered into between the State of Arizona and the Federal Government, through its Department of the Interior, Secretary Ickes, and the limitation that California placed on the use of the water and the contract entered into with the State of Nevada, did not, in effect divide and appropriate the water of the Colorado River.

Mr. CARSON. In the lower basin, that is my position. I think that has already been done, by the agreement made by California with the United States for our benefit—benefit of Arizona.

Mr. WHITE. You do not seem to take a consistent position. In one place you say that the States have not surrendered any rights, and in another place you say that by reason of some agreement with the Secretary of the Interior representing the United States, that he has the controlling and paramount power over this water. You seem to be in an opposite direction in those two cases.

Mr. CARSON. I think not. Let me explain it to you.

The compact is between the States and the water division made by the compact is between the upper basin and the lower basin; in the lower basin the division is made between the States by virtue of the California Limitation Act; the California contracts and the Nevada contract and the Arizona contract. They are just as effective in my judgment as if they were a tri-State contract, and do affect the division in the lower basin. That is what I am getting at there.

The over-all supply in the lower basin is $8\frac{1}{2}$ million acre-feet, and California has, by agreement with the United States, made an irrevocable and unconditional contract for the benefit of Arizona, according to the way I interpret that, that they will take 4,400,000 acre-feet, and no more, except one-half of the surplus or excess water that may accrue.

Mr. WHITE. You are not bringing in something new for the benefit of Arizona?

Mr. CARSON. No, sir. I emphasized that the very first time.

Mr. WHITE. That is, bringing anything in the record to help Arizona.

Mr. CARSON. Yes; the State of California by act of its legislature agreed irrevocably and unconditionally with the United States of America, and for the benefit of the State of Arizona, as well as Nevada, California, New Mexico, Utah, and Wyoming, as an express covenant, and in consideration of the passage of this that the aggregate annual consumptive use (diversion less return to the river) of water of and from the Colorado River for use in the State of California, including the use of 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, as set forth by paragraph (a) of article 3 of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such use to be subject to the terms of said compact.

That is practically, although not completely, a quotation from the act itself. You see, I know these things pretty well. I simply live with them.

Mr. WHITE. Was that prior to or subsequent to the entering into of the California Limitation Act?

Mr. CARSON. This act was passed in December 1928.

Mr. WHITE. I understand this is a Federal act.

Mr. CARSON. This is a Federal act; yes, sir.

Mr. WHITE. It was passed before or after the California Limitation Act?

Mr. CARSON. Before the other was passed.

Mr. WHITE. California, in response to that act, proceeded to comply with requirements of the Federal Government, and passed the limitation act by its legislature?

Mr. CARSON. I will have to refer to the first part of this section, because I think that will make it rather clear. I am talking now about the Boulder Canyon Project Act. [Reading:]

"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, * * * 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 State of Arizona"—

And so on. They passed it in order to get this act effective. They adopted the act of the California Legislature in 1929—I think it was in March 1929; was it not, Mr. Dowd?

Mr. DOWD. I think so. Then the States ratified the compact, and the compact became effective with the proclamation of the President of the United States.

Mr. CARSON. That is true. After the States ratified the compact, the compact became effective by the proclamation of the President of the United States on June 25, 1929, in which he recited these particular points, and I wish to refer to one in particular, to the effect that the State of California has in all instances met the requirements set out in the first paragraph of section 4 (a) of said act of December 31, 1928, necessary to render said act effective, and so on, and so forth. That is the limitation act. So California is limited, therefore, to 4,400,000 acre-feet of the $8\frac{1}{2}$ million acre-feet apportioned to the lower basin, and Nevada received 300,000 acre-feet, which left 3,800,000 acre-feet of the $8\frac{1}{2}$ million acre-feet for use in Arizona and parts of Utah and New Mexico, which are in the lower basin.

Mr. WHITE. What happens if the water is deficient and does not flow?

Mr. CARSON. What is that, sir?

Mr. WHITE. Suppose there is not that much water.

Mr. CARSON. I think we will never have that situation, sir, and if it did happen, then, under this plan they would cut down in proportion, under my construction

of it. However, I do not think it will ever do that, because it is far in excess of that amount.

Mr. WHITE. Mr. Chairman, I think it is very essential that someone place in this record, so that we will have at some place in this record, a record of the full and complete rights on the Colorado River as determined by the several States.

Chairman MURDOCK. That has already been inserted.

Mr. WHITE. We do have in the record now also the flow of the Colorado River as determined by the appropriate Federal bureau?

Chairman MURDOCK. That has also been inserted in the record.

Mr. WHITE. Do you have the flow by years?

Chairman MURDOCK. That has been put in.

Mr. WHITE. I want the minimum flow, where the water is so measured, and the maximum flow for the last 10 years, and I would like to know if that is available in this record.

Chairman MURDOCK. Those are already inserted, or, if not, I will direct that they be inserted, for we must have those physical facts.

Mr. WHITE. What is the maximum annual flow?

Mr. CARSON. I do not know that it has been worked out yet in this record.

Mr. Baker called attention to the table in the report of the Bureau of Reclamation.

Mr. ROCKWELL. Mr. Baker's figure was 16,271,000 acre-feet.

Mr. WHITE. I want the minimum and the maximum flow.

Mr. BAKER. I will work that out for you.

Mr. CARSON. I think we can get that worked out.

Mr. WHITE. Can you put that in, Mr. Baker? I think it would be very essential to have that as a part of this testimony.

Mr. BAKER. I will do so.

Mr. ROCKWELL. For the last 15 years I think it has been running about 4,000,000 feet less than that. The only question is that we may not be able to do as much in the upper basin as we planned.

In other words, the upper basin people probably cannot use these $7\frac{1}{2}$ million acre-feet that they thought they were reserving for themselves.

Mr. WHITE. Let us suppose we come down to 7,500,000 acre-feet per year.

Mr. ROCKWELL. Yes. What would happen then?

Mr. WHITE. You have given us the figure, I believe, of 16,271,000 acre-feet.

Mr. ROCKWELL. 16,271,000 acre-feet has been the average for the last 46 years, which is twice as much as is needed.

Mr. WHITE. Certainly that is twice as much as is needed. On the other hand, in the last 15 years has there been a change in the situation?

Mr. ROCKWELL. Would it be possible, because of Colorado and other upper basin States, not availing themselves of the full amount?

Mr. WHITE. I think it is a good question as to whether they are, myself. I will put the question: Would it be possible, because Colorado, New Mexico, and other upper basin States are not availing themselves of the full flow to which they are entitled? Is it possible for them to use all of it that they are not now utilizing?

Mr. Baker, can you answer that?

Mr. ROCKWELL. I think that was the basis of Mr. Dowd's statement: to show that if we had been using $7\frac{1}{2}$ million acre-feet for the last 15 years, there would be about $1\frac{1}{2}$ million more acre-feet per year shortage. And we would have to restrict ourselves that much per year. On the other hand, we are only using $2\frac{1}{2}$ million acre-feet in the four upper-basin States at the present time, which would have us available for some development in the four upper-basin States but not enough.

Mr. WHITE. Under the terms of the contract, half of the deficiency will fall on California and half of it on Arizona?

Mr. CARSON. So far as the Mexican treaty is concerned—and we have to take that into consideration, also—let me develop that a little bit. Under the compact, article 3 (d), the upper States agree to deliver to Lee Ferry 75,000,000 acre-feet over each 10-year period reckoned in consecutive series so that the lower basin is under all conceivable circumstances entitled to count on $7\frac{1}{2}$ million acre-feet average, which will be $7\frac{1}{2}$ million acre-feet per year for use in the lower basin. These figures that Mr. Baker has put in, and those that Mr. Rockwell has put in, are based upon the flow at Lee Ferry. Assuming that the upper basin used $7\frac{1}{2}$ million feet this would show there is no additional storage needed, so far as this project is concerned. There is ample storage available at Boulder Dam to take care of this flow, and of this additional 600,000 acre-feet, and leave

a considerable amount due to Arizona still in the river under any possible theory of the construction of this California contention, in Lake Mead created by the Boulder Dam itself.

So that under any construction of it, or under no consideration, could this amount of water added to what other water now is used in Arizona, could there in any way be any infringement upon the 4,400,000 acre-feet California is entitled to receive. The total we are now using on all projects—you mentioned priorities; I do not have the relative priorities between these projects that Mr. Baker spoke of, but all the projects and priorities in Arizona now utilizing Colorado River water out of the main stream, total only 407,000 acre-feet. This project for 600,000 acre-feet, and if California could by any way try to increase the normal consumptive use in the lower basin under their figures, it would be not more than 1,000,000 acre-feet consumptive use, and there would still be plenty of water.

In other words, it boils down to this, no matter how California goes about this thing, so long as they stay within the most outermost regions of the California Limitation Act, there will be plenty of water, and there would be a surplus even beyond that.

Mr. WHITE. The test would be if every State used their full portion, California to use its full portion under its limitation, there would be a comparable situation on which we might consider the issue. There is probably another contention here. As to the residue, which would include Arizona along with the rest.

Mr. CARSON. Yes; on the over-all plan, but I have not heard any statement about that, and California has not made any claim that this 600,000 acre-feet for the Wellton-Mohawk-Yuma Mesa project could interfere with their use.

Mr. WHITE. There is another element, the 1,500,000 acre-feet that is being delivered to Mexico?

Mr. CARSON. That is correct.

Mr. WHITE. A reduction of the waters available for use in the United States by that amount, so if there is a deficiency in the upper basin or lower basin, then you would have to prorate their share of such a shortage?

Mr. CARSON. Yes. We have taken care of that, and still there is no possibility of this project interfering with California, under her limitation act.

Mr. WHITE. I think that is a very definite statement you have made there, sir.

Chairman MURDOCK. Mr. Rockwell, do you have anything to add to that?

Mr. ROCKWELL. I just want to say, Mr. Chairman, that I think you told a very good story. We had a lawyer at home who only wanted to hear one side of the case, because when he heard both sides it confused him. When Mr. Carson gets on the stand he convinces me, and when Mr. Dowd gets on the stand I am on the other side. Mr. Carson, I would like to go over these figures and see where I am wrong.

There are 8,500,000 acre-feet of water in the lower basin.

Mr. CARSON. That is correct, sir.

Mr. ROCKWELL. There are 4,400,000 acre-feet that go to California?

Mr. CARSON. That is correct.

Mr. ROCKWELL. Four hundred thousand feet go to Nevada, Utah, and New Mexico?

Mr. CARSON. That is correct.

Mr. ROCKWELL. Three million seven hundred thousand acre-feet are available for Arizona. What happens to the surplus?

Mr. CARSON. I can tell you, and then I think I can tell you where the difficulty arises.

We took the other figures. You took the surplus figures of Mr. Dowd. We took the other figure, 3,800,000 acre-feet for Arizona, and from that figure we deducted for use in those portions of Utah and New Mexico, parts of which are in the lower basin, 131,000 acre-feet for their use and prospective use in Utah and New Mexico. They are in the lower basin, within that definition.

Mr. ROCKWELL. You get the same result?

Mr. CARSON. We get the same result, but we figure it a little bit differently.

Mr. ROCKWELL. From Mr. Baker's statement the other day I take it these figures show that there was no use or prospective use of the 1,500,000 acre-feet for your Central Valley project.

Mr. CARSON. Just how is that, sir?

Mr. ROCKWELL. Let me get those figures again before me.

From Mr. Baker's statement I take it that these figures show that there was in use, or in prospective use, 1,500,000 acre-feet for Central Valley, 1,000,000 acre-feet for the Gila project; 407,000 acre-feet for the five little projects down here;

600,000 acre-feet for this project we are talking about, namely, the Yuma Mesa-Wellton-Mohawk; then we add in there 317,000 acre-feet losses from reservoirs; and that makes a total of 3,569,000 acre-feet of water, not accounting for the probability of having to get 750,000 acre-feet to Mexico which breaks the thing up again.

What is wrong with my figures? Where have I missed a point? This is apparently a little more than 3,700,000 acre-feet, and I think I got those figures from Mr. Baker.

Mr. CARSON. I think I had better let the answer come from Mr. Baker, then. If you got them from him, perhaps he would be a better man to explain them to you than I.

Mr. BAKER. I could not follow you there, sir, I am afraid. Perhaps if I could discuss with you off the record, I could show you what figures I have, and you can show me the figures you have, and we could work the thing out.

Chairman MURDOCK. While you are doing that, I do want to go into a few matters here.

If I understand the philosophy that appears from the West in Congress, and those interested in reclamation, it is this: That we out West, where reclamation prevails, are very jealous of State rights and control of water by the States; that we have given up a portion of that right in developing the Colorado River in this case going to the United States Government, the control of the water stored in Lake Mead, but otherwise we are virtually maintaining our State control over the use of waters; "yes" or "no" on that?

Mr. CARSON. Yes, sir. May I add a little to that, if I may, Mr. Chairman?

Chairman MURDOCK. Certainly, you may do so.

Mr. CARSON. As to this water stored in Lake Mead, we cannot get at it except by contract with the Secretary of the Interior, then Mr. Ickes, but once we do get it out then the State laws relative to priority of use within the State again take hold.

Chairman MURDOCK. Now, one more statement: I want to say this for the benefit of my friend here from Idaho, Mr. White, who led me to believe that he does think under the right of State control of waters it would be possible to take water out of the rivers to use in some place in Arizona. Now, I want to remind my friend from Idaho that there are seven States in the Colorado River Basin, six of them being full-grown States prior to 1910, and no doubt were diverting water along the river, but when Arizona became a State, as a condition of statehood, she was required to pinch herself off from the Colorado River by a border of public lands.

Mr. WHITE. It related to water rights.

Chairman MURDOCK. Yes. To have irrigation in Arizona we have to get at the water, but we have to have the authority to do so from the Federal Government. This is a legal fact of paramount importance.

Mr. WHITE. As a practical matter, the water of a State belongs to every citizen of that State until it is appropriated, and the States themselves composed of the citizens of the State devise and pass certain laws that confer the right of the citizen to avail themselves of the water rights and proceed to appropriate it. Then the right of that water user becomes superior to the right of the other inhabitants.

Mr. CARSON. That is correct.

Chairman MURDOCK. Yes.

Mr. WHITE. That is the reason I am asking here that the secretaries of the three States furnish us a list of the existing water rights; that is, those recognized, the ones that are presently valid. Any excess of water covered by these water rights stored in Lake Mead, the Government has the authority to contract, or was given the authority to deliver to these contractors in consideration of their contribution to repay the cost of the Boulder Dam project, and have the water diverted to them. Let us stop a moment at that point.

Where is that authority to be found?

Mr. CARSON. That is section 5 of the act. But we have listed here in this table 3 of Mr. Baker's all of the use in Arizona—existing and planned—at this time of water of the main stream of the Colorado River.

Mr. WHITE. Does that include State water rights?

Mr. CARSON. Yes; it has come out of our share of the main stream water to supply the existing rights.

Mr. WHITE. It has cost this individual Member of Congress \$3,000 to find out something about water rights in a law-suit, and that has made me sensitive to the matter.

Mr. CARSON. Our contract with the Secretary provides for the delivery to persons in Arizona, including all existing rights, of 2,800,000 acre-feet, less these minor deductions, and then the State law steps in and protects the private users in the order of their priority.

Mr. WHITE. How do you propose to appropriate water from the Colorado River without covering it by a filing with the Secretary for the use of the Colorado River water?

Mr. CARSON. We will have to get a contract with the Secretary of the Interior after this act is passed. Then, after we have made arrangements with the Secretary for the irrigation of the Yuma Mesa-Wellton-Mohawk project, whenever the limits of the land to be irrigated are determined, the irrigation district will then file with the State orders and applications for that water.

Mr. WHITE. You are just anticipating a little? You are going to anticipate making a contract with the Secretary for the utilization of this water, the appropriation of water of the Colorado River? You are anticipating the right you will obtain by the State filings?

Mr. CARSON. Yes; and they will be filed in ample time. We cannot, as I understand it, by acts of the legislature or otherwise, set up these things other than in that way, without upsetting our water code. In other words, that will be the orderly course of procedure, as I understand it.

Mr. WHITE. Other than the authority of the law to make filings on the Colorado River?

Mr. CARSON. To make filings on the Colorado River; yes.

Mr. WHITE. But you have to have some intent to make the filing, and that has to be evidenced?

Mr. CARSON. Yes; and you have to show the source of the water, and you can show the source of the water at Lake Mead and not until you can get arrangements worked out with the Secretary. In other words, you cannot show the source of the water of Lake Mead until you have an arrangement worked out with the Secretary that you can get that water. I think that, of course, is obvious.

Chairman MURDOCK. I want to point out again that the State of Arizona differs from the other basin States; it is the only State out of these seven Colorado Basin States that has this condition in its water supply from the river because of our not having free access to the Colorado River. I am not going to let that fact be overlooked on such bills as this.

Mr. Rockwell, do you have some comment to make on that now?

Mr. ROCKWELL. I might say that Mr. Baker had a table that he had apparently used before I came which gives the same results that I have worked out. In other words, if and when the three projects were all built, all the water that Mr. Baker feels Arizona is entitled to will be used.

Mr. CARSON. I think that is satisfactory, sir.

Senator MCFARLAND. We will now call Mr. Debler.

Senator DOWNEY. Senator, is he your last witness?

Senator MCFARLAND. He is our last witness. Yes.

Senator DOWNEY. Mr. Chairman, that I may properly apprise my office staff as to whether there will be any overtime for them tonight, I am wondering if I may make a tentative inquiry as to how long Mr. Debler's statement will be.

Senator MILLIKIN. How long will it be, Senator?

Senator MCFARLAND. I would rather Mr. Debler told us.

Mr. DEBLER. It will take about 25 or 30 minutes.

Senator MILLIKIN. I am sure you don't go home early in your office, Senator, so I don't imagine you will have overtime.

Senator DOWNEY. Thank you, Senator.

Senator MCFARLAND. If you do, you will have to pay them time and a half.

Senator MILLIKIN. The next witness is Mr. Debler.

STATEMENT OF E. B. DEBLER, CONSULTING ENGINEER FOR THE STATE OF ARIZONA

Senator MILLIKIN. Mr. Debler, will you state your full name, your residence, and your business?

Mr. DEBLER. I am a consulting engineer in private practice, located at Denver, Colo., and have been so engaged for about 2 months.

Prior to that time, for a period of some 28 years, I was with the United States Bureau of Reclamation: From 1921 until 1943, in charge of most of the project planning for the Bureau and in charge of hydrological work; from 1943 to 1944, Director of Project Planning; and from 1944 to April of this year as regional director of region 7.

Senator MILLIKIN. Proceed, Mr. Debler.

Mr. DEBLER. I tender copies of my statement, Mr. Chairman.

Senator MILLIKIN. If you will distribute the copies, please. [The copies were so distributed.]

Proceed, Mr. Debler.

Mr. DEBLER. Waters for the project are to be diverted from the Colorado River by pumping from Lake Havasu, impounded by Parker Dam built by the Bureau of Reclamation at the expense of the Metropolitan Water District of Los Angeles, to facilitate diversion by that district, and for other purposes.

Availability of water is controlled by the Colorado River compact, the Boulder Canyon Project Act, and the treaty with Mexico.

I would like to interject just a slight statement here that from here on this paper presents my interpretation of the legislation and the intent thereof as gained from my connection with the Colorado River matters dating from a year or two prior to the compact and as the result of listening to many learned discussions and deciding in my own mind as to what was intended.

The Colorado River compact, signed at Santa Fe November 24, 1922, by representatives of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, was approved by Congress in section 13 of the Boulder Canyon Project Act of December 21, 1938, with a waiver of the part of article XI requiring approval of the compact by all of the States, such approval by the Congress being conditional on acceptance of the waiver and approval of the compact by California and at least five other States. The States, except Arizona, complied promptly. Arizona ratified on February 24, 1944.

The compact provisions pertinent to the central Arizona project are as follows:

ARTICLES II AND III, COLORADO RIVER COMPACT**ART. II. As used in this compact:**

(a) The term "Colorado River system" means that portion of the Colorado River and its tributaries within the United States of America.

(c) The term "Lee Ferry" means a point in the main stream of the Colorado River 1 mile below the mouth of the Paria River.

(f) The term "Upper Basin" means 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.

(g) The term "Lower Basin" 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 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 below Lee Ferry.

ART. III. (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 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).

(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.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River system unapportioned by paragraph (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).

ARTICLES VI AND VIII, COLORADO RIVER COMPACT

ART. VI. Should any claim or controversy arise between any two or more of the signatory States:

(a) With respect to the waters of the Colorado River system not covered by the terms of this compact;

(b) Over the meaning or performance of any of the terms of this compact;

(c) As to the allocation of the burdens incident to the performance of any article of this compact or the delivery of waters as herein provided;

(d) As to the construction or operation of works within the Colorado River Basin to be situated in two or more States, or to be constructed in one State for the benefit of another State; or

(e) As to the diversion of water in one State for the benefit of another State, the governors of the States affected, upon the request of one of them, shall forthwith appoint commissioners with power to consider and adjust such claim or controversy, subject to ratification by the legislatures of the States so affected.

Nothing herein contained shall prevent the adjustment of any such claim or controversy by any present method or by direct future legislative action of the interested States.

ART. VIII. Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this compact. 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 waters 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 situated.

Mr. DEBLER. The compact (art. IIIa) apportions to each of the upper and lower basins in perpetuity a total of 7,500,000 acre-feet for beneficial consumptive use annually and (art. IIIb) grants the further right to the lower basin to increase its beneficial consumptive

use by 1,000,000 acre-feet annually. This division does not apportion the total annual water yield of the system, but (art. IIIc) establishes the basis for supplying any right later recognized in Mexico and (art. IIIf) leaves the apportionment of any excess among the States after October 1, 1963. By the terms of the compact (art. IIId), the States of the upper division cannot cause the flow of the Colorado River at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years.

The compact does not define "beneficial consumptive use," nor have the States acted under article VI of the compact to secure such clarification.

The compact in article III (d) does place a limitation on such "beneficial consumptive use" with respect to the upper basin in periods of low run-off by designating a specified minimum 10-year delivery of water at Lee Ferry, the downstream limit of the upper basin. It appears only reasonable to conclude, then, that the intention in article III (a) was to permit the upper basin to deplete the flow of the Colorado River at Lee Ferry by an average of 7,500,000 acre-feet per year. The average annual flow of Colorado River at Lee Ferry, under virgin conditions, is estimated at 16,270,000 acre-feet by the Bureau of Reclamation in the report on the Colorado River in March 1946, page 55. With a depletion of 7,500,000 acre-feet by the upper basin, an average annual flow of 8,770,000 acre-feet remains at Lee Ferry. As later explained, it was also apparently the understanding by Congress, at least, that the lower basin was similarly apportioned a "depletion" of the flow of the stream to the extent of 8,500,000 acre-feet per year.

Average annual virgin flow at Lee Ferry after deduction of upper basin depletion of 7,500,000 acre-feet leaves 8,770,000 acre-feet. The average annual gain from Lee Ferry to international boundary under virgin conditions is 1,450,000 acre-feet, as reported in the same 1946 report by the Bureau. That leaves the burden on water arriving at Lee Ferry a supply of 10,220,000 acre-feet per year.

The apportionment to lower basin is 8,500,000 acre-feet; waters accorded to Mexico by treaty, with delivery at international boundary, 1,500,000 acre-feet; and that leaves a surplus of waters unapportioned and available for apportionment after October 1, 1963, of 220,000 acre-feet.

Senator DOWNEY. Mr. Debler, may I interrupt there?

Would the allowance in the treaty of an additional 200,000 feet to Mexico, under certain conditions, cut down, in your opinion, the hypothetical surplus that you have just mentioned?

Mr. DEBLER. Without attempting to express a legal opinion, Senator, as I read the treaty with Mexico, Mexico is entitled to 200,000 acre-feet a year of waters that are surplus to the needs within the United States. That is not, in my opinion, an apportionment.

Senator DOWNEY. I would prefer a categorical answer, because I have no opinion on it myself. I just want to know your opinion. Do you think that that tentative allowance to Mexico under certain conditions, of 200,000 feet, above the primary right of a million five hundred thousand, might tend to absorb this hypothetical surplus of 200,000 that you have mentioned? "Yes" or "no."

Mr. DEBLER. On the assumption that that is a tentative allowance, I would say "Yes."

Senator DOWNEY. Well, all right.

No further questions, Mr. Chairman.

Senator MCFARLAND. That would be only on condition that we did not need it in the United States.

Mr. DEBLER. That is my interpretation of the situation.

Senator MCFARLAND. That is all.

Senator DOWNEY. We haven't got very much of a hypothetical surplus there, have we?

Mr. DEBLER. Not very much.

The accumulating stream-flow records now indicate periods of as much as 20 years, with upper-basin obligations limited to a delivery at Lee Ferry under article III (d) of the compact averaging 7,500,000 acre-feet per year, plus such additional water for Mexico as may be required by the circumstances, under article III (c), and leaving no unallotted surplus at such times.

Now the pertinent provisions of the Boulder Canyon Project Act, approved December 21, 1928.

(Secs. 4 and 5 follow:)

SEC. 4. This Act shall not take effect * * * until the State of California * * * shall agree * * * 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. * * * This 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, * * * 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, 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 * * * 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 para-

graph (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 the Colorado River compact and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

SEC. 5. That the Secretary of the Interior is hereby authorized * * * to contract for the storage of water in said reservoir and for the delivery thereof at such points on the river. * * * Contracts for irrigation and domestic uses shall be for permanent service. * * * 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.

Mr. DEBLER. Congress, in section 4 (a) of the Boulder Canyon Project Act, in providing that the act should not take effect nor water rights claimed thereunder unless and until California had agreed to limit California uses for the benefit of other States, uses the words "annual consumptive use (diversions less returns to the river) of water of and from the Colorado River." Congress here defined consumptive use as the depletions of the river—meaning the Colorado River. As this definition was made only 6 years after the signing of the Colorado River compact, and at a time when there was full and frank discussion of the numerous contentions and interpretations of the compact, it must be concluded that it was intended that all apportionments were to be based on their effect on Colorado River flows. That interpretation is, therefore, hereinafter used.

The words "one-half of any excess or surplus waters unapportioned by said compact" could refer only to such surplus waters as might become available for use by California and Arizona jointly.

TREATY WITH MEXICO

A treaty relating to the division of the waters of the Rio Grande and of the Colorado and Tijuana Rivers was signed by representatives of the two Governments on February 3, 1944, and, together with the protocol signed November 14, 1944, and clarifying reservations, were ratified by the United States Senate on April 18, 1945, and by the Mexican Senate on September 27, 1945.

The treaty guarantees Mexico a delivery of 1,500,000 acre-feet annually collectively at a number of points on the international boundary in the vicinity of Yuma. This quantity may be reduced in time of extraordinary drought to the same degree that consumptive uses are reduced in the United States.

Mexico is also to receive, without acquiring a permanent right thereto, up to 200,000 acre-feet of additional water when a surplus exists in the supply for users in the United States.

CONTRACT BY THE STATE OF ARIZONA WITH THE UNITED STATES FOR WATER

By an agreement dated February 9, 1944, with the United States, Arizona contracted for the storage of water in Lake Mead and for the

delivery thereof at points on the Colorado River to be agreed upon, for irrigation and domestic use. The portions of the contract particularly pertinent to the central Arizona project are as follows:

Subject to the availability thereof for use in Arizona under the provisions of the Colorado River Compact and the Boulder Canyon Project Act, the United States shall deliver and Arizona, or agencies or water users therein, will accept under this contract each calendar year from storage in Lake Mead, at a point or points of diversion on the Colorado River approved by the Secretary, so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet.

The United States also shall deliver from storage in Lake Mead for use in Arizona, at a point or points of diversion on the Colorado River approved by the Secretary, for the uses set forth in subdivision (a) of this Article, one-half of any excess or surplus waters unapportioned by the Colorado River Compact to the extent such water is available for use in Arizona under said compact and said act, less such excess or surplus water unapportioned by said compact as may be used in Nevada, New Mexico, and Utah in accordance with the rights of said States as stated in subdivisions (f) and (g) of this Article.

The obligation to deliver water at or below Boulder Dam shall be diminished to the extent that consumptive uses now or hereafter existing in Arizona above Lake Mead diminish the flow into Lake Mead, and such obligation shall be subject to such reduction on account of evaporation, reservoir, and river losses, as may be required to render this contract in conformity with said compact and said act.

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 like use of 1/25 (one twenty-fifth) of any excess or surplus waters 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 Article III (g) of the Colorado River Compact.

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 herein shall prejudice such rights.

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 (Chapter 16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

ARIZONA SHARE OF APPORTIONED WATERS

Mr. DEBLER. Arizona, California, and Nevada have not entered into a compact or agreement for a division of lower basin apportionments of water as authorized by section 19 of the Boulder Canyon Project Act, nor are they in agreement on such a division.

In arriving at the share of Arizona in available waters, the following factors have been taken into consideration:

(a) The compact intended to permit the lower basin under articles III (a) and III (b) to deplete stream flow by 8,500,000 acre-feet as heretofore discussed.

(b) California, under the terms of section 4 (a) of the Boulder Canyon Project Act, and its conforming statute, is limited to an aggregate annual consumptive use (diversions less returns to the river) of 4,400,000 acre-feet plus one-half of any surplus that may be apportioned to the lower basin.

(c) Congress by section 4 (a) of the Boulder Canyon Project Act authorized an agreement by Arizona, California, and Nevada providing (1) for division of the 7,500,000 acre-feet of III (a) water, with Arizona apportioned 2,800,000 acre-feet and Nevada 300,000 acre-feet, (2) Arizona may use one-half of the unapportioned waters, (3) Arizona to have exclusive beneficial consumptive use of Gila Basin waters within its borders.

Since the California limitation statute limits that State to the use only of III (a) and surplus waters, it follows that the 8,500,000 acre-feet of Colorado River depletion apportioned by articles III (a) and III (b), in the absence of a lower basin agreement, are available to the States as follows: To California not more than 4,400,000 acre-feet; to Arizona and other States, not less than 4,100,000 acre-feet. Arizona by the water contract of February 9, 1944, recognizes the right of Nevada to a beneficial consumptive use of 300,000 acre-feet of apportioned water, and the rights of Utah and New Mexico to equitable shares of lower basin apportioned water. While the shares of these latter States have not been fixed by agreements, the report "The Colorado River" dated March 1946, by the Department of the Interior and the Bureau of Reclamation, page 184, presents the estimated ultimate depletion by the lower basin portions of these States as follows:

	<i>Acre-feet</i>
New Mexico-----	13, 000
Utah -----	101, 300
Total -----	114, 300

¹ Exclusive use of Gila River Basin waters.

Nevada in the same report is estimated to be able to deplete the stream by 256,800 acre-feet annually, compared with an Arizona recognition in its contract with the United States, of 300,000 acre-feet. Allowing for a combined use by Nevada, Utah, and New Mexico of 400,000 acre-feet, leaves for Arizona 3,700,000 acre-feet of apportioned water.

Arizona depletion of Colorado River flows by reason of use of Gila Basin waters will average approximately 1,100,000 acre-feet leaving the relative consuming uses of main stream water below Lake Mead, by California and Arizona in the ratio of about 4,400,000 acre-feet to 2,600,000 acre-feet.

WATERS AVAILABLE TO ARIZONA

Colorado River Basin run-off records started in a small way in 1895 in the upper basin. The Yuma record dates from 1902 and Lee Ferry from 1921. The earlier records marked the close of a period of low run-off which ended in 1904 and was followed by a 25-year period of much higher run-off. A period of low run-off beginning with 1930 has not yet ended. While the average run-off of the period of record is more than adequate to meet the present apportionments to the two basins together with waters accorded Mexico by treaty, that is not true in protracted periods of low run-off like that of 1930 to date, which may reach a length of 20 years.

In such a period the upper basin would be expected to deliver at Lee Ferry its minimum obligation of 75,000,000 acre-feet in any

10-year period plus its proper share to meet requirements for Mexico. In making such delivery, the upper basin would necessarily draw upon reservoirs which must be built to enable the upper basin to comply with that requirement. The flow at Lee Ferry would then average 7,500,000 acre-feet plus the upper basin obligation for meeting the Mexico requirement.

Not until 1934 was a satisfactory gaging station established near Boulder Dam which would enable a satisfactory determination of inflow to the Colorado River in the Lee Ferry-Boulder Dam section. From 1935 to 1938, Lake Mead was filled for the first time and the resulting filling of bank storage for the first time, so obscured stream flow as to make the records of doubtful value for determining tributary inflow. The period of 1939-45 is, however, very satisfactory in this regard in that Lake Mead contents were nearly the same at the beginning and the end of the period, while Colorado River inflows during that period from the Little Colorado and Virgin Rivers, principal source of Lee Ferry-Boulder Dam inflows, had almost the same average flows for the 1939-45 and the 1930-45 periods. Bright Angel Creek, representative of much inflow in the Grand Canyon National Park area, likewise had like average flows for these two periods.

I refer there, Mr. Chairman, to table 1, which is a part of this paper but which table together with the following tables I do not intend to read.

Senator McFARLAND. May they be incorporated in the record, Mr. Chairman?

Senator MILLIKIN. They will be incorporated in the record.

Mr. DEBLER. Analysis of the 1939-45 operations at and above Lake Mead to Lee Ferry (table 3) indicate an average net gain, in the absence of Lake Mead, of 810,000 acre-feet per year. Under virgin conditions, the gain would be as follows:

	Acre-feet
Actual 1939-45.....	810,000
Existing depletions (from p. 184, March 1946 report on the Colorado River):	
New Mexico.....	13,000
Arizona.....	64,000
Utah.....	45,000
Nevada.....	44,000
Total.....	166,000
Which indicates a gain under virgin conditions in period of low run-off....	976,000

At the start of a low run-off period Lake Mead would be filled, and it would be emptied during such period. At a time 100 years distant the reservoir capacity may be reduced one-third from the present, with a remaining active capacity of 20,000,000 acre-feet, of which 4,000,000 might then be held for flood control, leaving 16,000,000 acre-feet to be withdrawn. Bank storage, by reference to table 2, would yield 2,000,000 acre-feet additional water.

As basin development nears maturity it will become incumbent in Colorado River Basin interests to conserve water by retaining hold-over storage in the higher altitudes with their low evaporation rates, so far as practicable, at all times. Lake Mead should be drawn down promptly at the beginning of a drought period. Allowing for silt deposits at that time in the lower part of the reservoir sufficient to

reduce water areas by one-third, a content of 5,000,000 acre-feet will result in an average water level of 1,042 and an average area of 50,000 acres, with an average reservoir evaporation loss of 400,000 acre-feet per year, about one-half the long-time acreage loss. While such operation will reduce power output at Hoover Dam materially, that project will by that time be paid out, making high power revenue unnecessary and the saved water will have a value relatively greater than that of the lost power.

By that time Marble Canyon, Bridge Canyon, and Davis Dam would be built and operating with losses as indicated in table 5.

Senator MILLIKIN. What is the time now that we are looking forward to?

Mr. DEBLER. This is a period 100 years hence.

Senator MILLIKIN. Go ahead, please.

Mr. DEBLER. Losses from Hoover Dam to the International Boundary (see table 4) have increased materially since 1934, when a gaging station was established near Hoover Dam. The low loss of 1934 may be disregarded as that was a year of water shortage. The average loss was 1,305,000 acre-feet in 1935 to 1939 and 1,656,000 acre-feet in 1941 to 1945. The increase of 351,000 acre-feet is due to—

(a) Operation of Lake Havasu with an average depletion of 69,000 acre-feet, by reference to table 5.

(b) Silting of river channels with extensive water logging and swamping of areas at the heads of Lake Havasu and the Imperial Reservoir.

(c) Increased diversions for Parker Valley—

Mr. Chairman, should I attempt to read this?

Senator MILLIKIN. Run through those. That is interesting.

Mr. DEBLER. Increased diversions for Parker Valley, about 50,000 acre-feet, and Palo Verde Valley, about 100,000 acre-feet, with inadequate drainage to effect return to Colorado River of waters not beneficially used.

Losses from Hoover Dam to the International Boundary in recent years, while stream flows have been held steady by Lake Mead control, closely resemble future conditions except:

(a) Davis Dam not constructed and water losses in that area are expected to increase from a present loss of 45,000 acre-feet to a future loss of 164,000 acre-feet.

(b) With Davis Dam operating and releasing only clear water, and with reasonable stream improvement work, a narrow channel will in time develop through Needles Valley with salvage of fully 60,000 acre-feet in present losses in the waterlogged area at the head of Lake Havasu.

(c) At the head of the Imperial Dam reservoir area, and between Imperial and Laguna Dams conditions are similar to that at the head of Lake Havasu and salvage of 40,000 acre-feet in the existing losses may in time be expected.

(d) Irrigation development is incomplete with the following amounts of present depletion, and of added depletion with full development of the valley lands:

The different States of Nevada, California, and Arizona has possibilities of irrigation projects, as presented in the March 1946 report of the Bureau, which projects are here listed:

	Depletion in 1,000 acre-feet		
	Present	With full development ¹	Increase
Big Bend and Fort Mohave, Nev.....	0	6	6
Mohave Valley, Ariz.....	0	21	21
Parker (Colorado River Indian), Ariz. ¹	50	170	120
Palo Verde Valley, Calif. ²	100	139	39
North and South Gila, Ariz.....	20	26	6
Yuma project:			
California.....	31	31	0
Arizona.....	130	130	0
Total.....	331	523	192

¹ Little of present average diversion of 80,000 acre-feet is returned to river, for lack of suitable drains and wasteways.

² Of present average net diversion of 270,000 acre-feet (diversion less waste returns), much returns to the river through drains.

³ From table 6.

It will be noted that I have omitted from this table areas outside of the valley proper—that for the reason that I am developing here the relative gains and losses below the Hoover Dam under existing conditions and under the conditions of full development. From a study of these conditions, I here present this estimate of the present uses, the uses with full development and the increased depletion of the Colorado River by reason thereof.

The result of that is an increase from the present to the future, a net increase of 192,000 acre-feet of depletion of the Colorado River.

Are you ready to proceed?

Senator MILLIKIN. Yes.

Mr. DEBLER. Present losses in the Hoover Dam—international boundary section thus are as follows:

	<i>Acre-feet</i>
Average loss 1941-46 (Gila and Bill Williams Rivers excluded).....	1,656,000
Less water to be salvaged above Lake Havasu, Imperial and Laguna Reservoirs.....	100,000
Evaporation at Lake Havasu, Headgate Rock Dam, Imperial Dam and Laguna Dam Reservoirs, exclusive of temporary waterlogging at heads of Lake Havasu and Imperial Reservoir (table 5).....	98,000
Irrigation uses.....	331,000
	529,000
Net unsalvageable loss.....	1,127,000

which, by way of explanation, would be expected to continue in the future.

The water available for compact apportionment of 8,500,000 acre-feet to the Lower Basin and for delivery of 1,500,000 acre-feet of treaty water in Mexico, except Gila River depletions of 1,100,000 acre-feet, in a 20-year of low run-off, would then be as follows:

Upper Basin delivery at Lee Ferry, exclusive of water furnished for Mexico, 7,500,000 acre-feet;

Undepleted gain, Lee Ferry to Boulder Dam, 976,000 acre-feet, that figure being taken from page 10.

Draw-down at Lake Mead, including bank storage 18,000,000 acre-feet in 20 years, 900,000 acre-feet, that figure being 10,000,000 acre-feet of visible storage to be withdrawn—storage to be withdrawn divided into 20 years.

Unsalvageable losses Hoover Dam to international boundary, Gila and Bill Williams Rivers excluded, 1,127,000 acre-feet, which is taken from the top of page 13.

Inflow from Bill Williams River, 119,000 acre-feet.

Useable inflow to Colorado River from Gila River, 92,000 acre-feet. That item, by note 1, is derived by taking the figure of 154,000 acre-feet annually of Gila River water which must be pushed out of the basin for salinity control, as developed by Mr. Larson in his testimony, and of these 154,000 acre-feet of water 60 percent, or 92,000 acre-feet, can be expected to enter the Colorado River.

The net gain or loss, then, from the Hoover Dam to the international boundary is a gain of 960,000 acre-feet; making a water supply, a total water supply available for depletion by lower basin and for delivery to Mexico, exclusive of depletion of Gila River of 8,460,000 acre-feet.

I have heretofore developed that with the State of Arizona depleting the Gila River by 1,100,000 acre-feet the burden on the lower river for the lower basin and Mexico is 8,900,000 acre-feet a year.

That results, then, in a 20-year low period deficit of 440,000 acre-feet.

In view of the deficiency in water to fully meet lower basin apportionments together with a full supply to Mexico, the situation would warrant invoking the Mexican treaty provision for prorating shortages, in water supply.

The upper basin is going to be very short of water in such a period when it attempts to make use of 7,500,000 acre-feet and also supplies 7,500,000 acre-feet at Lee Ferry. As a result of that situation, it is tentatively estimated by me that the upper basin will in fact be short an average of 1,000,000 acre-feet a year during such a period.

The indicated deficiency for the lower basin and Mexico, except in the Gila Basin water, is 440,000 acre-feet. The total deficiency, then, is 1,440,000 acre-feet, and this amount is 8.8 percent of 16,400,000 acre-feet, being 17,500,000 acre-feet of apportioned and treaty water less 1,100,000 acre-feet depletion of Gila River.

Mexico's share of the deficiency would be 132,000 acre-feet.

The resulting water supplies except by depletion of Gila Basin runoff would be:

Delivery by upper basin at Lee Ferry, 7,654,000 acre-feet. That is derived by deducting from 440,000 acre-feet of apparent deficiency the amount that Mexico is to be shorted in the amount of 132,000 acre-feet; the remaining deficiency of 308,000 acre-feet is then prorated to the upper and lower basins with each to supply 154,000 acre-feet, making the necessary delivery by the upper basin 7,654,000 acre-feet.

There would be available for the lower basin and Mexico 8,614,000 acre-feet.

There would be delivery to Mexico of 1,368,000 acre-feet and available for depletion by the lower basin the difference of the last two quantities, or 7,246,000 acre-feet.

The division of main stream depletions contemplated by the Boulder Canyon Project Act, as heretofore discussed, is 4,400,000 acre-feet to California and 4,100,000 acre-feet to other States, leaving 2,600,000 acre-feet for depletion by Arizona after deduction of 400,000 acre-feet for depletion by Nevada, Utah, and New Mexico, exclusive of Gila River depletion by New Mexico, and an average

Gila River depletion of 1,100,000 acre-feet by New Mexico and Arizona. The low run-off period depletion of 7,246,000 acre-feet would then be divided as follows:

Available for depletion, 7,246,000 acre-feet.

Less main stream reservoir losses Marble Canyon to Laguna Dam inclusive, 870,000 acre-feet normal loss from Table 5 less 400,000 acre-feet reduction in reservoir loss in such a period of low run-off at Lake Mead, leaving net 470,000 acre-feet.

Uses by New Mexico, Utah, and Nevada, 392,000 acre-feet. Four hundred thousand acre-feet less 2 percent deficiency, 2 percent being in the same proportion as the deficiency for the other users of lower basin water, making a deduction of 862,000 acre-feet and leaving for a net supply for other uses by Arizona and California 6,384,000 acre-feet, of which Arizona's share is 2,600,000 acre-feet, divided by 7,000,000 acre-feet, or 2,371,000 acre-feet.

CONTEMPLATED DEPLETIONS OF MAIN STREAM WATER, EXCEPT WATER
ORIGINATING IN GILA BASIN, BY ARIZONA

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.

Senator MILLIKIN. No questions?

Senator DOWNEY. Mr. Chairman, my mind not being as penetrating as that of the chairman, I must admit I do not entirely understand the effect of these figures. It may be that I would not want to ask Mr. Debler any questions. I would like the right to reserve the right to recall him to the stand perhaps later after I have been able to analyze these figures. Probably it wouldn't be over 10 or 15 minutes' cross-examination, if any questions arise in my mind.

Senator MILLIKIN. Will you be here tomorrow, Mr. Debler?

Mr. DEBLER. I will.

Senator McFARLAND. No questions.

Senator MILLIKIN. Then, that will close your testimony, Mr. Debler.

Senator McFARLAND. Except, Mr. Chairman, I would like the privilege of inserting in the record following Mr. Debler's testimony a copy of the Arizona contract.

Senator MILLIKIN. All right.

(Tables 1 to 6, inclusive, appended to Mr. Debler's statement, follow:)

TABLE 1.—Colorado River tributaries, Lee Ferry to Parker

[Annual discharges, 1,000 acre-feet]

Run-off year	Bright Angel Creek	Little Colorado at Grand Falls	Virgin River at Littlefield	Williams River at Planet	Gila River at Dome
	(1)	(2)	(3)	(4)	(5)
1930.....	20.5	189.3	188.1	33.0	15.6
1931.....	16.9	165.2	119.4	108.9	103.0
1932.....	42.4	465.8	381.9	319.6	266.0
1933.....	17.1	129.2	127.4	13.3	1.2
1934.....	13.5	71.0	78.0	11.6	0.2
1935.....	31.6	215.4	164.8	110.2	5.9
1936.....	25.3	165.1	131.0	21.8	0
1937.....	41.9	339.5	240.3	252.9	153.7
1938.....	44.3	170.2	278.6	113.0	45.9
1939.....	25.9	83.2	154.9	231.5	3.5
1940.....	31.5	132.2	173.7	30.8	0
1941.....	64.4	586.8	400.0	436.8	589.7
1942.....	29.3	149.0	215.0	26.8	0
1943.....	33.8	103.0	178.1	14.2	13.5
1944.....	26.3	129.0	182.7	114.3	14.2
1945.....	26.7	159.5	166.3	60.1	11.8
Averages:					
1934-38, inclusive.....	31.4	192.2	178.5	101.9	41.1
1939-45, inclusive.....	34.0	191.8	210.1	130.6	90.4
1930-40, inclusive.....	31.1	193.3	185.3	113.3	54.1
1930-45, inclusive.....	30.7	203.5	198.8	118.7	76.5

ANNUAL RUN-OFF DATA FROM USGS WATER-SUPPLY PAPERS

	Average 1939-45, inclusive	Average 1930-45, inclusive
Little Colorado, and Virgin.....	401.9	402.3
Little Colorado, Virgin, and Bright Angel.....	435.9	430.0
Little Colorado, Bright Angel, Virgin, and Bill Williams.....	566.5	551.7

TABLE 2.—Bank storage in Lake Mead

[Units, 1,000 acre-feet]

Water year	Colorado River at Grand Canyon	Virgin River at Littlefield, Ariz.	Lake Mead content at end of year	Colorado River below Boulder Dam	Net loss in Lake Mead area	Evaporation by Lake Mead	Unmeasured inflow less bank storage in Lake Mead
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1934.....	4,656	78	0	5,058	+324	0	+324
1935.....	10,220	165	4,140	5,556	-689	100	-589
1936.....	12,320	131	6,414	6,282	-690	350	-340
1937.....	12,410	240	12,432	5,826	-806	520	-286
1938.....	15,630	279	21,065	6,168	-1,108	660	-448
1939.....	9,618	155	21,749	8,473	-616	865	-249
1940.....	7,435	174	21,144	7,694	-520	870	+350
1941.....	16,940	400	26,150	11,730	-604	920	+316
1942.....	17,260	215	25,430	17,880	-315	975	+660
1943.....	11,430	178	24,070	12,500	-468	950	+482
1944.....	13,530	183	22,860	14,450	-473	915	+442
1945.....	11,870	166	21,620	12,940	-336	858	+522
Average, 1939-45.....							+432

Discharges and reservoir contents from water supply papers of USGS reservoir contents at close of 1936 and thereafter exclude 3,207,000 acre-feet of dead storage resulting from gate closure in that year.

	<i>Acre-feet</i>
Loss 1935-38, inclusive.....	1,663,000
Assuming run-off conditions alike for 1935-38, inclusive and for 1939-45, inclusive, gain in 1935-38, inclusive, would have been 4 x 432,000 acre-feet or.....	1,728,000

Bank storage in Lake Mead for active capacity of 21,000,000 acre-feet is.....	3,391,000
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Virgin River flows at Littlefield were 15 percent lower in 1934-38 period than in 1939-45 period. Bright Angel Creek, more representative of inflow in Grand Canyon-Boulder Dam area was 15 percent higher in 1934-38 period, than in 1939-45 period. It is concluded that the derived bank storage of 3,391,000 acre-feet may be accepted. With silting of the reservoir bank storage will increase. The operating levels of the reservoir will gradually rise with reduction in flood-control capacity enabled by increasing upstream storage, utilizing ground storage on some 15,000 acres additional reservoir area. Considering also that of the 1934-38 loss supplied to dry soils hygroscopic water will not return, recoverable bank storage is estimated at 2,000,000 acre-feet.

TABLE 3.—Colorado River loss and gain—Lee Ferry to Hoover Dam

[Units 1,000 acre-feet, water-years]

Calendar year	Colorado River at Lees Ferry plus Paria	Colorado River below Hoover Dam	Lake Mead content at end of year	Historical gain (+) or loss (—) Lees Ferry to Boulder Dam
(1)	(2)	(3)	(4)	(5)
1934.....	4,395	5,058	0	+663
1935.....	9,912	5,556	4,140	—216
1936.....	11,965	6,282	6,414	—202
1937.....	11,897	5,826	12,432	—53
1938.....	15,436	6,168	21,065	—635
1939.....	9,404	8,473	21,749	—247
1940.....	7,091	7,694	21,144	—2
1941.....	16,048	11,730	26,150	+688
1942.....	17,030	17,880	25,430	+130
1943.....	11,259	12,500	24,070	—119
1944.....	13,219	14,450	22,860	+21
1945.....	11,446	12,940	21,620	+254
1946.....	8,730	.....	19,011	.....
1947.....	.....	.....	.....	.....
* Average 1934 to 1938, inclusive.....	.....	.....	.....	—89
Average 1939 to 1945, inclusive.....	.....	.....	.....	+104

Discharges and Lake Mead contents from Water Supply Papers of USGS except for 1946.

In and after 1936 indicated contents exclude 3,207,000 acre-feet dead storage.

Estimated average evaporation 1939-45, inclusive, at Lake Mead.....	<i>Acre-feet</i> 908,000
Less loss in reservoir area under virgin conditions.....	202,000

Net new reservoir loss.....	706,000
Average recorded gain 1939-45.....	104,000

Average gain Lee Ferry to Hoover Dam, 1939-45, inclusive, with dam not built.....	810,000
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TABLE 4.—*Colorado River loss and gain—Boulder Dam to International Boundary*

[Units 1,000 acre-feet—water years]

[All data from USGS water supply papers]

Water year (1)	Inflow, except Williams and Gila Rivers				Outflow					Total, out (11)	Loss (12)
	Colorado River below Boulder Dam (2)	Williams River at Planet (3)	Gila River at Dome (4)	Total in columns 2, 3, and 4 (5)	Metro-politan diversions (6)	Colorado at Rock-wood heading (7)	Im-perial Canal below Pilot Knob (8)	Returns from Yuma Valley (9)	Change in storage at Lake Havasu (10)		
1934.....	5,058	12	0	5,070	0	3,762	0	200	0	3,962	1,106
1935.....	5,556	110	0	5,672	0	4,250	0	200	0	4,450	1,222
1936.....	6,282	22	0	6,302	0	4,721	0	200	0	4,921	1,381
1937.....	5,826	253	154	6,233	0	4,708	0	200	0	4,908	1,325
1938.....	6,168	113	46	6,327	0	4,830	0	200	+25	5,055	1,272
1939.....	8,473	232	4	8,709	122	6,664	3	192	+526	7,385	1,324
1940.....	7,694	31	0	7,725	121	6,133	7	172	-71	6,241	1,484
1941.....	11,730	437	590	12,757	52	9,986	980	167	-41	11,092	1,665
1942.....	17,880	27	0	17,907	13	14,094	2,237	194	-151	16,374	1,533
1943.....	12,500	144	14	12,528	52	7,757	2,518	195	+364	10,334	1,694
1944.....	14,450	114	14	14,578	37	10,120	2,537	196	-17	12,836	1,742
1945.....	12,940	60	12	13,012	66	8,525	2,663	162	+18	11,368	1,644
Average 1941 to 1945, inclusive.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,656

Column 2. Willow Beach Station to 1938.

Column 7. Sum of Colorado River at Yuma, Yuma Main Canal wasteway, California drain, and Pilot Knob wasteway with California drain estimated at 20,000 acre-feet per year prior to 1939.

Column 8. All-American Canal above Pilot Knob wasteway less flow in wasteway.

Column 9. Sum of Cooper, Eleven Mile, Twenty-one Mile, West Main Canal, and East Main Canal wasteways together with main drain flows; prior to 1939 estimated, in absence of dependable records at 200,000 acre-feet.

TABLE 5.—*Colorado River Lower Basin mainstream reservoirs—comparison of losses before and after development—average conditions*

Reservoir	Total area, acres in 1,000	Virgin conditions					Developed conditions					Increase in loss, 1,000 acre-feet
		Water area		Land area		Annual loss, 1,000 acre-feet	Water area		Land area		Annual loss, 1,000 acre-feet	
		Acres in 1,000	Loss rate in feet	Acres in 1,000	Loss rate in feet		Acres in 1,000	Loss rate in feet	Acres in 1,000	Loss rate in feet		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Marble Canyon.....	5.0	1.6	5.0	3.4	0.5	10	4.8	5.0	0.2	1.5	27	17
Bridge Canyon.....	16.7	3.4	6.0	13.3	.5	27	12.7	6.0	4.0	2.0	84	57
Lake Mead.....	162.7	6.6	7.0	156.1	1.0	202	110.0	6.5	52.7	1.5	794	592
Davis.....	27.7	5.0	7.0	22.7	1.0	58	24.0	6.5	3.7	2.0	164	106
Lake Havasu.....	25.1	4.5	7.0	20.6	1.5	63	18.0	7.0	1.6	4.0	132	69
Headgate Rock.....	4.0	1.2	7.0	2.8	2.0	14	4.0	7.0	0	0	28	14
Imperial.....	7.0	3.3	7.0	3.7	2.0	30	4.0	7.0	3.0	4.0	40	10
Laguna.....	5.6	.8	7.0	4.8	3.0	20	1.5	7.0	4.1	3.5	25	5
Total.....						424					1,294	870

Losses do not include rainfall.

EXPLANATION

Areas in column 2 from reservoir topography.

Areas in column 3 reflect river stage at 10,000 second-feet, taken from 1902 topography by USGS for areas below Black Canyon and from USGS river profile surveys of 1923 for areas above Black Canyon. Column 5 equals column 2 minus column 3.

Areas in columns 8 and 10 anticipate 20,000,000 to 30,000,000 acre-feet regulating capacity above Lee Ferry to enable compliance with compact requirement for delivery of 75,000,000 acre-feet in any 10-year period, including reservoirs at Bluff and Coconino sites for flood and silt control. Consequently minor regulating storage will be utilized at Marble Canyon and Bridge Canyon Reservoirs. Lake Mead would be held

relatively low to minimize evaporation and hold-over storage would be held in cooler upper basin reservoirs so far as practicable. Average storage level at Lake Mead estimated at 1,170 with original area of 130,000 acres at that level reduced to 110,000 acres by silting. Davis Reservoir would be used for seasonal regulation only, filling and emptying each year. Lake Havasu would be held at average elevation 448 to minimize pumping head with remaining storage capacity utilized to coordinate power and irrigation uses; original water area of 23,500 acres at elevation 448 reduced to 18,000 acres by silting. Alamo Reservoir assumed built for flood control only. Headgate Rock water level to be held constant for power head. Imperial and Laguna assumed largely silted. All silted areas at heads of reservoirs estimated to use water heavily no matter how utilized.

Evaporation pans at Lake Mead indicate loss of 10 feet with class A pans and 8 feet from partially submerged floating pans from which rate of 6.5 feet adopted for Lake Mead; others adjusted thereto considering temperatures, operating conditions, and reservoir areas.

TABLE 6.—Comparison of losses in Colorado River Valleys below Davis Dam before and after development (exclusive of reservoir areas)

(A) UTILIZED AREAS

Irrigation Project (Valley area only)	Gross area, 1,000 acres	Virgin conditions		Developed conditions					Change in annual loss, 1,000 acre- feet
				Irrigable land		Nonirrigable land		Annual loss, 1,000 acre- feet	
		Loss, rate feet	Annual loss 1,000 acre- feet	Area, 1,000 acres	Loss rate, feet	Area, 1,000 acres	Loss rate, feet		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Big Bend, Nev.	1.0	1.0	1	0.5	2.5	0.5	1.5	2	1
Fort Mohave, Nev.	3.6	1.0	4	2.6	3.0	1.0	1.5	9	5
Mohave Valley, Ariz.	11.0	1.0	11	10.0	3.0	1.0	2.0	32	21
Parker (Colorado River, Indian), Ariz.	100.0	1.2	120	90.0	3.0	10.0	2.0	290	170
Palo Verde Valley, Calif.	80.0	1.2	96	75.0	3.0	5.0	2.0	235	139
North Gila, Ariz.	6.0	1.5	9	5.4	3.5	.6	2.0	20	11
South Gila, Ariz.	8.4	1.5	13	7.6	3.5	.8	2.0	28	15
Yuma, Calif., part.	17.1	1.5	26	15.0	3.5	2.1	2.0	57	31
Yuma, Ariz., part.	53.2	1.5	80	50.0	4.0	3.2	3.0	210	130
Total			360					883	523

NOTES.—The project areas here included represent only the valley areas which might be using some river water under virgin conditions either by direct inundation by extreme floods or through subirrigation, and which would be included within protecting levees or within irrigation district boundaries (existing in some cases).

The rates of loss (of river water only, precipitation not included) with virgin conditions represent estimated rates considering character of vegetation.

The rates of loss, developed for irrigated lands are in accord with findings in Lowry-Johnson Paper on Consumption Uses (A. S. C. E. paper No. —).

For nonirrigable lands rates are estimated by comparison with irrigated lands considering probable vegetation.

(B) NONUTILIZED AREAS

Locality	Total area, 1,000 acres	Virgin conditions					Developed conditions					De- crease in annual loss, 1,000 acre- feet
		Water area, 1,000 acres	Rate of loss, feet	Land area, 1,000 acres	Rate of loss, feet	Annual loss, 1,000 acre- feet	Water area, 1,000 acres	Rate of loss, feet	Land area, 1,000 acres	Rate of loss, feet	Annual loss, 1,000 acre- feet	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Davis Dam-Lake Havasu.	41.4	3.6	7.0	37.8	3.5	158	2.7	7.0	38.7	2.5	116	42
Headgate Rock-Imperial Reservoir.	92.4	11.5	7.0	81.0	3.5	364	8.6	7.0	85.8	2.5	275	89
Laguna Dam-International boundary.	29.7	2.5	7.0	27.2	3.5	113	1.9	7.0	27.8	2.5	83	30
Total						635					474	161

NOTES.—Table covers valley areas not in reservoirs or within irrigation projects; the water areas upon development estimated 25 percent less than under virgin conditions through elimination of braiding of channels when silt loads are largely eliminated. The rate of loss for land areas is reduced by development as the land areas will largely be inundated with a controlled river.

(A copy of the Arizona contract appears in the testimony of Arvin B. Shaw, Jr.)

Senator DOWNEY. Mr. Chairman, might I make this inquiry? In view of the fact that there is no formal report from the Bureau of Reclamation and no recommendations, in view of the further fact that the Bureau has not yet submitted any report or recommendation to the Bureau of the Budget, would it be the intention of the chairman of the subcommittee to consider any final action or report on this pending measure prior to the time those reports would be available?

Senator MILLIKIN. Let me ask a preliminary question.

What is the provision of the so-called O'Mahoney-Millikin amendment? That would call for reports from the States, as I recall it.

Senator DOWNEY. Yes; Mr. Chairman.

Senator MILLIKIN. How much time have they to get their reports in?

Senator DOWNEY. They have 90 days. I beg your pardon.

Senator MILLIKIN. They of course, have not made such reports because the Bureau has not submitted its report.

Senator DOWNEY. That's right, Mr. Chairman.

Senator MILLIKIN. The Chair will rule tentatively, at least—I will take the matter under advisement—that this committee should not make a final report until those reports are before it.

Senator DOWNEY. Yes; Mr. Chairman.

I might say this, the decision of the chairman as indicated by his statement that it is a tentative ruling, might very much affect the amount of evidence that we would want to introduce because we are left somewhat uncertain what would be the final findings of the Bureau of Reclamation.

Senator MILLIKIN. I can understand that.

Senator McFARLAND. Well, Mr. Chairman, we would like for the testimony to go in and on the basis that this temporary report will be the same as a final report—

Senator MILLIKIN. It occurs to me that the States themselves might bring in matters in their reports that might require some additional testimony—I don't know. I haven't the slightest idea. I assume the California report would be oppositionary, and I assume that the California people know pretty well now what will be in their report. I don't know what the report of Nevada would be or of New Mexico or Utah or Wyoming or Colorado.

I don't believe, since we have the O'Mahoney-Millikin amendment, that the committee would be warranted in making a final report until those reports are before it. That seems pretty clear to me.

I would say, also, that those final reports might call for some additional testimony. If they do call for additional testimony in the opinion of the committee, opportunity will be given to provide it.

Is that sufficient?

Senator DOWNEY. Well, that is sufficient, Mr. Chairman, except I might even consider, tentatively, not introducing any evidence at this time as long as—

Senator MILLIKIN. No—pardon me, Senator. Of course, you will do as you please, but I would like to get all the testimony in here that is possible in this session and time has been set aside for it. We have given 8 hours to Arizona and we have given 8 hours to California, as much as can be anticipated. I would like to get it into the record. I don't need to tell the Senators what our situation is. We have dis-

located a lot of other engagements in order to go ahead with this business, and I don't believe it would be economy to half finish it now and then dribble it out and get into it later on. I would like to have everything in here that can be gotten prior to the final form of the Bureau's report and the reports of the States and other parties who are interested.

Senator DOWNEY. Well, Mr. Chairman, May I point out certain real difficulties in the proper and expeditious presentation of our testimony. There are material differences already developed between the preliminary report submitted to the various States upon which they have prepared their comments and the very data given by the Bureau of Reclamation in this hearing. I anticipate there will be more and even substantial variations in the final report between the data presented here and the data presented to the States. It is an anomalous situation, because we all applauded the very fine legislative piece of work in the O'Mahoney-Millikin amendment and we thought the bills wouldn't be considered until the States had the final opportunity of reviewing all the data. That is the reason we could be much more precise and much more expeditious and much more laconic in our presentation, if we wait until everything is in. But, of course, I am very happy to conform to the suggestion made by the chairman.

Senator MILLIKIN. How far can the State of California go forward under the possible new developments that there might be in these reports?

Senator DOWNEY. Well, of course——

Senator MILLIKIN. I mean the stream data, for example, won't be changed by the reports. That is what it is.

Senator DOWNEY. That is correct.

Senator MILLIKIN. And the physical facts.

Senator DOWNEY. Except, Mr. Chairman, I am not even sure of that. I think that the Bureau of Reclamation right now is in the process of making later findings on the amount of water available in the Colorado River, and I understand those findings that are now in process, not submitted here, are more pessimistic than any we have had so far.

Senator MILLIKIN. But the Bureau's report will not put water in the stream nor take water out of the stream.

Senator DOWNEY. It may take it out, Mr. Chairman.

Senator MILLIKIN. I assume that California has a theory on the stream, it has a theory as to the physical features of this project, which I don't know how soon could be changed by a report.

Senator DOWNEY. Certainly, our viewpoint on the law is fixed and unchangeable.

Senator MILLIKIN. There is a viewpoint on the law. All that I am suggesting is that all of those matters would not be changed by the report, that we go forward and get it in.

Now, supposing that if there is delay, we come back here in the early part of next session: I think that session will be even more rushed and pressed than this one.

I would like to do full justice to both sides in this matter, and as expeditiously as possible, so I would like to see California go forward with as much as she can go forward with.

Senator DOWNEY. We will be prepared to present 8 hours of testimony next week.

Senator McFARLAND. Of course, we have rebuttal that we will want to offer.

I would like to call the attention of the chairman to this situation, without getting personal with the State of California or with Senator Downey. But with that explanation, I would like to state the situation that Arizona finds itself in. Every time it presents a bill, California asks for delays. It was thus on the Gila bill; it is thus on every bill.

The engineering data here, as has well been said, is all complete. It may be that the engineers could make a more complete report in regard to some features of the project by maybe making a few more measurements; but this project is as complete, the engineering data is as complete, as ordinarily is the case with respect to the basis for submitting bills to Congress.

Now, we are in a desperate situation in Arizona. We are in a situation where we need to know what we can count on. We have got to know, if we are to maintain our present economy.

I think in fairness to the State of Arizona, regardless of any law, that we are entitled to go forward, that we are entitled to know, that the circumstances surrounding Arizona and the people of Arizona demand that we know what to expect. There isn't any law that cannot be later changed or modified to meet changing conditions; enactment of this bill now would be no exception. If there was one indispensable bit of data that would be in after these reports, it would be a different situation. But Arizona has not overdramatized this picture; they haven't sufficiently dramatized the importance of this project to the State of Arizona. People have made a little money during the war. They are living on that money, wanting to know what they can count on in the future, and if our people cannot count on it, if they have got to move out to California or some other State, they should be told it now while they can move out. And time is the very essence here as far as Arizona is concerned.

I plead with the chairman and I plead with this committee to push this decision forward as rapidly as possible, not only for the good of the State of Arizona but for the whole United States because we have people who came there who have invested their money in homes, they have invested their money in businesses; and if they are not going to be able to continue, it is best for the United States as well as best for the State of Arizona if they know their predicament now, not 5 years from now.

California would like very well to put this off for 5 or 10 years.

Senator MILLIKIN. It is the very recognition of the claimed emergency that has caused this committee to move. I can assure the Senator that we will go forward. We will go forward as rapidly as possible.

I do not believe, though, Senator, that we would be warranted in proceeding in violation of what is now the law of Congress.

Senator McFARLAND. When we finish, I would like for the chairman to keep an open mind.

Senator MILLIKIN. I will keep an open mind. I stated that my conclusion was tentative. And if that conclusion should become fixed, then I hope that the Bureau of Reclamation will expedite its work in this matter, get its report in here and get its report to the States, so that we will lose no time in getting to a conclusion of this matter.

I am in hearty cooperation to the point of getting this thing ended. That is why we are sitting here this afternoon.

Senator McFARLAND. I understand.

Senator MILLIKIN. That is why we have been sitting here this week; that is why we will be sitting here next week. I want to get action one way or the other. I am in entire sympathy with that objective.

Senator DOWNEY. If I may say a personal word here in view of the attacks that have been made against me and upon the State that I represent, I don't know of another bill affecting the water rights between California and Arizona that has come before the Senate since I have been in the Senate.

Now, the Senator presented this last bill involving the allocation out of the Colorado River of 600,000 acre-feet on the lower Gila, but the chairman knows I did everything I could to facilitate that bill that was consistent with the presentation of our views. I could have objected to it upon the consent calendar; I could have easily enough prevented action by unlimited arguments but I facilitated putting that bill through.

The distinguished chairman will remember that California was greatly distressed and burdened by the Mexican treaty. I did nothing to make any filibuster or delay there. We presented our views as ably and energetically as we could and allowed this matter to be passed on in the Senate after 3 or 4 days' argument.

No, the Senator representing Arizona is doing something that I have never known done on any important bill in Congress. Here is no recommendation by the Department of the Interior; here is no recommendation by the Bureau of the Budget; here is no procedure yet carried out under the very apt and wise bill that the chairman himself consponsored. I have made no objection.

Senator MILLIKIN. I am not defending the wisdom of the bill; it is a law of Congress.

Senator DOWNEY. The chairman should defend that because he consponsored it.

Senator MILLIKIN. I am not defending it in my capacity as chairman of this committee.

Senator DOWNEY. I think it is a very apt law, which recognizes the rights of the States in the Colorado River.

I want to say this, the Boulder Canyon Project Act was pending for years in Congress with full and proper committee hearings that we never made any objection to. The total expenditure was a mere fraction of this. The complications there were no greater than the complications here. Nobody from California ever even suggested there shouldn't be long, matured hearings and a fair consideration given everybody.

Here in the closing days of this season, the distinguished Senator from Arizona, for whom I have a deep admiration, is in here urging a far more accelerated action than any I ever heard suggested on any important bill. And I am not criticizing him for that, Mr. Chairman, but I don't think that he is justified in claiming that California is, or the Senators from California are attempting to harass and delay them. I don't know what he bases any such statement upon.

Senator McFARLAND. Mr. Chairman, I know the chairman is not interested in any parley between the Senator from California and myself. I am not going to enter into it.

Senator DOWNEY. You did. You made the charge.

Senator McFARLAND. I could substantiate every charge that I have made. I could give the dates and the times and the places, but I know the chairman is not interested.

Senator MILLIKIN. Let's bring this phase of it to an end right now.

The Chair will simply repeat that so far as this committee is concerned there will be no delay in reaching a conclusion once the necessary facts to a conclusion are before it; that this committee will do everything it can to expedite the production of those facts. We will go forward with this hearing.

I must necessarily leave it to California to bring in here now and during the next 3 or 4 days, during the time allotted, all facts which can be gotten behind us which would not be affected by any uncertainties, if uncertainties should develop, in any of these reports.

And on the assumption that the Chair will adhere to its ruling, I will try to keep an open mind on that, and I will be glad to hear further argument on it. All I want to do is to allay any fears that this committee is going into any indefinite stalling or delaying. This matter will be pushed along with the utmost expedition consistent with the necessary facts before the committee upon which it can act.

Now, is there anything further?

Senator McFARLAND. I thank you, Mr. Chairman.

Senator MILLIKIN. We will meet at 10 o'clock tomorrow morning.

(Whereupon, at 5:47 p. m., the subcommittee adjourned until 10 a. m., Saturday, June 28, 1947.)

BRIDGE CANYON PROJECT

SATURDAY, JUNE 28, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION,
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin presiding.

Present: Senator Millikin (presiding).

Also present: Senators McFarland and Downey.

Senator MILLIKIN. The committee will come to order.

Senator DOWNEY. Our first witness this morning, Mr. Chairman, will be Mr. Howard.

Senator MILLIKIN. Will you give the reporter your name, business address, and residence.

Mr. HOWARD. My name is James H. Howard, general counsel, Metropolitan Water District of Southern California.

I have a prepared statement, Mr. Chairman, but possibly I should say I am here on behalf of the Metropolitan Water District of Southern California, a public municipal corporation, composed of the area of 20 southern California municipalities, having an assessed valuation of approximately \$3,000,000,000 and a population of 3,000,000. Since we last discussed problems of the Colorado River with you, the city of San Diego and the San Diego County Water Authority have been added to the metropolitan district. I am here on behalf of the metropolitan water district, but I have to say is of general application and is not limited in its effect to my particular client.

STATEMENT OF JAMES H. HOWARD, GENERAL COUNSEL, THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Mr. HOWARD. The authorization requested in the pending bill is predicated upon the estimated availability of water from the main stream of the Colorado River, in an amount exceeding 1,000,000 acre-feet, for use in central Arizona. The Report of Feasibility (February 1947) submitted by the Department of the Interior and now a part of your record here says (p. 5):

* * * The amount of this flow which can be diverted for use in the State of Arizona must fall within the provisions of various compacts, agreements, and contracts, and a treaty between the United States and Mexico. Many of these documents are subject to conflicting interpretations. It is not the intent of this report to interpret the legal aspects of allocating the water of the Colorado River. Responsible officials of the State of Arizona have made interpretations of existing contracts and compacts for Colorado River water.

On the basis of these interpretations it is estimated that the Colorado River may be depleted by 1,077,000 acre-feet a year for the central Arizona project.

No effort is made in the report to state the effect of the "conflicting interpretations," or to state California's position. The Congress now is being urged to authorize a project, the cost of which will run into hundreds of millions, while the availability of water for the project depends on documents admittedly subject to conflicting interpretations, and in so doing, to rely upon an interpretation put forth by proponents of the project, without consideration of the effects in the event that the interpretation should be in error.

Senator MILLIKIN. I might say, that is why we have given 8 hours to southern California.

Mr. HOWARD. Thank you, Mr. Chairman.

In the absence of agreement or arbitration, the questions involved are more properly the subject of judicial, rather than legislative, determination. However, the matter being before the committee, it is the purpose of this statement to point out the basic errors in the Arizona interpretations and assumptions, vital to the finding of availability of water. These erroneous assumptions are:

(1) That, by the terms of the California Water Limitation Act, California agencies are excluded from participation in the use of water referred to in article III, paragraph (b), of the Colorado River compact; (2) that the measure of beneficial consumptive use of waters of the Gila River in Arizona is the amount of depletion of the virgin flow of the river at its confluence with the Colorado River, and not "beneficial consumptive use"; (3) that the 4,400,000 acre-feet of water apportioned by article III (a) of the Colorado River compact, to which California is limited by the Project Act and the Limitation Act, is subject to further reduction by reason of evaporation and other reservoir losses, particularly at Lake Mead. These subjects will be presented in the order set out.

Senator MILLIKIN. Will you hold up just a moment, please? What is the water referred to in article III (b)?

Mr. HOWARD. That is the million acre-feet by which the lower basin may increase its beneficial consumptive use in addition to that apportioned by article III (a).

Senator McFARLAND. I have the language here if you would like to read it.

Mr. HOWARD. I set it up later.

Setnator MILLIKIN. I recall it now. Go ahead, please, Mr. Howard.

Mr. HOWARD. Regardless of any action the Congress may take, the availability of water for the central Arizona project depends on Arizona's ability to sustain her position in court on these issues. Obviously, before the project is authorized and the investment made, the "conflicting interpretations" should be resolved in some manner binding on the parties.

For convenient reference, copies of the Colorado River compact, section 4 (a) of the Boulder Canyon Project Act, and the California Water Limitation Act are attached hereto, marked exhibits "A," "B," and "C," respectively.

I first discuss the status of III (b) water under the Limitation Act. It is California's position that, in enacting the California Water Limitation Act (exhibit C) (California Statutes 1929, p. 38), it did not

renounce the right to participate in the million acre-feet of water by which the lower basin is authorized to increase its beneficial consumptive use of waters of the river under paragraph (b) of article III of the compact; that such million acre-feet constitutes a part of the "excess or surplus waters unapportioned by the Colorado River compact" and, as a part of such excess or surplus, is available for use in the lower basin, including California. Arizona, on the contrary, argues, and bases her computations on the proposition, that by the terms of the Limitation Act California renounced any claim to the one million acre-feet by which the lower basin may increase its beneficial consumptive use under article III (b) of the Colorado River compact; that the only place such water may be lawfully used in the United States is in the State of Arizona.

The Boulder Canyon Project Act, section 4 (a) (exhibit B), provided that the act should not take effect until all seven States ratified the Colorado River compact, or, if such seven-State ratification did not occur within 6 months, unless six of the States, including California, should ratify the compact, and California, by act of its legislature, in consideration of the passage of the Project Act should agree, for the benefit of the other States of the basin, to limit its use of Colorado River water to—and this is quoted:

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 the said compact.

Arizona did not ratify the compact within the 6-month period, thus forcing California into adopting the Limitation Act in the words required by section 4 (a) of the Project Act. California also ratified the compact, as did five other States.

The Boulder Canyon Project Act and the Limitation Act constitute a compact or contract made by the State of California with the United States for the benefit of the other States of the basin. Such compacts, evidenced by reciprocal legislation, have been recognized by the Federal Supreme Court. The interpretation of the statutory compact arising out of the Limitation Act and the Boulder Canyon Project Act is a matter of contract law. The intent of the parties must control. For the purpose of disclosing that intent, we will consider the text of the Colorado River compact, the legislative history of section 4 (a) of the Boulder Canyon Project Act, and the text of that section.

First, as to the Colorado River compact. Article III (a) of the Colorado River compact reads as follows:

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.

That is followed by a paragraph designated "(b)" which 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.

Paragraph (c) relates to the supply of water to Mexico under treaty.

Paragraphs (d) and (e) are not pertinent to this discussion. Paragraph (f) provides that:

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).

Paragraph (g) provides the mechanics of such additional apportionment.

Paragraph (b), the meaning of which is particularly involved in the controversy, does not use the word "apportion" with reference to the 1,000,000 acre-feet. The phrase "right to increase" appears. Had it been the intent of the framers of the compact to consider the waters referred to in paragraph (a) and (b) as being in the same class, it would have been extremely simple to cover the matter in one paragraph, apportioning 7,500,000 acre-feet to the upper basin and 8,500,000 acre-feet to the lower basin. The fact that paragraph (b) was set up as it was, indicates a different intent. The intent, while not clearly apparent on the face of the compact, is disclosed by the comments of Delph E. Carpenter.

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 between the States of the Colorado River Basin. I hardly think it necessary to enlarge as to Mr. Carpenter's qualifications when addressing this chairman.

Senator MILLIKIN. I know Mr. Carpenter, and have known him for 37 years.

Mr. HOWARD. After the compact was signed by the States' representatives at Santa Fe, Mr. Carpenter, under date of December 15, 1922, 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, Seventieth Congress, second session, December 14, 1928, pages 577-579, 584-585. In his report, 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.

I should state possibly that all emphasis is supplied in this document. Then, a few lines later Mr. Carpenter states:

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.

Still quoting from Mr. Carpenter:

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.

Later in his comments, Mr. Carpenter makes this statement:

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. This clause does not interfere with the apportionment to the upper basin or of the right of the States of the upper basin to ask for further apportionment by a subsequent commission.

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.

Mr. Carpenter's statement and explanation of the compact were before the Congress at the time the Colorado River compact was approved, and the Boulder Canyon Project Act adopted. There was no contrary statement, nor was any question raised as to the accuracy of Mr. Carpenter's analysis.

During the progress of the debate the same interpretation was used. It is true that at times the aggregate of (a) and (b)—that is, 8,500,000 acre-feet—was more or less casually referred to as water "apportioned" to the lower basin. It is to be noted, however, that whenever any party to the debate attempted to be precise about the matter, the distinction between the apportionment of water under III (a) and the right to increase under III (b) was preserved. For example, Senator Hayden of Arizona, in describing the compact—page 388—I am referring to Congressional Record, Seventieth Congress, second session, volume LXX, part 1—I am quoting from Senator Hayden:

The Colorado River compact, as originally written, contemplated that seven States of the Colorado River Basin would enter into an agreement apportioning 7,500,000 acre-feet of the waters of that basin to the upper basin, 7,500,000 acre-feet to the lower basin, and reserving to the lower basin the right to increase its beneficial consumptive use of water by an additional 1,000,000 acre-feet.

Senator Bratton of New Mexico, in describing the compact, maintained the same distinction. He said—page 326:

Under the terms of the compact 15,000,000 acre-feet of water per annum was apportioned, 7,500,000 acre-feet thereof to the upper basin, and 7,500,000 acre-feet to the lower basin, with the additional provision that the lower basin was given the right to increase its beneficial consumptive use of water from said stream system.

Admittedly on the face of the compact, the question is not entirely free from ambiguity. In paragraph (f) of article III, reference is made to—

further equitable apportionment of waters unapportioned by paragraphs (a), (b), and (c).

It may be argued that this language, in a negative way at least, indicates that the framers of the compact considered the 1,000,000 acre-feet referred to in paragraph (b) as apportioned. It is to be noted, however, that paragraph (c) also is mentioned along with (a) and (b). That paragraph refers to a possible treaty with Mexico.

No quantity of water is "apportioned" thereby. In fact, the compacting States had no power to, and did not, attempt to apportion water to Mexico. That power resided in the United States. It would appear, then, that no finality or determinative significance attaches to the word "unapportioned" in paragraph (f). The word is negative and does not mean that each of the paragraphs referred to "apportions" water.

In any event, the matter being one of contract law, we are concerned with the manner in which the parties to the contract used the words, rather than with any absolute or abstract meaning. We turn, then, to the legislative history of section 4 (a) of the Project Act, for the purpose of determining what was in the minds of the Senators participating in the framing of the California limitation.

LEGISLATIVE HISTORY OF SECTION 4 (A) OF THE PROJECT ACT

During the debate on the floor of the Senate on the Boulder Canyon Project Act, Senator Hayden of Arizona offered an amendment to section 4 (a) appearing on page 162 of the record, which, for parliamentary reasons, was later withdrawn in favor of an amendment offered by Senator Phipps of Colorado—page 382.

If I may interpolate, the Senate had a rule against amendments in the third degree, possibly still in effect—I don't know. But Senator Johnson had substituted the House bill for the Senate bill and it was ruled that constituted an amendment. There were amendments offered to Senator Hayden's amendment which reached the third degree, so for the purpose of bringing the amendment within the rules, Senator Hayden withdrew his amendment and Senator Phipps' language was substituted.

Senator Phipps' amendment provided that the Project Act should not take effect unless the seven-State Colorado River compact be ratified by all the States, or, if the seven States fail to ratify the compact within 1 year from the date of the passage of the act, then until six of the States, including California, should ratify the compact, and the State of California, by act of its legislature, should agree with the United States for the benefit of the other States of the basin, that—I am quoting:

* * * the aggregate annual consumptive use (diversion 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 be pointed out later. 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—page 387.

While the matter was in this stage, Senator Phipps gained the floor and said—page 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 that allocation of water refers directly to the 7,500,000 acre-feet of water that are mentioned in paragraph 3.

The records uses the Arabic 3 instead of the Roman III which ordinarily appears in designation of compact sections.

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 refer to an apportionment of 8,500,000 acre-feet. The amendment, adding the reference to paragraph (a) of article III, would refer 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," but desired his amendment to be perfectly clear on the point. He did not consider the water referred to in paragraph (b) as apportioned water. Such water was considered to be in the class of "excess or surplus waters unapportioned" by the compact.

A legislator of Senator Phipps' experience and standing would not refer to his amendment as a perfecting amendment if he had thought that the effect would be to change the meaning so that, instead of referring to an aggregate of 8,500,000 acre-feet, it would refer 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 I now offer.

He offered it at a later stage.

Senator King obtained the floor to comment on the Phipps perfecting amendment. The following colloquy occurred between Senators King of Utah and Johnson of California [reading]:

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 III 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 Ging, 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 as a million acre-feet, but whatever the surplus amounted to, California was to be entitled to one-half.

Senator King, in a further effort to remove any possible misunderstanding, put this question to Senator Hayden of Arizona—page 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 this answer, Senator Hayden lumped the 1,000,000 acre-feet with any other excess or surplus of unapportioned water and expressed the view that all such waters were subject to the same disposition.

Senator Hayden then offered an amendment requiring a three-State lower basin compact. His language was amended to authorize, rather than require, a three-State compact, and, as so modified, now appears as the second phase of section 4 (a) of the Project Act.

Space does not permit the full transcription of the Senate debates. In reviewing the record in its apparent, however, that the Senators who participated in the discussion resulting in the present language of section 4 (a) of the Project 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, the California Legislature viewed the matter in the same light. The intent of the parties to the resulting statutory compact is clear and controlling.

We turn then to the text of section 4 (a) of the Project Act. The text of section 4 (a) of the Boulder Canyon Project Act, as finally adopted, is in entire accordance with Mr. Carpenter's explanation of the Colorado River compact and the understanding of the Members of the Senate at the time the bill was under consideration. Section 4 (a) has two phases: First, that part which, in the absence of a seven-State compact, required of California the adoption of a limitation act as the price of passage of the Project Act; and second, the congressional authorization of a three-State compact apportioning the waters of the lower Colorado River Basin. The first phase was acted upon by the State of California and has resulted in the statutory compact usually referred to as the Limitation Act. The authorization to enter into a three-State compact never was carried out.

However, the language used in proposing the three-State compact is valuable as a guide to the interpretation of the earlier part of the section. It must be presumed that the words and phrases used 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 proposed three-State compact provides no water at all for California.

In section 4 (a), the Congress was unquestionably attempting to make provision for, and provide, a means of settling questions relating to the use of all of the waters available to the lower basin in the Colo-

rado River system, under the Colorado River compact. Nothing appears in the act or in the debate which indicates any intent to leave the question of III (b) water open, yet that paragraph is not mentioned. California is limited to 4,400,000 acre-feet of water apportioned by article III (a) of the compact, "plus one-half of the excess or surplus waters unapportioned by the Colorado River compact." Arizona, under the proposed three-State compact, would have been allotted 2,800,000 acre-feet of the water apportioned by article III (a) "plus one-half of the excess or surplus 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 suggested three-State compact is III (b) water mentioned. Unless we take the entirely unwarranted assumption that Congress intended to leave the III (b) water entirely out of the settlement, 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 that water is part of the excess or surplus, one-half of which is available to California. By the same token, under the proposed 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). By compact definition that water is "water of the Colorado River system," a phrase which includes the Gila.

Later, in the suggested three-State compact—clauses 3 and 4—it is provided that Arizona shall have the exclusive beneficial use of the Gila and that, except as to return flow reaching the Colorado River, the Gila shall never be subject to any diminution by reason of allowance of water to Mexico under treaty. Arizona argues that this meant that in the proposed compact the Gila water was to be in addition to the 2,800,000 acre-feet of system water theretofore mentioned; in other words, 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, the use of the waters of the Gila constituting 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. To consider the Gila as an addition to the 7,500,000 acre-feet would carry the apportionment of III (a) water to Arizona, together with that 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 the suggested 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 made a part of the proposed compact, 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 throwing the draft to serve the Mexican burden on the main stream.

Even if California could agree with Arizona's contention as to the Gila water, it would probably meet with opposition from the upper basin States. The effect would be to add the Gila uses, aggregating 2,300,000 acre-feet per annum, to the 7,500,000 acre-feet apportioned to the lower basin. This would increase the quantity of water of the main stream available to the lower basin under article III (a), and correspondingly decrease the "excess or surplus" beyond the waters 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. One of the results of Arizona's position would be to increase the occasions for, and increase the quantity of, the upper basin's contributions to Mexico.

In the light of the explanation given the compact by Mr. Carpenter, in the light of the texts of the Project Act and the California Water Limitation Act, and the legislative history of the Project Act, it is clear that the Congress and California intended that California should participate in III (b) water. The Limitation Act should be so construed.

Senator MCFARLAND. Mr. Chairman, it is not my purpose to argue points of law with Mr. Howard here today, because this statement of his is in the nature of a brief or argument of law rather than testimony; and I think that, knowing that, we can argue points of law by presenting our brief in opposition to it. But there are a few things that I would like to take an exception to and call attention to, either now or when Mr. Howard finishes—whatever the Chairman or Mr. Howard would prefer, whether we take them up as he finishes each section or when he finishes the whole paper.

Senator MILLIKIN. It is a matter of indifference to me.

Mr. HOWARD. My preference would be to let this document appear in the record as a more or less coherent, solid bit of writing, if you don't mind. However, I shall be very happy to respond to any questions the Senator may have.

Senator MCFARLAND. I was going to take up the matter after each section, but I would just as soon wait, if you so desire.

Senator MILLIKIN. Let's do it that way, then.

Mr. HOWARD. Pass, then, to the question of the measure of charge against III (a) water on account of Gila uses.

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 flows into the Colorado its bed is wide, sandy, flat, and subject to the intense heat of the desert. As a result, although about 2,300,000 acre-feet of water flowed 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, before any water was put to use in central Arizona, an average of approximately 1,300,000 acre-feet per annum flowed from the Gila at its mouth into the Colorado. The rest was lost by evaporation and transpiration.

By construction of an extensive system of pumps and impounding reservoirs in the mountains east of Phoenix, Ariz., projects have accomplished the capture and utilization of substantially all of the 2,300,000 acre-feet. All of that water supply is being beneficially and consumptively used in Arizona and produces crops.

Under many conditions the amount of "depletion" of a stream coincides with the amount of "beneficial consumptive use"; in fact, that may be generally true. In many instances, however, and particularly in the case of the Gila, the depletion of the main stream is not equivalent to beneficial consumptive use.

The compact apportionment of water under the Colorado River compact was not made in terms of depletion. It was made in terms of utilization. Article III (a) of the compact apportions "the exclusive beneficial consumptive use" of waters of the "Colorado River system." No reference is made to main-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 the river. The words "consumptive use" have been defined in other documents relating to the Colorado River.

The California limitation clause of the first paragraph of section 4 (a) of the Project Act defines "consumptive use" parenthetically as "diversions less returns to the river." This plainly means returns to the river from which diversions are made. Thus, Gila uses are to be measured as diversions from the Gila less returns to the Gila.

Senator MILLIKIN. Mr. Howard, where is section 4 (a) of the Project Act?

Mr. HOWARD. I think it is exhibit B attached to this statement.

Senator MILLIKIN. I have it. Go ahead, please.

Mr. HOWARD. The recent treaty with Mexico contains the following definition:

ART. I (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.

Mr. Ross Tipton, a distinguished consulting engineer from the State of Colorado and one of the negotiators of the treaty, testified before the Senate Committee on Foreign Relations when the treaty was under consideration. In discussing the drought provisions he said (pp. 1225-1226 of hearings):

The extraordinary drought provisions of this treaty will be invoked, as I say, when these areas up in here begin to suffer deficiencies. We indicated to the Mexican negotiators that the entire basin must be considered, and we put the words "consumptive use" in, because it will be more practical to use it as a measure than the thousands of diversions. It is very practical to use as a measure the consumptive use, because many gaging stations are installed throughout the irrigated areas, and many more will be installed for the purpose of determining for compact administration what the various States are consuming.

Senator DOWNEY. Do you think it says "consumptive use"?

Mr. TIPTON. It says "Consumptive uses in the United States are reduced in proportion"—

Senator DOWNEY. "Consumptive uses"?

Mr. TIPTON. The plural, because we have a consumptive use on this little tributary, a consumptive use on this tributary, a consumptive use on this stream, and so forth. So we have a series of

consumptive uses, and that is what we are talking about in the treaty. The amount of these consumptive uses is readily ascertainable by measuring the inflow to the areas and the outflow from the areas; and when those being to reduce, this provision can be invoked, and that is long before there can be any material depletion of storage in these various main-stream reservoirs.

Mr. HOWARD. I will certainly do that.

Mr. Tipton clearly understood the meaning of the words "consumptive use" and evaluated such uses at the place of use. The resultant depletion may be, and on the lower Colorado definitely is, quite a different thing.

Under date of December 17, 1946, the State of Colorado filed with the Secretary of the Interior its comments, views, and recommendations concerning Project Report No. 34-8-2 of the Bureau of Reclamation, dated March 1946, the document commonly referred to as the comprehensive report.

The letter of transmittal was signed by John C. Vivian, Governor, and chairman of the board; Clifford H. Stone, director of the board—I might interpolate there, he is a very well recognized and highly competent lawyer, well informed on Colorado River matters; C. L. Patterson, chief engineer; R. J. Tipton, consulting engineer; Jean S. Breitenstein, attorney. Certainly these gentlemen are "responsible officials of the State of Colorado." I emphasize that phrase because the Bureau of Reclamation refers to responsible officials of the State of Arizona.

Among other things, it is stated in the Colorado comments, page 6:

Although the reported depletion quantities are said to represent the resulting effects upon outflows from the upper basin at Lee Ferry, and from the lower basin at the international boundary, that rule appears to have been applied only on the lower Gila River at and below the Phoenix vicinity in Arizona. All other depletion estimates presented in the report are based on the rule of evaluation at the site, and, to indicate their resulting effects upon outflows at Lee Ferry or at international boundary, it becomes necessary to allow for and subtract the losses which the water, if not consumed at the site, would suffer incident to its conveyance to Lee Ferry or the international boundary.

Later in the Colorado comments (pp. 20-21), the following appears:

Colorado says that this conclusion of the report is inaccurate, and is confusing if not misleading to the affected States and the Congress. It involves the implied assumption that the natural consumption of water and the channel losses of virgin flow volumes and conditions will prevail undiminished in amount regardless of future stream flow volumes and conditions—an assumption which, being contrary to known facts, is unjustified. In order to deplete the flow into Mexico from its estimated virgin volume of 17,720,000 acre-feet to its future volume of 1,500,000 acre-feet as fixed by the treaty, it will be necessary to utilize in the United States a quantity of water materially greater than the reported 16,220,000 acre-feet annually. The amount by which the uses of water and depletion of stream flows in the United States will exceed 16,220,000 acre-feet annually will be determined by the extent to which the natural consumption and losses of water, which prevailed under the stream flow volumes of virgin conditions, are reduced, or prevented, or avoided, or are converted to beneficial consumptive uses, with development in the United States.

Colorado points out that existing developments and uses of water in the United States have already had the effect of reducing the natural losses under virgin conditions; that the estimated 1,030,000 acre-feet of natural or virgin channel loss in the section of the Colorado River from Boulder Dam to Laguna Dam has been materially reduced in amount since Lake Mead came into operation, by reason of the more regulated stream flow volumes and the reduced flows to Mexico; that the estimated 1,007,000 acre-feet of natural or virgin channel loss

In the section of the Gila River from the vicinity of Phoenix downstream, incident to the conveyance of 2,279,000 acre-feet of estimated natural or virgin condition inflows to the Phoenix vicinity, has since been largely reduced in amount by the developments which store, divert, use, and consume the water supplies at and above the Phoenix vicinity; and that all such channel loss reductions constitute savings or the salvage of water, which correspondingly add to the supplies available in the United States. The above-mentioned examples under present developments are in amounts which are subject to determination by comparative analytical studies.

Colorado says that further reductions in the natural losses of virgin conditions will necessarily accompany the future progressive development in the United States; and that in the future, with full development in the United States, when the flow of the Colorado River at Lee Ferry has been reduced from its virgin volume of about 16,000,000 acre-feet to about half that amount, and when the flow of the Colorado River at the international boundary has been reduced from the virgin volume of about 17,700,000 acre-feet to about 1,500,000 acre-feet, the further reductions in natural losses will further increase the supply of water available in the United States. The future salvage of water is subject to estimation from engineering data and studies with as much assurance of accuracy as estimations of the future depletions by so-called potential projects. Estimations of salvage water clearly should be included in this report on the future development and full utilization. * * *

And I emphasize the word "utilization."

* * * utilization in the United States of all the waters of the Colorado River system available to the States of the Colorado River Basin.

The quoted language points up the proposition that in considering apportionments of water under the Colorado River compact we are not dealing with natural conditions or depletions of the main stream or of the tributaries measured against natural conditions. The control of the river avoids some losses and incurs others, the net result being the utilization of more water than would be available for use in a state of nature. The apportionments are made in terms of utilization.

It is probably not the function of a lawyer to compute the amount of beneficial consumptive use of the waters of the Gila and its tributaries. Let it be clearly understood, however, that we do not double up on the charge. Water is diverted and applied to the land. Some of it is lost by evaporation and transpiration, some is returned to the stream from which it is diverted. That which is lost is consumptively used. The same process may be repeated downstream, may be repeated many times, until salt concentrations render the water useless or the supply is completely exhausted.

The aggregate of the losses, not the aggregate of the diversions, represents the consumptive use. This is the type of operations referred to by Mr. Tipton in his quoted testimony.

The amount of consumptive use of the waters of the Gila and its tributaries determined by evaluation at the site is much greater—practically double—the amount determined on main stream depletion theory and used by Arizona and the Bureau of Reclamation, as evidenced by Mr. Larson's testimony.

In its bill of complaint filed in the Supreme Court in *Arizona v. California* (283 U. S. 423), Arizona made the following allegations:

(Bill XIV, 3): Said (Colorado River) 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 (in Arizona and New Mexico).

(Bill VII): Of the appropriated water (of the Colorado River and its tributaries in the United States) diverted below Lee Ferry, 3,500,000 acre-feet are an-

nually diverted, used, and consumed in Arizona, 2,900,000 acre-feet are diverted from the Gila River and its tributaries. * * * 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 since been, nor is there now, any unappropriated water in the Gila River or any of its tributaries.

The figure of 2,900,000 acre-feet alleged to be diverted and all put to beneficial use is probably too high but is indicative of the great difference between depletion and consumptive use.

In the comments of the State of Colorado, hereinbefore referred to (p. 21), the figure 2,279,000 acre-feet is used as the inflows to the Phoenix area, all of which is beneficially consumed.

Rounding the figure to 2,300,000 acre-feet, the difference between the depletion theory advanced by Arizona and the compact measure of beneficial consumptive use amounts to approximately 1,000,000 acre-feet.

If the computations submitted by Mr. Larson and by Arizona are corrected for this feature alone, the water available to central Arizona out of water classified as III (a) and III (b) under the compact is virtually eliminated. The project would depend on surplus subject to additional apportionment after 1963 and subject to first call to satisfy the Mexican treaty.

I might add at this point, Mr. Chairman, that the effect would also be detrimental to the interests of the Upper Basin States in that by charging less against the Gila, the Arizona take-out of the main stream is increased and thereby the excess and surplus available for Mexico is decreased, and in the event of shortage, the call on the upper basin is in greater amounts than would be the case if Arizona is charged with the actual beneficial use on the Gila.

Senator MILLIKIN. Would you mind giving me a résumé of your point No. 2.

Mr. HOWARD. Point No. 2—the one I have just concluded?

Senator MILLIKIN. The reason that leads to your conclusion.

Mr. HOWARD. The conclusion is dependent upon the term "beneficial consumptive use." All the way through the compact, with one exception, the authors of the document were dealing with the utilization of waters. I have reviewed the minutes of the meetings of the Colorado River Commission that framed the compact in 1922 to the extent that those minutes are available. Unfortunately, I think there were 28 or 29 meetings, and about 19 meetings are available in minute form; the others were not taken or they have been lost or destroyed; at least, I can't find them.

They started in to divide the water among the several States, first on the theory of acreage—that is, of water enough to irrigate sufficient acreage. They found that way impractical and tried various methods and ended up by just making a division of beneficial consumptive use of 15,000,000 acre-feet, half to the upper basin and half to the lower basin, but they did it in terms of use. Throughout the compact that phrase appears. It appears with reference to not holding back water which can't be put to use or demanding water which can't be put to use. The only exception is in subdivision (d), I think it is, of the compact—the one in which the upper basin guarantees to the lower basin 75,000,000 acre-feet at Lee Ferry over a 10-year period. That is, of course, water in the river at that point and is to

be determined by whatever water reaches there. Whatever depletions occur above would be reflected in that amount. But that is an entirely separate and distinct covenant. It has no bearing upon the provisions of article III (a) of the compact but is a covenant which would be separately applied without reference to beneficial consumptive use in the upper basin conceivably might exceed 7,500,000 acre-feet a year and still the basin might be able to comply with the guaranteed covenant of 75,000,000 every 10-year period.

But, nevertheless, as far as article III (a) is concerned, the Upper Basin States would be exceeding the apportionment. It may be necessary for the Upper Basin States to consumptively use beneficially somewhat less than 7,500,000 acre-feet, or to provide very large storage in order to comply with the guaranteed delivery, but that is a covenant which is separate. It is my view that, of the two covenants, that which is the more restrictive would control; that is, the upper basin is limited to consumptive use of 7,500,000 acre-feet, which I think would be determined by actual use of water, including salvage water—that is, water which is made available because of control works. That might be the controlling limit.

We might find the controlling limit is the guaranteed delivery. Whichever one comes into operation will control, but the two covenants are entirely separate and distinct.

The compact having been written in terms of use, we next turn to the point that the Gila River by compact definition is a part of the Colorado River system. That is, the definition provides that the Colorado River system, the waters of which are apportioned, includes all tributaries within the United States, and that admittedly includes the Gila, so that all beneficial consumptive uses of water of the Gila system are constituent consumptive uses of the waters of the Colorado River system, the Gila being a part of it, and the State making the use of that water is changeable—that is, the lower basin is chargeable with that beneficial consumptive use and that being the case it should be considered as a beneficial consumptive use in Arizona.

The idea that the only measure is the depletion of the flow of the river arises out of the idea that salvaged water put to beneficial use is not chargeable as beneficial consumptive use under the Colorado River compact and we believe it is chargeable. The difference between the beneficial consumptive use on the Gila, which for purposes of this discussion we will say amounts to 2,300,000 acre-feet, and the amount of water that the Gila delivered at the point of confluence with the Colorado River before there was any development, was, I think, approximately 1,300,000 acre-feet, according to the Bureau statistics. This creates a difference between depletion at the river and beneficial consumptive use in the Phoenix area of approximately a million acre-feet, and it is our conviction that the Upper Basin States would be in a position to charge that against us as a beneficial consumptive use. That being the case, we are unwilling to see Arizona use the depletion theory, which would be directly contrary to the interests of California and to the Upper Basin States. Have I muddled the question or clarified it?

Senator MILLIKIN. Thank you very much.

Senator MCFARLAND. May I ask a question right along this line. Then, Mr. Howard, you likewise contend that in the Upper Basin States the users of water on the tributaries are charged with the

waters that they divert from those tributaries less the waters returned to them, and not the amount that they deplete the main stream of the Colorado?

Mr. HOWARD. I think that is correct.

Senator McFARLAND. In other words, in the State of Colorado on the Gunnison River, regardless of how little the people in Colorado may deplete the main stream of the Colorado they are charged with all the water they divert, less the amount they return whether it gets to the Colorado River or not?

Mr. HOWARD. I think that you are correct.

Senator McFARLAND. That would likewise be true with the Little Snake and the San Juan and the other rivers?

Mr. HOWARD. All tributaries of the Colorado River constituting a part of the Colorado River system.

Senator McFARLAND. And that is true with the Green River in Utah and all tributaries up there? Those people there, regardless of how little they may deplete the Colorado, how little that water might get down to the main stream, they are chargeable with all they deplete the tributary?

Mr. HOWARD. All they divert, less that which they return.

Senator McFARLAND. I just want to get your position plain that it applies to the upper basin the same as Arizona?

Mr. HOWARD. I haven't had the opportunity to discuss this particular problem with Judge Stone or Mr. Tipton or any of the authors of the Colorado statement, but judging by the comments that the State of Colorado made on the comprehensive report, that is the theory applied in that State. If I am wrong in that, I am subject to correction. I am basing my statement purely on their comment. I think that is true. Also, if you analyze what Mr. Tipton said in discussion of consumptive uses under the Mexican treaty, that was his idea.

Senator McFARLAND. I think it is better that Judge Stone and Mr. Tipton speak for themselves.

Mr. HOWARD. I am merely saying I am of the opinion that is true.

Senator McFARLAND. I understand.

Senator MILLIKIN. Let us proceed.

Mr. HOWARD. Treatment of Lake Mead evaporation losses. Another error which appears in Arizona's computations relating to availability of water arises out of the treatment of evaporation and other losses incident to storage, particularly at Lake Mead. It is erroneously assumed that the III (a) water to which California is limited, that is, 4,400,000 acre-feet per annum of the water apportioned to the lower basin States by article III (a) of the Colorado River compact, is subject to further reduction on account of Lake Mead losses. Possibly I should have said "river losses" rather than "Lake Mead" because it goes for the whole stream and all storage on the stream.

Section 4 (a) of the project act, and the reciprocal language of the California Limitation Act, does not justify such treatment. The controlling language is:

* * * 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 * * * 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 * * *.

Lake Mead lies in the States of Arizona and Nevada. The limitation on California relating to diversions "for use in the State of California" cannot be construed as including any part of the reservoir losses occurring at Lake Mead. As the word is ordinarily used, such water is not "diverted" nor is it used in California. The limitation of 4,400,000 acre-feet is a net limitation. There is nothing in the text of the limitation nor in its legislative history pointing to any other conclusion. Any set of computations based on the theory used by Arizona will not stand up when the issues finally are adjudicated.

Conclusion: It is not the purpose of this statement to analyze the mathematical result of the misinterpretations of contract provisions used by the proponents of the central Arizona project. The detailed figures will be left to the engineers. In general, it can be said, however, that by assuming the exclusion of California agencies from participation in the water referred to in paragraph (b) of article III of the compact, by using the depletion theory as the measure of beneficial consumptive use on the Gila instead of using the measure set out in the compact, and (c) by charging the California limitation relating to III (a) water with evaporation losses at Lake Mead, Arizona has built up a vastly exaggerated quantity of water as available for the central Arizona project. If, as we confidently believe will be the case, these assumptions are found by the courts to be in error, the investment of Federal money sought to be authorized by the pending bill will be lost for lack of water.

That concludes the formal statement, Mr. Chairman. I am open for an attack by Senator McFarland at any time.

Senator MILLIKIN. Are you ready to "attack," Senator?

Senator McFARLAND. I might say, Mr. Chairman, that it is not my purpose to attack the law as stated in his argument in his brief. There are one or two points, one or two things I would like to bring out—two questions I would like to ask.

Mr. Howard, you have referred to the discussion on the floor of the Senate in the debate that preceded the passage of the Boulder Canyon Project Act. I might state, Mr. Chairman, that for proper questioning, I would have to have the text of those debates before me, and it would take some time, as those debates cover days, and I don't want to take the time to go into them now. It took days to discuss the subject on the floor, and if we quoted everything that was in the Congressional Record it would take days to do. We would be here for some 2 or 3 weeks. But I will ask Mr. Howard if Senator Hayden, in his discussion on the floor, if he did not relate the history of the III (b) water and the adoption of that section in the compact as he saw it?

Mr. HOWARD. If the Senator has that impression, it is probably correct. I don't recall any discussion on the floor of the Senate which would give any better light on the situation of III (b) than that contained in Mr. Carpenter's comment.

Senator McFARLAND. In Mr. Carpenter's comments, since you have mentioned them, that is on what page of your report?

Mr. HOWARD. It is early in the report. On page 7, Senator.

Senator McFARLAND. On page 7 he refers to the use on the Gila River—that was in regard to the quotation you made. He says:

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 * * *.

He did show that he knew that the people who adopted the compact had in mind the Gila River when they adopted III (b).

Mr. HOWARD. Together with other developments. He calls them "future development incident to the necessary construction of flood works." May I in this connection call attention to the statement that appears on page 8 of my memorandum where he speaks again of this article III (b) with no mention of the Gila, and that is this:

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 * * *.

He had in mind whatever development had taken place on the Gila and unquestionably that was before the Compact Commission met. In addition, he took into consideration this forced development.

Senator MCFARLAND. You are acquainted with what is known as the Hoover Bible, and I will direct your attention to page 395, which is the answer by Mr. Hoover to the letter of Clarence C. Stetson, I believe it is.

Mr. HOWARD. That is 395?

Senator MCFARLAND. Yes. Question 5. This question was asked:

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?

The answer is:

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. HOWARD. You don't desire a comment on that question now?

Senator MCFARLAND. Doesn't that show that is apportioned water in Mr. Hoover's opinion?

Mr. HOWARD. No. That answer puzzled me for quite awhile, but I am of the opinion that there is erroneous reference there. If you read the question you will see that Senator Hayden was speaking of:

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?

The question has no reference whatever to III (b), and the only way you can read that as making sense is to consider that (b) in the second line to be an erroneous reference, really meaning (d). That was what Mr. Hoover was trying to say, I think:

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 (d).

You will note the question refers to (d).

Senator MCFARLAND. You desire to change the answer of Mr. Hoover by using something he does not use?

Mr. HOWARD. I merely desire to correct a typographical error. If you study that question and answer there is no question about it at all. He is talking about (a) and (d).

Senator MCFARLAND. If you will allow me to correct the typographical errors made by the State of California in the case and this general subject, there wouldn't be any question about this thing.

Mr. HOWARD. I would be very happy to correct all you could find. If you read the question and answer, it seems obvious. I haven't had the opportunity to see the original. It may be the error occurred in the original. I am quite sure that is an erroneous reference.

Senator MCFARLAND. This was the language expressed on the floor of the Senate, wasn't it?

Mr. HOWARD. I would have to check the Congressional Record to see whether the error occurred or not.

Senator MCFARLAND. I am not talking about an error. I don't think there is an error. I am talking about the statement of Senator Hayden as he gave it on the floor of the Senate.

Senator MILLIKIN. What is the record reference, Senator?

Senator MCFARLAND. That is in the "Hoover Bible." That paragraph I am reading is from the remarks of Senator Hayden, January 30, 1923, 2710. That begins on page 393 of what is known as the "Hoover Bible"—"Hoover Dam Contracts."

Then on page 396, question 8:

As a matter of fact more than 1,000,000 acre-feet of water from the tributaries of the Colorado below Lee Ferry are now being beneficially used and consumed within the State of Arizona. Will the excess above that amount be accounted for as a part of the 7,500,000 acre-feet first apportioned to the lower basin from the waters of the Colorado River system as provided in paragraph (a) of article III?

And the answer:

By the provisions of paragraphs (a) and (b), article III, the lower basin is entitled to the use of a total of 8,500,000 acre-feet per annum from the entire Colorado River system, the main river and its tributaries.

Mr. HOWARD. That is correct.

Senator MCFARLAND. Don't you think that clearly shows that was apportioned water?

Mr. HOWARD. I don't read it that way, sir. It doesn't use the word.

Senator MCFARLAND. Then when you quoted from III (a), you quoted from section 4 (a) of the Boulder Canyon Project Act which is referable to the California Limitation Act. The language is plain there that California is to receive only 4,400,000 acre-feet of III (a) water and one-half of the unapportioned water, isn't that correct?

Mr. HOWARD. Excess or surplus unapportioned water.

Senator MCFARLAND. So if, as a matter of fact, III (b) water is apportioned water, why California isn't entitled to any part of it, isn't that right?

Mr. HOWARD. That interpretation would exclude California from participation in III (b) water. It is our conclusion that is the effect.

Senator MCFARLAND. I just want to get the difference clearly before the committee. I see no big object in arguing this in detail except to get the issues before the committee at this time, Mr. Chairman.

Then, your main second point is that, as pointed out a little bit ago, Arizona is chargeable with not only the depletion, not with just the amount she depletes the Colorado River by use of water of the Gila River system?

Mr. HOWARD. Chargeable with beneficial consumptive use, including salvage water.

Senator McFARLAND. You understand that the virgin flow of the Gila River at its mouth is estimated at 1,270,000 acre-feet or less?

Mr. HOWARD. I have used the word "1,300,000." I don't think it is inaccurate enough to make any material difference.

Senator McFARLAND. Let us suppose that Arizona would decide: "We will let those waters go on down to the Colorado, and we will use the main stream of the Colorado River water and there is a 1,600,000 acre-feet going down to the stream and we would get credit for the extra 300,000." You would only get the benefit, from that water flowing from the system, of 1,270,000, wouldn't you, under your interpretation?

Mr. HOWARD. I imagine that would be the result.

Senator McFARLAND. That is all any of the States is affected by the Gila River system—it is 1,270,000 or 1,300,000, whichever is correct, isn't that correct?

Mr. HOWARD. I would say that would be true.

Senator McFARLAND. That is all.

Senator MILLIKIN. That is all.

Senator DOWNEY. Thank you, Mr. Howard. We will call Mr. Shaw.

Senator McFARLAND. I might state, Mr. Chairman, we will give direct evidence in opposition to this, that is, a brief rather than just argument of law.

Senator MILLIKIN. I assumed you would have your own legal theory.

Senator McFARLAND. That is right. I think it is pretty well before the committee. We will explain it more in detail.

Senator MILLIKIN. Let's take a 5- or 6-minute recess.

(A short recess was taken.)

Senator MILLIKIN. We will proceed.

Senator McFARLAND. Mr. Chairman, I would like, for the record, to show that the Congressional Record of January 30, 1923, contains the same language which I read from the "Bible" we referred to as the "Hoover Bible," and that that is the language which Arizona has relied on, upon the answer of the man who presided at these meetings, and that that language was the basis of our making no more objection and of our congressional delegation permitting this act to pass, and that III (b) water is apportioned water.

Senator MILLIKIN. Mr. Shaw, we are glad to see you. Will you give your name and your residence and your business to the reporter and proceed?

Mr. SHAW. Before commencing my statement, may I call to your attention another illustration of how we are at the mercy of stenographers and printers. You will note on page 411 of this Hoover Dam contract book that it would appear that California was limited to 4,200,000 acre-feet of water apportioned by III (a), whereas the statute says 4,400,000. I just put that in as an example.

Senator McFARLAND. I might say, Mr. Chairman, it doesn't make any difference what the original documents might have said; the important thing now is what language and what document are placed in the Congressional Record as the basis for the interpretation made by the man in charge for Arizona. Arizona has a right to rely on that record of what exact language was used on the floor, even if it wasn't corrected at that time.

**STATEMENT OF ARVIN B. SHAW, JR., ASSISTANT ATTORNEY
GENERAL OF CALIFORNIA**

MR. SHAW. My name is Arvin B. Shaw, Jr. I reside in Pasadena, Calif. I have been an attorney since 1918 for one or more California irrigation districts holding rights to Colorado River water and, since 1939, assistant attorney general of California, assigned to represent the Colorado River Board of California. This work has required me to make close study of Colorado River legal problems. I participated in two of the three suits brought in the Supreme Court by Arizona against the other six States in the Colorado River Basin.

The purpose of this statement is to present certain factors which circumscribe and limit Arizona's claims to Colorado River water, to indicate uncertainties relating to Arizona's claims, and to point to the solution of those uncertainties.

My first topic is the Arizona water contract of February 9, 1944.

Section 5 of the Boulder Canyon Project Act of 1928 authorizes the Secretary of the Interior to contract for the storage and delivery of water in Lake Mead. The section also provides:

No person shall have or be entitled to the use of the water stored as aforesaid except by contract made as herein stated.

Without pursuing the question whether secretarial contracts made under this section do or do not convey a water right, it is evident, at the least, that Congress directed, in positive terms, that no one should enjoy the benefits of Government storage—that is, take floodwaters salvaged by storage in the Government's works—unless he had a secretarial contract. The Congress had, of course, full authority to regulate the use of its works under the clause of the Constitution which authorizes it to manage the "property" of the Nation (art. IV, sec. 3, cl. 2).

Recognizing this, Arizona, from time to time, through the years 1934 to 1939, made a number of ex parte efforts to obtain from the Secretary of the Interior a State-wide contract which should earmark a fund of water for later disposition for projects in Arizona. These efforts aborted because the provisions which Arizona sought to have in the contract impaired the interests of all the other six States in the basin and were objected to by them.

Later, in 1943, official representatives of all seven States met in a series of conferences in which a draft of contract was formulated and submitted to the Secretary. Five of the States deemed that this draft protected their interests. California, considering that the draft contained dangerous ambiguities, opposed it at a hearing before the Secretary. On February 9, 1944, the Secretary, after making amendments designed to meet the California objections, executed the contract. In so doing, he issued an explanatory memorandum, the significance of which will be later discussed.

At the time the Project Act was adopted, the natural low summer flow of the river had for many years been fully appropriated and put to use on projects in California and Arizona. There was nothing left to appropriate, except the torrential spring floods, which were unusable without storage. In a word, no expansion of irrigation in Arizona could take place, except through use of Hoover Dam storage.

Since Arizona could get no water for new projects except by partaking of the benefits of storage provided by the United States, it follows that when Arizona accepted the 1944 contract it did so upon the terms which the Congress had, within its constitutional jurisdiction, prescribed, namely upon the terms and circumscribed by the limitations which the Secretary considered necessary to set out in his contract.

It has been said by some Arizona spokesmen, and, parenthetically, I am referring among others to the statement made by Mr. Carson before the House Public Lands Committee last year which has been put in the record here, that under the contract executed by the Secretary, the United States undertook to deliver to Arizona 2,800,000 acre-feet of water from the main stream of the Colorado River. It has also been said that the contract is firm and is to be, and can be, satisfied from water allocated by the Colorado River compact to the lower basin, and not from unallocated surplus. These statements are unsound. Examination of the contract will demonstrate that the figure of 2,800,000 acre-feet must be taken as a nominal figure only, upon which no specific reliance can be placed. It will also show that there is little, if any, firm or allocated water available to Arizona under the contract.

And, parenthetically, may I say that I have used the term "allocated" here rather than the term "apportioned" intentionally and to avoid the discussion which Mr. Howard made this morning as to the extent of the apportioned water. I use the term "allocated" as covering both III (a) and III (b) water.

Article 7 (a) of the contract provides that—

the United States shall deliver and Arizona or agencies or water users therein, will accept under this contract each calendar year from storage in Lake Mead, * * * so much water as may be necessary for the beneficial consumptive use for irrigation and domestic uses in Arizona of a maximum of 2,800,000 acre-feet.

The contract also provides for delivery of a portion of the "excess or surplus waters" unapportioned by the compact, but for the purposes of this statement it is unnecessary to trace out the limitations upon this item. Nowhere in the contract is the 2,800,000 acre-feet defined nor characterized as being deliverable out of the 7,500,000 acre-feet apportioned to the lower basin by article III (a) of the compact, nor out of the additional 1,000,000 acre-feet to which the lower basin is entitled to increase its use under article III (b) of the compact. There is, therefore, no foundation for any assertion that this quantity of water is firm or allocated water under the compact. On the fact of the contract it may be water of any category, or any combination of the categories referred to in the compact.

It is, indeed, inevitable that the Secretary could not deliver to Arizona from Lake Mead 2,800,000 acre-feet of III (a) water. California is admittedly entitled to 4,400,000 acre-feet, and Nevada to 300,000 acre-feet of the III (a) water. Out of Arizona's share of the III (a) water, which could not exceed, and as will hereinafter appear must be less than 2,800,000 acre-feet, must first be taken the amount of her rights existing at the effective date of the compact, for article III (a) of the compact states that the water therein apportioned "shall include all water necessary for the supply of any rights which may now exist." As will be hereinafter noted, rights exceeding 2,000,000 acre-feet did exist in Arizona at the effective date of the compact.

The following provisions of the Arizona contract establish qualifications and limitations upon the nominal quantity of 2,800,000 acre-

feet, each of which must be taken into account to ascertain what quantity of water the United States undertakes to deliver:

1. Article 7 (a) provides that the delivery of water is—

Subject to the availability thereof for use in Arizona under the provisions of the Colorado River compact and the Boulder Canyon Project Act.

The agreement is, therefore, subject to the availability of the water for use in Arizona, under the law. If, by reason of prior commitments, the United States was lawfully obligated to deliver the water for use elsewhere, it obviously could not be delivered for use in Arizona and was not available.

2. A further clause in article 7 (a) points up the matter discussed in the preceding paragraph. The agreement is not to deliver 2,800,000 acre-feet, but "a maximum of 2,800,000 acre-feet." No minimum is stated. Hence the obligation of the United States is not to deliver any fixed quantity, but a floating and indefinite quantity which, nevertheless, shall not exceed 2,800,000 acre-feet per annum.

3. Article 7 (d) provides:

The obligation to deliver water at or below Boulder Dam shall be diminished to the extent that consumptive uses now or hereafter existing in Arizona above Lake Mead diminish the flow into Lake Mead * * *

There have been for many years consumptive uses of water of the Colorado River system on tributaries in Arizona flowing into the Colorado above Lake Mead, particularly on the Little Colorado River and its tributaries. Some of those rights antedate the Colorado River compact. Whatever they amount to is a specific deduction from the nominal figure of 2,800,000 acre-feet.

4. Article 7 (a) provides for another deduction from the 2,800,000 acre-feet. The text reads:

Such obligation shall be subject to such reduction on account of evaporation, reservoir, and river losses, as may be required to render this contract in conformity with said compact and said act.

Evaporation and reservoir losses from Lake Mead and other reservoirs now or in the future existing on the Colorado River are estimated to amount to about 900,000 acre-feet. It appears to be commonly accepted that reservoir losses constitute a form of beneficial consumptive use of water, and that such losses are chargeable to the basin in which or for the benefit of which the reservoirs exist. Without arguing here the question whether Arizona is chargeable with all or only a portion of the reservoir losses in question, it is obvious that they represent a substantial deduction from the figure of 2,800,000 acre-feet.

5. Article 7 (f) reads:

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. * * *

The Secretary of the Interior has by certain other contracts agreed to deliver to Nevada 300,000 acre-feet annually. The Arizona contract, by recognizing the right of the United States and Nevada to make this contract, and characterizing the Nevada water as being "apportioned," constitutes an admission that the 300,000 acre-feet is III (a) water, and constitutes a positive estoppel against the State of

Arizona which prevents her from asserting any claim to the same water which the United States has agreed to deliver to Nevada.

6. Article 7 (g) provides:

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 nothing contained in this contract shall prejudice such rights.

Although not generally emphasized, small portions of each of the States of New Mexico and Utah lie within the lower basin. Consumptive uses of Colorado River tributaries have existed in these areas long antedating the Colorado River compact. These items, commonly estimated to require about 131,000 acre-feet annually, are by the language of article 7 (g) quoted, made a specific deduction from the Arizona figure of 2,800,000 acre-feet. Arizona is estopped to claim the same water which is necessary to serve the lower basin projects in New Mexico and Utah. Neither Nevada nor California has so estopped itself by contract or otherwise.

7. Article 7 (h) provides:

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 (chap. 16, Statutes of California of 1929) upon which limitation the State of Arizona expressly relies.

This provision is parallel to article 7 (f) regarding the Nevada contracts. It constitutes an admission that the United States and California agencies were entitled to contract for the delivery of the full quantity of water specified in the California contracts, subject only to the proviso that the aggregate of such deliveries shall not exceed the quantities specified in the California Limitation Act. It constitutes also an estoppel against Arizona inhibiting it from claiming or demanding delivery of any of the water which the United States has agreed to deliver to California. Neither California nor Nevada has so estopped itself by contract or otherwise as to the water nominally deliverable under the Arizona contract.

8. Article 7 (1) provides in part:

All consumptive uses of water by users in Arizona, of water diverted from Lake Mead or from the main stream of the Colorado River below Boulder Dam, whether made under this contract or not, shall be deemed, when made, a discharge pro tanto of the obligation of this contract.

As has been seen, one deduction from the figure of 2,800,000 acre-feet, consisting of consumptive uses in Arizona above Lake Mead, is provided for in Article 7 (d). The text just quoted adds a similar deduction of consumptive uses in Arizona from Lake Mead or below Lake Mead. These uses, much larger in volume than those above Lake Mead, include the Colorado River Indian Reservation at Parker and the Yuma project, both of which antedate the Colorado River compact.

9. Article 7 (1) also provides:

Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this contract.

Parenthetically, that is a duplicate of language of the Colorado River compact.

The effect of this provision is to demonstrate that not only the Yuma and Parker uses, but also the old established uses on the Gila and Salt River system, all of which are by the terms of the compact definitely to be served with III (a) water, are unimpaired. The claims of Arizona under the contract in question are therefore subordinated and postponed to such extent as is necessary so that the "present perfected rights" may be satisfied out of the apportioned water. The "present perfected rights" mentioned approach or exceed 2,800,000 acre-feet. It therefore appears that there cannot be available for Arizona from the main stream as much as an additional 2,800,000 acre-feet of the water specified in articles III (a) and III (b) of the compact.

10. Article 10 provides:

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, 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.

This language makes it abundantly clear that the Secretary of the Interior, in executing the Arizona contract, had no intention to resolve in favor of Arizona any of the questions specified. Recognizing that these questions were matters for a judicial, not administrative, determination, the Secretary, in a memorandum issued concurrently with his execution of the contract (press release dated February 10, 1944, P. N. 35473) declared:

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 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.

From this examination of the Arizona contract two things stand out: First, Arizona cannot with any degree of plausibility assert that the United States has agreed to deliver to Arizona 2,800,000 acre-feet of water annually, or any quantity approaching that amount. The con-

tract contains too many limitations, qualifications, deductions, and estoppels to permit such a claim. Second, Arizona cannot plausibly assert that whatever quantity is deliverable under the contract is firm or allocated water. Too much water under perfected rights, or belonging to other States and so recognized by the contract must first be deducted from the allocated water for that claim to be tenable. It is entirely probable that all water deliverable to Arizona under the contract is surplus water and subject to further apportionment under articles III (f) and (g) of the compact after October 1, 1963. Engineering witnesses will hereafter apply to the water-supply facts the principles herein set out.

Under the sweeping reservations of article 10 of the contract, supported by the Secretary's memorandum of February 9, 1944, it is plain that the contract does nothing to clarify, or advance the disposal of the long-standing differences between Arizona and California.

Efforts to settle the lower basin water controversy: The shares of Nevada, Utah, and New Mexico in the lower basin water being comparatively minor and well recognized, those States have not been particularly engaged in contention. Arizona and California have, however, been forced by circumstances into a dispute which has persisted for over 25 years.

During this period leaders in the two States have periodically, on literally hundreds of occasions, met and endeavored to reach a negotiated settlement of the difficulty. The last negotiations between the States, through their respective commissions, ran through most of the year 1940.

I can testify that at that time men of good will on both sides of the river earnestly and sincerely sought to find a common ground. They could not find it. The essence of the matter is that there is not enough water available for use in the lower basin to satisfy the legitimate aspirations of both States.

This condition has been growing more acute as years go by. The primary reasons are these: With the prolonged dry cycle of the thirties it has been realized that the estimates of water supply of the river made at the time the compact was made were grossly optimistic; development of engineering methods has led some to believe that the development of new projects once thought fantastic is possibly within reach, regardless of cost; and, finally a Mexican treaty has subtracted from the stream twice the quantity of water hitherto considered possible. Thus the prospect of an agreed settlement has steadily become worse.

In March 1946, the Secretary of the Interior submitted to the Governors of the seven Colorado River Basin States for comment under the Flood Control Act of 1944, a report entitled "The Colorado River." In this report the following statement is made—Paragraph 70:

The following recommendations are made in view of the fact that there is not enough water available in the Colorado River system to permit construction of all the potential projects outlined in the report and for full expansion of existing and authorized projects, and that there has not been a final determination of the respective rights of the Colorado River Basin States to deplete the flow of the Colorado River;

Under that, recommendation 2:

That the States of the Colorado River Basin determine their respective rights to deplete the flow of the Colorado River consistent with the Colorado River Compact.

The comments on this report filed by the State of California with the Secretary in February 1947, include the following:

In response to recommendation (2) set forth in paragraph 70 of the Regional Directors' report, which suggests a determination of rights, it is recommended that negotiations be initiated forthwith among the States of the Lower Basin, acting through their respective Governors, for the purpose of determining the rights of each of the States of the Lower Basin to the use of the waters of the Colorado River System, in accordance with the Colorado River Compact, the Boulder Canyon Project Act, and relevant statutes, decisions and instruments.

Following up this recommendation, on March 3, 1947, Governor Warren of California addressed to Governors Pittman of Nevada and Osborn of Arizona a letter in which he called attention to the secretary's report, and suggested that the three Governors meet and endeavor to arrange for either (1) negotiation of a compact, (2) arbitration, or (3) a judicial determination.

To this letter Governor Pittman replied on March 6, expressing his conclusion from the experience of the past that negotiation would be unavailing, and his view that the three States should join in requesting Congress to authorize a suit in the Supreme Court.

Governor Osborn replied on March 12 to the effect that the rights of the three States have already been determined and that nothing further need be done.

Something should be done. Real, or asserted, ambiguities and uncertainties of considerable importance have been found in the Colorado River compact, in the Boulder Canyon Project Act, and in each of the successive acts, contracts, and other documents which now make up the law of the river, the last of which, and not the least ambiguous, is the Mexican water treaty. It is not possible for any man to predict, with fair certainty, how the Supreme Court would resolve the interdependent and therefore interacting uncertainties of the situation. Yet they should be resolved.

"Solution": In the last suit brought by Arizona against the other six States in the basin (*Arizona v. California*, 298 U. S. 558) it was determined that the United States was a necessary party to a determination of the rights of the States, and that in the absence of its consent to be sued the court would not entertain the suit. It is understood that legislation is about to be introduced in this Congress granting consent that the United States become a party to a suit for determination of rights to lower basin water. It is respectfully submitted that the lower-basin States should join to see that such legislation is promptly adopted and that the judicial determination of the problem is expedited.

Without a determination neither State has a sound foundation upon which to erect its future irrigation development. Nor has the Congress either the jurisdiction to solve the problem nor the equipment with which to solve it.

It is not in order for any State to ask the Congress to risk hundreds of millions of taxpayers' money on building a project for which there may or may not be a water supply. It is particularly out of order when the State neither offers to underwrite the project nor to furnish security that its contentions are correct. For these reasons the orderly and prudent procedure is to determine first whether there is a water supply for the central Arizona project, and then what kind of project appears to be feasible and justified.

Senator DOWNEY. I have one question I wanted to ask the witness. Am I correct in assuming that it would be possible for the Chief Executive, the President, to order a suit in the Supreme Court determining the respective rights of the States in the Colorado River water and directing an interpleading against the States?

Mr. SHAW. I believe so, Senator. The action of the United States in bringing suits against States is frequently directed by the Executive.

Senator DOWNEY. So this suit about which you were talking to determine the rights of different States in the Colorado River could be provided for by either an act of Congress or by the President of the United States?

Mr. SHAW. Yes.

Senator McFARLAND. Mr. Shaw, you state in your statement here, in the next to the last paragraph:

Without a determination, neither State has a sound foundation upon which to erect its future irrigation development.

Then you state:

It is not in order for any State to ask the Congress to risk hundreds of millions of taxpayers' money on building a project for which there may, or may not be, a water supply.

Congress has already risked quite a number of millions of dollars on California, has it not?

Mr. SHAW. I think not.

Senator McFARLAND. Well, it has advanced money for the benefit of California?

Mr. SHAW. It has never erected a project in California without a signed contract from a responsible institution capable of repaying the money advanced. That is the difference between that situation and this one, because no one under this proposed bill offers or agrees to pay back anything.

Senator McFARLAND. Well, we won't argue about this bill. But right now, the point I want to make, Congress has appropriated money, millions of dollars, which have gone for development in California?

Mr. SHAW. Yes.

Senator McFARLAND. And you never thought about asking for adjudication before you asked for these appropriations?

Mr. SHAW. No, sir. We undertook to repay the money that was expended on those works and signed contracts, not only for the irrigation works but for power works, as required by the terms of the Project Act.

Senator McFARLAND. It is only when Arizona wants the advance of money that you want the litigation?

Mr. SHAW. Only when Arizona wants the money without offering to sign the note.

Senator McFARLAND. If Arizona signed the note you would withdraw all objection to this bill, would you?

Mr. SHAW. If the note appeared to be a good note.

Senator McFARLAND. Oh!

Mr. SHAW. That is a very serious question, Senator—if it be signed by a solvent agency, able to pay, I don't think we would argue whether there would be a risk or not.

Senator McFARLAND. Well, in a contract for power, unless the power is available, there is no obligation to pay; that isn't a good note, is it?

Mr. SHAW. Unless the power is available?

Senator McFARLAND. Yes. In a contract for the purchase of power, unless the power is available, the contract does not constitute a good note, does it?

Mr. SHAW. You mean as applying to Bridge Canyon?

Senator McFARLAND. Bridge Canyon or the Hoover Dam?

Mr. SHAW. I assume it is your thought that there is no power available at Hoover Dam?

Senator McFARLAND. I didn't say that. California undertakes no risks, nor does its people. Unless they agree to pay whether or not any power is furnished there is no risk. Wouldn't you say the Federal Government put up the risk?

Mr. SHAW. I think you are in error, Senator. The reason, if I may be permitted to answer the question, is that the metropolitan water district of southern California agreed by contract with the United States to buy and pay for 36 percent of the power produced by Boulder whether it was used or not, and for a series of years before a recent adjustment was made, did actually pay to the United States approximately \$150,000 a month for power which it never got. That is an illustration of what I mean by a solvent organization agreeing to pay to the United States.

Senator McFARLAND. Yes; but those contracts have grown to be valuable contracts, haven't they?

Mr. SHAW. They were contracts under which power was delivered and retailed to the consumer and that power could have been procured from other sources.

Senator McFARLAND. You wouldn't give them up now?

Mr. SHAW. At comparative prices.

Senator McFARLAND. You wouldn't want to give them up now, deducting the amount of benefits you have received from the amount you paid out?

Mr. SHAW. I wouldn't want to answer as I am unable to tell whether it costs any more to produce power from any other source but I think the costs are comparable.

Senator McFARLAND. Why is California seeking Davis Dam power?

Mr. SHAW. Because it must make arrangement of some kind to meet the future requirements of power, either from steam plants or from hydro plants, as the community grows.

Senator McFARLAND. And it follows they prefer the hydroelectric power to steam?

Mr. SHAW. I have no answer to that because I am not speaking for power agencies and should prefer that they would say whether they prefer Davis Dam power or steam power.

Senator McFARLAND. Well, Mr. Chairman, the Arizona contract speaks for itself and we put it in the record. I know that the able chairman and other members of this committee will be able to interpret it without any questioning on my part as to its meaning. So far as that part of the discussion is concerned, I do not want to take time of the committee to go over the discussion of what that contract means. I have the utmost of confidence in the ability of members of this committee to analyze that contract for itself.

We will show before we get through that these so-called contracts or guaranties or whatever they were called, which were secured by California, were very, very much beneficial to the State of California and were for a natural resource of the State of Arizona. As a matter of fact, this depletion, Mr. Shaw, that was testified to here, is something that is peculiarly beneficial to the State of California for the reason that California doesn't have any tributaries and doesn't contribute any water to the Colorado River?

Mr. SHAW. I wouldn't put it that way, Senator. The question is whether Arizona should be treated the same way as each of the other States in the basin with regard to accounting for water which it consumptively uses.

Senator McFARLAND. We expect to be.

Mr. SHAW. The essential element here is this. Shall Arizona obtain water to the extent of a million acre-feet, raise crops with it, and make dollars from those crops, and consume the water without being charged for it? No other State is in that position. No other State claims to be entitled to salvage water, use and consume it, and not be charged with it. It happens, Mr. Chairman, that this particular instance of the Gila River is the exaggerated instance, the very unusual situation in which a great loss of water occurred in the state of nature and that water has been salvaged by reservoirs and by pumping plants so it can be put to agricultural use.

The same situations exist in a very much minor way in Colorado, Utah, Wyoming, but the question only highlights itself with respect to the Gila.

Senator McFARLAND. But the fact remains that California greatly benefits by such an interpretation, at the expense of the other basin States which have tributaries?

Mr. SHAW. I don't see that there is any question of benefit or loss.

Senator McFARLAND. I think it speaks for itself.

Mr. DOWNEY. That is all the witnesses we have this morning, Mr. Chairman.

Senator MILLIKIN. There being nothing further, the meeting is adjourned until 10 o'clock Monday morning.

(Whereupon, at 12:20 p. m., the meeting adjourned until 10 a. m. Monday, June 30, 1947.)

BRIDGE CANYON PROJECT

MONDAY, JUNE 30, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin presiding.

Present: Senators Millikin (presiding), O'Mahoney, and Ecton.
Also present: Senators McFarland, Downey, and Hayden.

Senator MILLIKIN. The meeting will come to order.

The secretary of the committee has a statement by the Honorable Sidney Kartus, of Phoenix, Ariz., which will be entered into the transcript.

(The statement is as follows:)

HOUSE OF REPRESENTATIVES,
STATE OF ARIZONA,
Phoenix, June 17, 1947.

MR. HUGH BROWN,
*Chief Clerk, Committee on Public Lands,
United States Senate, Washington, D. C.*

DEAR MR. BROWN: In accordance with your letter of April 26, I am sending you under separate cover five copies of my statement on the McFarland-Hayden Colorado River bill formerly designated as S. 433 but now designated as S. 1175. This is my formal statement which I desire to be placed in the record of the hearing on this legislation which begins June 23. I have sent Senator McFarland a copy of the statement and a copy of this letter.

Sincerely yours,

SIDNEY KARTUS.

STATEMENT BY SIDNEY KARTUS, OF PHOENIX, ARIZ., PRESIDENT OF THE ARIZONA
HIGHLINE RECLAMATION ASSOCIATION, AND PRESIDENT OF THE GLEN-BRIDGE-VERDE-
RECLAMATION DISTRICT, ON S. 1175

Mr. Chairman and members of the committee, my name is Sidney Kartus, of Phoenix, Ariz. With your permission I will first relate the capacities in which I appear here to testify before you. Following that, I desire to make some general remarks on S. 1175, and after that to suggest some amendments thereto.

I appear before you as a member in my second term of the Arizona House of Representatives, in which I represent Maricopa County legislative district No. 6, including an agricultural area directly affected by this bill. I am a member of the house committee on agriculture and irrigation. I have been chairman of a special Colorado River committee of the house in the seventeenth and in the eighteenth, or current, legislature. During the 1930 decade, I served as a member of the Colorado River drainage basin committee of the President's National Resources Committee. Also I have served as Assistant Secretary of the Arizona Colorado River Commission and in a water expert capacity for that body.

I also appear as president of the State-wide patriotic, nonprofit, nonpartisan Arizona Highline Reclamation Association, founded in 1923, which is the original organization formed for the purpose of diverting Colorado River waters from

Bridge and Glen Canyon Dam sites by gravity canal or by the Verde tunnel into central Arizona to develop several million acres and electrical horsepower.

I appear also as trustee for the Colter filings for and on behalf of the State of Arizona and water users under said projects. These filings were made beginning September 20, 1923, and thereafter, by the late Fred T. Colter, and supplemental filings thereto have been made by myself as his successor after his death. These are the prior and superior reservoir storage filings on the waters and power of the Colorado River and its tributaries and include some 40 dam, canal, and reservoir sites in the river system. The key and major units are the Glen Canyon storage and diversion dam, the Bridge Canyon storage and diversion dam, the Arizona All-Gravity Highline Canal, the Marble Gorge storage and diversion dam, and the Verde Tunnel, with the dams between them. All are to be developed as one unit with irrigation and power combined and irrigation superior, and the power revenues to pay for the irrigation, municipal, domestic, multiple uses of the water. The waters and power are attached to the land to develop 6,000,000 acres and 5,000,000 electrical horsepower, and the power revenue will more than overpay the entire cost, and the project conforms to maximum reuse of waters within the river system.

Due diligence has been maintained to these water rights and filings, which was vested in landholders thereunder. The preorganization Glen-Bridge-Verde-Highline Reclamation District, founded in 1923, and comprising lands under this project, is being completed, and when perfected will issue tax-exempt municipal bonds to finance these projects, and can make contracts with the Secretary of the Interior. I am president of this land-holders' district organization. All of this is intended if possible in cooperation with the Interior Department.

I have been duly authorized by both of these organizations to make this statement which they have endorsed. I will offer for the record at the end of my statement a resolution to that effect.

During this period of 24 years since these filings were made, our organizations have warned the people of Arizona of devastation such as now threaten them due to failure to make Colorado River waters available to the State of Arizona. During all this time, Arizona's officials, including the congressional delegation, have taken no effective action to ward off this disaster. Probably they did not realize the danger.

Although our organizations have had opposition to the actions we have proposed, everyone in Arizona, now that disaster is upon them, can see the need of immediate action, and as the legislature, the Governor, the congressional delegation have placed their sole reliance on Congress providing the money for this development to relieve the situation, I have no intention of being an obstructionist, and will plead just as long and earnestly as they will for the help of Congress, for immediate construction of the works necessary to provide Arizona with Colorado River water at the earliest possible time, and I offer this testimony for that purpose. This, however, is the immediate need and should by no means obscure development in a more economical manner. I have in mind here the construction of an all-gravity system.

We are not proposing anything that would purposely antagonize the Congress of the United States, but we most certainly will safeguard the right of the State of Arizona to preserve her own destiny. The State of Arizona has been subjected to more inequity economically and more handicaps have been thrown in her way to impede her progress than is the case with any other State in the Union.

My intention by putting up this picture of desolation is not for the purpose of bringing tears to the eyes of this committee, but is most earnestly intended to prevent widespread disaster within our State and the tears that will follow in the eyes of our people who depend upon agriculture for all they have in the world.

The State of Arizona, which contains the greatest share of the assets and physical properties of the Colorado River system thus far has been the least beneficiary of their development. Nor is this any ordinary matter of minor injustice which may engender some disappointment but no wounds that time will not heal if the State of Arizona should not receive her just rights in this matter. The present economic status and the future of Arizona depend entirely upon rapid and favorable action in this development. The State of Arizona has no water except the Colorado River system. The other six basin States have other rivers on which to depend, but Arizona, which is semiarid and the economy of which is based on water, has no place to look to except the Colorado River. Arizona has 92 percent of the power, 43.6 percent of the drainage basin, and 80 per-

cent of the irrigable land within the river system. The mild climate and the all-year growing season which has been responsible for expansion of agriculture, industry, and population, particularly in the central and southern sections of the State, have brought about a rapid growth which has resulted in a proportionately heavy drain on the tributary and underground waters within the State.

This has so lowered the levels of existing reservoirs on the tributaries and of underground water tables that disaster due to water shortage faces our irrigated valleys, cities, communities, and people, if water is not brought into the central part of the State from the Colorado River to relieve this water shortage. There should be no effort to evade the actual need of water for Arizona by using a supplemental water only demand. I am here to ask for the saving of our presently irrigated lands and for future growth as well by use of Colorado River waters, but our primary emergency is for supplemental water to save lands now under cultivation.

By this request, we are not asking for that to which we are not entitled, nor for anything which is within the power of Congress rightfully and constitutionally to withhold from us. Were Congress to fail us we have only to exercise compliance with technicalities of Federal law respecting navigation, rights-of-way over public domain, and matters of like general nature applicable to all reclamation projects, in order for the State of Arizona and those claiming under it to proceed with construction of this project independent of Congress. The eighteenth legislature of our State, in its regular session which adjourned in March feeling that Congress might take offense at such independent action by the State of Arizona, declined by the margin of one vote in the House of Representatives to pass House bill 83 which I introduced for this purpose. In explanation of my ideas in presenting House bill 83 to the eighteenth Arizona legislature, I said that I felt that Congress would more readily aid the State of Arizona if Congress were to see that we were trying to help ourselves, wherein we were preventing delay in this most urgent matter. By its action in rejecting that bill the legislature of Arizona has thrown the State of Arizona on the mercy of Congress.

We are not here as beggars but as equal members of the family of sovereign States. Congress may well and properly extend the mercy which the legislature of Arizona is expecting to prevent the certain decline and the possible destruction of our State by providing the necessary authorization and funds for bringing Colorado River waters to the central part of the State. Congress might choose to do this by authorizing a temporary expedient such as the Parker pump lift which we could not regard as our ultimate development, but we in Arizona would be grateful for whatever temporary aid the representatives of all of the States here assembled might see fit to extend to a sister State in danger of its life, and we would expect to foot the charges even for this temporary expedient, and to reimburse the good Samaritan who found us by the wayside. The development we seek is self-supporting. We admit that we are stricken but we deny that we are without the same legal and moral rights of other States. We deny that Arizona is not entitled to the same consideration and sympathetic hearing in these halls which any other State might have if beset with some natural calamity. Congress has even gone to foreign countries to extend such aid. Our country extended aid to the Japanese people in the prewar earthquake. Should Arizona expect any less?

Congressional aid in flood control is an accepted national policy. So is reclamation. One is as necessary to preservation of wealth and security in the Nation as is the other. I am not at all certain, in fact I greatly doubt, that Congress has yet awakened to the seriousness of our danger. There seems to be no lack of awareness of emergencies abroad. There is little opposition to the proposal to spend public funds for the emergencies of other countries, to give Mexico millions of dollars to fight hoof-and-mouth disease among cattle, billions to rebuild our former enemy, Germany, and four hundreds of millions of dollars annually for Greece and Turkey. Yet here in our midst one of our sister States, populated with our own kinsmen, faces an appalling prospect of impoverishment of its citizens and abandonment and loss of homes and property, which might render many of these foreign emergencies that so absorb us insignificant by comparison.

Arizona faces abandonment of half of its agriculture, doom of many of its cities and towns, and exodus of great numbers of its citizens. It has before it the fate which was suffered by Owens Valley in California and that of the Dust Bowl which was restored by your emergency aid which Congress did not hesitate to grant. Has Arizona any less claim on your sympathy and your aid? Remember, Arizona is your infant, the youngest of the States.

We have just emerged victorious from a world conflict in which we were compelled to resort to food rationing and approached the hunger which has been the affliction of Europe and Asia since time immemorial but which this land of freedom has thus far largely escaped. Under these circumstances would it be wise or foolish for Congress to stand idly by while hundreds of thousands of acres of cultivated lands in Arizona return to the desert from which they were redeemed by the ingenuity and work of our people, for the lack of a few dollars when compared to the vast amounts which we are handing out to foreign countries, and where the need of that agriculture may be felt again in the preservation of our democracy? Food riots are occurring in Germany. We would be far better off and the likelihood of peace will be enhanced, if we have plenty for ourselves and plenty to help others without denying ourselves what we actually need and should have.

In view of her record, there might be some justification for the dismembering of Germany, but for Congress to take no steps to prevent the dismembering of the State of Arizona would be an act which could not be classed as negligence nor as being intelligent. We come not to censure but to ask for our just rights. In asking those rights we ask to take nothing from other States. We request a helping hand which we feel we will be able to return in helping the people of other States who come to us for recreation, pleasure, and health, to say nothing of finding their fortunes in a new and developing State.

Since we have elected to come before Congress as though to a banker, we should recite to you our repayment experience at your hands. We are most certainly prepared to give you a financial statement second to none. We should point out that the advancing of money to self-liquidating projects, from a banker's point of view, is adding capital, not aking it away. The same thing is evident in the advancing of money to create additional wealth in any of the States. I realize that there is a struggle under way in Congress in regard to public power and another between the advocates of reclamation and those who believe they should oppose it, and yet another between the economy-minded who want the budget slashed and those who do not want it slashed. Legislation has been introduced to make power-producing irrigation projects pay 2 percent interest on Federal money advanced for power where no interest is now required. It has been stated in the press that a House appropriation subcommittee has decided to deny new appropriations for reclamation work during the next fiscal year.

Congress should not be overly concerned with such fiscal matters when disaster faces one of the States. Congress should regard this as an emergency worthy of the help of the Nation. It is a war against want and starvation which deserves the expenditure of money just as any other war without any fiscal consideration whatever. Billions were spent almost daily in World War II. We could not wait for expense thoughts. It was salvation we had in mind. So it is in this matter, the salvation of a State, not fiscal matters which Congress in its wisdom may decide in its leisure.

Shall Congress be willing to lend-lease a few millions to help save Arizona when it has lend-leased billions to help foreign countries which will never repay the advance, while Arizona can and will easily repay as her past history demonstrates?

A few short months ago crops on cultivated lands in the Republic of Mexico in the delta regions of the Colorado River were threatened with destruction in the hot summer months, due to water shortage. This Nation came to the aid of Mexico by releasing Colorado River waters through the All-American Canal to save our neighbor from great and irreparable loss, although we were under no legal or international obligation to do so. Arizona made no objection at that time, and we raise none now. It is a tradition of our Nation to help everyone, but Arizona is entitled to expect no less consideration from the Nation of which it is a part. We ask you to solve no water problems among the Colorado River Basin States or within Arizona. We ask you to take no part or sides in our interstate or intrastate differences which it is our business to settle. We make no such inappropriate request of Congress. But we do ask you to recognize the plight of Arizona as a national emergency which Congress should meet adequately and at once in the interest of the national welfare.

Congress will be as justified or more so in passing a law to build these projects to save the entire State of Arizona from desolation by water shortage as it was to pass the Boulder Canyon project act and build Boulder Dam to save a part of the State of California, the Imperial Valley, from destruction by flood. No one in Arizona objected to flood control for the Imperial Valley, and no one should object to saving Arizona.

S. 1175 authorizes construction of Bridge Canyon Dam and gravity tunnel. We are for that. You have an amendment to authorize the Parker pump lift to be constructed prior to the driving of the gravity tunnel, since it is claimed that the pump lift can be built more quickly than the tunnel can be driven. We do not object to the pump lift as a temporary auxiliary or stand-by to speed delivery of water to central Arizona. In fact, we are willing to support it for that purpose. But we will object to any provision in this bill which might construe this temporary expedient as a permanent fixture and a perpetual limitation upon Arizona, due to its limited capacity and the excessive cost of the 1,100 foot Parker pump lift to the farmers, and as a prohibition against future expansion of Arizona's irrigation through a gravity system from the Bridge Canyon Dam or by the Verde tunnel.

It would be far more economical and in the interests of the State of Arizona that the Parker pump lift be built to meet the present emergency, and then be retired from use except for stand-by purposes as soon as a gravity system is constructed. This stand-by plant may not have been necessary at all if the gravity project had been built before this emergency as our organizations have long urged, but the stand-by may have some value and we are now ready to concede it to be necessary on an emergency basis but not as the main or permanent reliance of the State of Arizona for water supply. Nearly 20 years ago United States Senator Ralph Cameron, of Arizona, at the request of Fred Colter, introduced a bill to construct the Glen-Bridge-Arizona-Highline Canal project at a cost of \$300,000,000. During the 1930 decade two applications were made by Fred Colter as trustee to the Public Works Administration for a \$350,000,000 loan to construct the Glen-Bridge-Verde Highline project. We have taken these and many other steps to finance and develop this gravity project and have urged this at previous congressional committee hearings over many years as we are again doing today.

It would not be fair to the State of Arizona, nor have we any reason to believe that honorable men in the other six Colorado River Basin States, or in any other States, would expect that as the price of a temporary expedient such as the Parker pump lift the State of Arizona should exclude itself from future development of lands within its borders.

The Parker pump lift is solely for the purpose of relieving the water shortage of lands already developed and cultivated. It will not irrigate any new land in our State from the Colorado River which is the only source from which this may never be done.

The officials of the State of Arizona and its legislature are entrusted with no authority to preclude the growth of the State. Neither can Congress, the other basin States, or the Interior Department demand it. If officials of Arizona were to agree to do so, no reliance could be placed on such an agreement, for whenever the people of the State chose to regain that which inherently and legally belongs to them and to the State of Arizona as the peer of any other State in the Union, they could so at will. No such demand can be enforced on Arizona by any interstate compact, by act of Congress, or by any undertaking or contract by the Secretary of the Interior, and I urge that no provision in S. 433 be used for this purpose. No court in the land would sustain it. Any attempt which might be made in this bill to relieve Arizona's present desperate plight at the expense of her birthright and future would be null and void and of no permanent effect.

I doubt that even those opposed to Arizona in Colorado River matters, if any there are, would desire to be placed in any such position. To render aid to a neighbor is humane and an act of friendship. To do so only upon condition of taking the greater part of his property would most certainly be a selfish act.

Having discussed the bill generally, I shall with your permission refer now to some of its specific provisions. Section 1 provides for the "generation of electrical energy as a means of making the project herein authorized a self-supporting and financially solvent undertaking." This provision should be made more exact as to the relationship between reclamation and power. Elsewhere in the bill, in sections 3, 4, 5, and 6 (b), control as to electrical energy is vested in the Secretary of the Interior, who is empowered to sell, distribute, and lease such energy. That the Secretary of the Interior can exercise no such authority on the Colorado River he has already conceded on more than one occasion and repeated in his last departmental report to the President. Legislation has been introduced in this session of Congress proposing a fiscal relationship between reclamation and power which is different from that proposed in S. 1175.

It has long been the policy of the reclamation States and of Congress to give preference to multiple-purpose water projects. This is right and natural, owing

to the fact that water is limited and necessary to all life. It has also long been the policy and the law of such States and the Federal Government to accord irrigation preference over power and to consider the former a higher use than the latter. Time and the inventiveness of man have confirmed the wisdom of this policy. It is freely predicted that atomic power before many years will be a strong factor in the price of electricity. But nothing can substitute for water in the growing of crops. Food for the human race is of greater importance than a source of power which may some day be relegated to the past like the faggot and the pine knot. A fight over hydroelectric power and interest rates is not consequential as compared with saving the agriculture of the people of Arizona. Furthermore, scientists are not ever likely to produce two drops of water from one, while very material changes might come in the matter of production of power.

Hydroelectric power development on the Colorado River should be in the light of this possibility and in accordance with rights under law. Such developments are subject to rights acquired under State water laws, the Federal Water Power Act, and other applicable Federal law. Valid water rights and filings under State law must be recognized by the Federal Power Commission under terms of the Federal Water Power Act. Under Arizona law, the water power at the Bridge Canyon Dam site referred to in this bill, together with all such power to be developed up the Colorado River, through the Grand Canyon, to the Glen Canyon Dam site near the Utah line, has been appropriated since 1923 by the Colter filings for the State and the people of Arizona made before the Arizona State water commissioner and Federal Power Commission. Under said filings, some 5,000,000 electrical horsepower to be generated at these sites and at drops on the gravity tunnel and canal system which will convey the water to Arizona lands, is combined with and made subsidiary to the irrigation to pay for the development of 4,455,000 acres in Arizona by gravity and 6,000,000 acres with reflow use.

This is the largest and most economical combined reclamation and power project in the world. The power developed will several times overpay the entire cost. This is proved by engineering survey reports by qualified authorities, including hypothesis 6 of the United States Reclamation Bureau report of September 1945 on comparison of diversion routes for the central Arizona project, in which a 2,000,000 acre-foot gravity diversion from Bridge Canyon Dam and tunnel, with a 4-mill charge for power, and 3-percent interest charge against power installation, shows a profit of nearly \$2,000,000 per year above all costs. I intend to offer for the record an analysis of this report. Previous favorable engineering reports on this gravity project were made by the Arizona engineering commission in 1922, of which the chairman was E. C. LaRue of the United States Geological Survey, the Sturtevant-Stam survey of 1923, the Arizona-Colorado Commission report of 1931-32, and the Scott engineering report of 1933.

The waters and power have been duly appropriated for use in Arizona and Federal funds advanced for development of this project will be repaid under the terms of existing law or under the terms of any proposed legislation now before Congress. The project can be financed either wholly or partly with Federal aid, or in the open market, through issuance of tax-exempt municipal irrigation- and power-district bonds. This district, which was started in 1926, is now being perfected, as I have already pointed out. Due warning and notice have been given from time to time by our organizations against any interference with these prior and superior rights by adverse contenders in this country or in Mexico. These prior water rights and filings antedate the Santa Fe-Colorado River Compact; the Boulder Canyon Project Act and all contracts thereunder; the building of Boulder Dam, Parker Dam, Imperial Dam, and Davis Dam; and the approval of the Mexican Water Treaty; and said rights are protected by the due-process clause of the Constitution, and by the laws of contracts, property, and water. We may feel certain that these protections in the end will prevail.

S. 1175 is silent as to the amount of water to be diverted into Arizona by the works for which it seeks construction. The bill, however, in sections 7, 8, 9, and 11 is made subject to the terms of the Santa Fe compact which purports to divide Colorado River waters between the upper and lower basins. It is not readily understandable as to why any such provision should be included in this bill. Since under terms of the compact there would be no water available to Arizona for the works proposed to be built for Arizona's benefit under S. 443, it would seem only common sense to strike these provisions from the bill, and I recommend that this be done. But we leave that entirely to you. We do not propose

to quarrel with Congress as to when it shall withdraw its consent to an interstate compact which has caused enmity instead of amity among the basin States, and has retarded development instead of promoting it, except for California and Mexico and the California power companies which have absorbed most of the benefits of funds appropriated by Congress for Colorado River development up to the present time. That is your province, not ours, and we leave you in undisputed possession of the Boulder Canyon Project Act until you are ready to dispose of it. The highest Court of the land has already afforded Arizona adequate protection against that act and the compact which governs it.

We want the help of Congress to get water on an emergency basis and without any ignoble surrender of our future. Our filings and rights do not conflict with any other legitimate interest. We will aid the upper basin States and want their help. We will help them to get all their projects within the basin built as speedily as possible, no matter how numerous or how much water they require within the basin. They in turn will not expect our assent to the diversion by them of an excessive amount of water out of the river system which would ruin their own development within the basin as well as that of other States such as Arizona in the lower reaches.

We will be forced to maintain against the upper basin States the justice of our position that they are endowed with no right to cut off the waters that Nature intended should flow to us after they have made all the use to which they can put them, in which we will gladly aid them. We have taken the necessary steps and given the necessary notices under law common to all States within the basin by which we have established and maintained legal rights to do what is natural, proper, and just in accordance with our rights in the Colorado River. This was our foresight and privilege and we harmed no man in so doing. Our projects conform to the maximum economical beneficial development of the entire river system beginning in the upper reaches as all conservation principles require. Under this procedure the river will not diminish its flow at the Utah line and there will be as much water running into the Gulf of California as before a ditch was ever taken out. That this is true is proved by the history of reclamation throughout the world.

But if it be desired to consign to the desert Arizona and the entire Colorado River system that object could be insured in no better way than by diverting out of the basin much of the limited waters it now has and forcing the remainder to the delta in Mexico after it has turned the power company turbines in the Grand Canyon, leaving Arizona high and dry.

As to California, we are willing that she should take what she has built works for, and California can expect to be limited since all the watershed takes is transported out of the river system. Why should not Arizona be free to take all that she is entitled to?

We recommend that S. 1175 be enacted with the two modifications I have suggested: first, the combination of reclamation and power, with the power to pay the reclamation expense; and, second, the elimination of reference to the Santa Fe-Colorado River compact from the bill.

I will now summarize the most pertinent facts that I wish to leave in the minds of the committee:

1. That Arizona must have water from the Colorado River.
2. That it must be made available without delay.
3. That Arizona has water for irrigation from only one river system and that is Colorado.
4. That the State of Arizona at the present time is making no effort to construct the works necessary to prevent disaster because a majority of the State legislature, the Governor, and the Arizona congressional delegation feared such action would be frowned on by the Congress and that a project of such magnitude would be too big for the State to undertake.
5. That these Arizona officials have thus placed us at the mercy of Congress.
6. That whatever money is spent for necessary dams, canals, and other works to bring Colorado River water into central Arizona purchases security or insurance against the present and future water shortages and disaster for Arizona and to some extent for the Nation as well.
7. That this is a National and State investment fully repayable with the repayment experience of Arizona showing both willingness and ability.
8. That Arizona is not asking any basin State to forego any rights it may legally have to Colorado River water and assumes every obligation and responsibility to repay the money advanced to build the central Arizona project which

S. 433 would authorize and advance the funds to build, providing the power and water revenues from the Bridge Canyon Dam and appurtenant works are credited to such construction repayment and reclamation development.

Whatever may be the status of compacts, contracts, treaties, or whatnot, we are not here to stand in the way of the passage of S. 1175 with proper amendments to insure the needed water for the State of Arizona at the earliest possible time.

We know by experience that we will get no water until we have the necessary dams built and canals constructed, and that all minor details which could be brought up at this time can be ironed out as required. There may be some people in our State who would be reluctant to leave all matters of water rights to the courts but I see no other way to quiet title to such rights.

Let us get the water first to avert a disaster in Arizona and take care of such matters later. Arizona is certainly entitled to all of the water that can be delivered by the project proposed in S. 1175.

We can take care of any additional water we are entitled to as soon as possible.

Since Arizona officials have placed full confidence in Congress to the exclusion of any other means of getting any water in central Arizona, we let the matter rest with you, and hope and pray that they are right. They place complete confidence in Congress and they rise or fall on your actions, for Arizona cannot survive without this water. To my mind this is asking of Congress what we declined to provide for ourselves. Nevertheless, I join other Arizona officials in making an earnest plea for passage of S. 433 with proper amendments which I have suggested. Right to my mind means only one thing. We are asking for that right. We hope that Congress will be able to conceive this as our right. Our rights are all that we ask. We expect no more. If our position were reversed you may be assured that your prayers would not go unheeded. We hope that the future of your State may never be in jeopardy as that of Arizona is today, but should that occur the people of Arizona would never hesitate to extend their aid to you. We confidently leave this matter in your hands, and pray that God will guide you to the right decision.

I now offer the record the resolution and analysis to which I referred earlier.

EXHIBIT I

PHOENIX, ARIZ., April 3, 1947.

JOINT MEETING OF ARIZONA HIGHLINE RECLAMATION ASSOCIATION AND GLEN-BRIDGE-VERDE-HIGHLINE RECLAMATION DISTRICT

Whereas hearings are to be held before congressional committees on S. 433 relative to diverting Colorado River waters into central Arizona: Now, therefore, be it

Resolved, That the Arizona Highline Reclamation Association and Glen-Bridge-Verde-Highline reclamation district do hereby authorize their president, Sidney Kartus, to testify in behalf of these organizations at such hearings and endorse and subscribe to the statements and data which he has prepared and will make and file at such hearings.

ARIZONA HIGHLINE RECLAMATION ASSOCIATION,
By SPECIAL RESOLUTIONS COMMITTEE:

ALBERT STEELE,
ARNOLD ABELSON,
J. B. WEBER.

GLEN-BRIDGE-VERDE-HIGHLINE RECLAMATION DISTRICT,
By ALEXANDER J. GADBOIS, *Secretary*.

EXHIBIT II

BRIEF OF REPRESENTATIVE SIDNEY KARTUS, ARIZONA WATER TRUSTEE, AT JOINT HEARING ON HOUSE BILL 83, COLORADO RIVER WATER AND POWER BILL, BEFORE COMMITTEES OF AGRICULTURE AND IRRIGATION, NATURAL RESOURCES, AND PUBLIC LANDS, ARIZONA HOUSE OF REPRESENTATIVES, EIGHTEENTH LEGISLATURE, FEBRUARY 12, 1947

House bill 83, introduced by 25 members of the house, provides for creation of a State-wide municipal irrigation and power district which under existing statutes will have authority to issue tax-exempt bonds to finance construction of the

Glen Canyon-Bridge Canyon All-Gravity Canal or Verde Tunnel project which was filed on beginning in 1923 and thereafter for the State of Arizona and water users under this major Colorado River project by the late Fred T. Colter.

This district, organization of which was initiated by Colter in 1923, will be able to make contracts with the Secretary of the Interior and others as necessary. It will be comprised of landholders under the project who will elect their board of directors to govern the district as required by law. This is democratic and places the resources of Arizona in the hands of the people to whom they rightfully belong.

The Arizona Emergency Commission of Natural Resources established by house bill 83 is to be a temporary body which is given the twofold task of perfecting this district and undertaking initial construction work. Both must be done. Some preconstruction details may require 2 or 3 years before excavation can start. Will we not be ahead if this is done now instead of waiting? All funds expended by the commission are to be repaid to the State within 40 years without interest by the district when completed. All costs will be borne by the lands to be benefited.

The sixteenth Arizona Legislature appropriated \$200,000 to be matched with the same amount of Federal funds for a joint State-United States Reclamation Bureau further investigation of this project. In September 1945 the Bureau submitted a preliminary report of 401 pages in which it compared the Glen Canyon-Bridge Canyon, Marble Canyon-Verde Tunnel, and Parker pump lift routes for diverting Colorado River water into central Arizona. House bill 83 calls for a gravity system. This Reclamation Bureau report was in addition to a number of previous such survey reports by qualified authorities, all of which had found these gravity projects both feasible and economical.

The Reclamation Bureau 1945 report is based on nine hypotheses, all of which are conjectural for the purpose of arriving at a conclusion as to the feasibility of bringing Colorado River water into central Arizona and generating power for sale. Naturally, power generation had to stand comparison with the prevailing wholesale prices. By steam generating plants or Diesels the costs are less than 1 cent per kilowatt-hour. Of course, it must be realized that every conceivable expense enters into and is a part of that cost. After calculating these costs, the engineers made up a number of hypotheses, each with a different set of figures. The cost basis then of 4 mills was decided as the cost per kilowatt-hour delivered at the load centers. The engineers always had in mind the cost factor per kilowatt-hour which had to compare with prevailing prices in the marketing area.

Now, let us see what a hypothesis is. Hypotheses, the dictionary says, is something assumed for the purpose of argument a theory to explain some fact which may or may not prove true.

From the amount of disagreement about the whole Colorado River problem and the assuming, for the sake of argument, that has raged off and on for 25 years it may be said that the word was coined especially to prove the great need for it in Colorado River matters. As for facts that cannot be proved as true, many presume Colorado River authorities, past and present, have studied and searched for facts, but they seem to be unable to prove them to be true. People greatly interested in the subject seem to be busy contradicting each other and disrupting facts that each other claims as such. Those who ask for harmony and cooperation do not seem to recognize it when it confronts them and is offered them. They are perhaps so busy, intentionally or otherwise, with their own in harmony and lack of cooperation that they do not take time to understand their contradictory position.

House bill 83 was designed to bring out the best possible reasoning concerning the Colorado River development. And everyone is invited to make constructive improvement of it to the end that we get water into Arizona at the earliest possible time. Let us all agree for a time that everybody who ever had an idea about getting the Colorado River water into central Arizona was, and is, right.

Let us all agree that we should lend every aid to our congressional delegation to get authorization from Congress in a proper bill for the money to start and complete the Bridge Canyon Dam and appurtenant works. Let us also agree that House bill 83 is a bill setting up an agency to do something if or when Congress fails to come to our aid, and an agency which must be organized sooner or later under law. Remember that there is nothing in House bill 83 that asks to squander the public money either Federal or State. There is only \$100,000 to be used to organize a landowners' district organization that can and will issue tax-exempt bonds to finance all or any part of the Glen-Bridge Dams and gravity canal project if Congress fails to help us to the proper extent when we need it and have waited long enough for it. The district must be organized at some time, and the sooner

it is the less we have left to do to get water. Is this not a sound idea? Some people may believe that we will not be able to sell these bonds. This is our chance to wipe out that contention. Others have had no difficulty in selling bonds far less attractive. We have greater assets than the Metropolitan Water District of Southern California which had no great difficulty in selling its bonds for construction of the Los Angeles aqueduct. Let us market these bonds if Congress fails to act or fails to advance the entire cost of the project.

We are told by some people that Arizona cannot run canals over Federal land. That is some more hypothesis that will not stand examination. We can clear that one up, too, if Congress fails to act. Our water rights and filings entitle us to 12 to 15 million acre-feet of water per year from the Colorado River. Others claim we may have less. We can clear that up, too.

House bill 83, if handled in the right way, will wipe out the power authority fight. For that is just a question of who can give the people of Arizona the most service for their money. The power authority develops their hypothesis and the private power distributors have developed theirs. The power companies have a long-time franchise voted by the people and it looks as though they have a monopoly on this proposition. The power authority can sell to them and thereby to the people or build a new complete distributing system. The public is wanting the best of everything they use for the least they can get it for. The power authority is preparing to take the business away from the private power distributors and the private power distributors have a monopoly to distribute power through a franchise given them by the people themselves, who in turn are not going to agree with the private-power distributors if the people think the power authority can give them a reduction in their cost of energy and as good service as they now receive. This adds up to one thing. They want the power for as low a cost as possible. The power company when they purchase their power for redistribution also want their power at a cost as low as possible.

Hypothesis 6 of the Reclamation Bureau report is based upon a 2,000,000 acre-foot diversion from Bridge Canyon Dam to central Arizona. The Bridge Canyon Dam is estimated at 673 feet high above stream bed and the Glen Canyon Dam at 414 feet. Power costs are to be repaid in 50 years at 3-percent interest, which should be 2 percent. Irrigation costs are to be repaid in equal annual payments over 100 years without interest. Power cost is estimated at 4 mills delivered at load centers, and water charge at \$2 per acre-foot at Granite Reef Dam or \$3 per acre-foot at the farm head gate. If California must have power and fuel is running short, and Arizona desires to sell some of her power temporarily to California, Arizona might well be justified in charging California somewhat more than 4 mills if cost of development of water justified. California has not hesitated to charge Arizona all the traffic would bear when in a position to do so, but I do not advocate a retaliatory attitude on our part.

But let us look into the matter of changing this hypothesis to give Arizona some consideration. California has enjoyed for years a cheap freight rate because of her natural advantage. She has enjoyed an abundance of oil and gas. She is favored with more rainfall to raise her crops. Through political advantage she has taken Colorado River water and put it onto her lands for much less than Arizona farmers had had to pay. If oil has become scarce, if gas must be brought into California, if the cost of fuel has gone up, then hydroelectric power may become more valuable. Arizona might at the earliest possible time ask to enjoy her natural advantage and still further reduce the cost of the project. Let us change hypothesis 6 from 4 mills to 5 or 6 mills for all the power we sell California temporarily with any adjustments to be made as time passes. The Reclamation Bureau report states that when the present generating facilities are insufficient and their owners buy power they are required to pay 8 mills per kilowatt hour. So a charge of 5 or 6 mills might not be excessive and would lower the project cost to Arizona considerably below the Bureau's estimate.

We seek no undue advantage of California. But we are entitled to the development of our resources, and to the protection of our State against ruinous water shortage.

Let us further examine hypothesis 6, using round figures. The cost of the entire Glen-Bridge Canyon gravity canal project is estimated in this hypothesis 6 at \$1,310,000,000. Out of this amount the charge to power is set at \$891,000,000 and the charge to irrigation at \$420,000,000, or roughly 3 to 1 in favor of power. The revenue from power is estimated at \$48,000,000, while revenue from irrigation is estimated at \$3,500,000. The proportion of power revenue to irrigation revenue on this basis is roughly 12 to 1 in favor of power. The charges of this project under this hypothesis based on the proportionate revenues derived from

power and irrigation, 12 to 1, would make the charge to the irrigation part of this project only \$110,000,000, if computed on the basis of revenue derived, while the charge actually made in the report to irrigation is \$420,000,000 or roughly one-third the entire cost.

Again using the Bureau's own figures and disregarding interest, it would require only some 19 years for the power revenue to pay off all costs charged to power. Using their own figures once more, it would take over 120 years for irrigation revenue to pay off the charges allocated to irrigation. There are no foreseeable conditions that would render the power possibilities beyond recovery. Obviously the Bureau in this report has allocated to power the lion's share of the benefits and treats the irrigation as if the revenues from it were on an equal basis when the approximate proportion is 12 to 1.

Everyone can agree that the generation and sale of power is more attractive to financial interests, but the State of Arizona is more interested in homes and security for its citizens. Irrigation alone can accomplish this. The Bureau has not taken this into consideration but has well taken care of the power business. We have no objections to the generation of power and realize its value in paying for the project. It will more than pay for all of this development, even on the Reclamation Bureau hypothesis, and far more so when Arizona receives the maximum water to which she is entitled under the prior and superior Colter filings to develop 6,000,000 acres and 5,000,000 electrical horsepower, with irrigation and power combined, and irrigation superior to the power which is to pay for the irrigation development. But we do object to the use of hypotheses which would reduce Arizona to the status of a water customer and does not give irrigation a square deal, making it possible for California to get low-cost power by use of an Arizona resource while Arizona foots the bill. Why should the State of Arizona be called on for a billion dollar project and its people saddled with an enormous expense to end the growth of this State and make possible cheap power for California while our water goes to that State and the Republic of Mexico under the Santa Fe compact and its contracts upon which this report and the hypotheses contained in it are based?

The billion dollar cost in the Reclamation Bureau report is a scarecrow which has caused some Arizonans to conclude that our life or death is in the hands of Congress. It is unwarranted as an irrigation charge, but even if it is conceded for only the small amount of 2,000,000 acre-feet and we foot the entire bill, about four times the amount of our annual sales-tax collection will pay the entire cost, without even counting the power potential, the value of the water calculated at least \$20 per acre-foot or more, or the many times multiplication of commerce, industry, and tax collections in Arizona. The highest estimates the Bureau can make at a time when prices are inflated as at present cannot make this project appear other than what it is and always has been, the world's largest, richest, and most feasible and economical combined reclamation and power project.

But let us pass House bill 83 and make sure that steady progress will be made toward that goal of getting water onto the lands of Arizona and converting hypotheses into figures that are arrived at by actual experience.

The legislators are our elected representatives, our board of governors. Certainly they are the ones to whom the people should look for constructive action in this matter. House bill 83 puts the destiny of Arizona in the hands of home people who are better able to understand Arizona's problems and to handle them. And House bill 83 can and should be considered and amended, if need be, to make the best possible bill out of it. No man, State, or nation can be blamed for trying to help themselves. We can be blamed for waiting on others without trying to help ourselves.

Now let us see what influences have brought the situation in which we find ourselves, in both the Colorado River power controversy and the water for irrigation stalemate as well:

There are those who are agreeable to giving private power companies a 25-year franchise for distribution and generation of power in Phoenix and franchises in other vicinities, and did not use their influence to prevent the Power Authority Act from becoming law. Either they thought that the power authority had very limited power or that it would agree to act only as a go-between agency in getting power from the Colorado River generating plants for the existing power distributors in Arizona. Or they might have been giving support to both franchises and power authority for reasons best known to themselves. The fact remains that both the power distributors and the Arizona Power Authority have been authorized to do business in the State and both

claim they can and will do the job better than the other and cheaper or both. The fact, however, that the private corporations have the monopoly on the sale of power in the most densely populated areas of Arizona for a number of years to come leaves the Arizona Power Authority with lots of power for sale with the customers for the power tied tight in the hands of present distributing private corporations, who can be gotten out of the way by purchase of their business only. House bill 83 will accomplish all legitimate purposes of the power authority more reasonably and more economically, and will bring the people of Arizona both irrigation and power. By separating irrigation water from the power it generates and making power preeminent, the power authority would minimize and destroy irrigation, which is the higher use.

The Colorado River water situation is another matter that these same influences might have the people of this State bring upon themselves. The plan is to enthrone bureaucracy, so that the people will have to look to Washington and Congress for everything they may get in the way of power or irrigating water from the Colorado River. There are those who will agree that the Federal Government should build and operate all dams on that river and generating plants also. But to agree is one thing and to get them to do it is quite another, even if all Arizonans were in agreement on that point.

But if the Federal Government does build these Glen-Bridge Dams and apportion works to deliver water into central and other parts of Arizona there is a crying need of a people's organization to look after their interests in this as against those of other States, especially California, and to prevent another power authority or a franchise-holding private corporation fight which places the people in the position of not knowing what they want or what they are doing.

Arizona citizens, if they do not pass House bill 83, will give to a Federal bureau the power over her destiny and share equally her natural advantages with California without any advantage to Arizona. California has not shared her advantages with us nor will she, and she has not surrendered them to any Federal bureau. The Metropolitan Water District of southern California and other California districts are the people's agencies of California to prevent injustice if possible. We are entitled to similar protection.

How can Arizona fight injustice and demand a square deal if we humbly turn Arizona back to Federal bureaus? What did we fight for statehood to win, equality in States' rights or to return to the status of a territory run from Washington, with no authority over the natural resources of our own State?

House bill 83 will set up our State-wide municipal irrigation and power district to look after our best interests. Arizona people will control their Colorado River power and water assets through the one agency over both departments, water and power, to look out for the State's interests, this to the exclusion of all adverse contenders either in or out of the State.

This is real cooperation. This is harmony insofar as harmony should prevail. A vote for House bill 83 is one to put Arizona people in charge of Arizona's assets. It is up to the eighteenth legislature to protect the people of Arizona in this matter.

SINDEY KARTUS,

Successor to Fred T. Colter, Arizona Water Trustee; President, Arizona Highline Reclamation Association; President, Glen-Bridge-Verde Highline Reclamation District; State Legislator.

Senator DOWNEY. Mr. Chairman, I believe it is our expectation that we will be able to finish with our witnesses tomorrow and I want to inquire of the chairman whether we will be in session on the Fourth of July?

Senator MILLIKIN. We will not be.

Senator DOWNEY. Thank you, sir.

Senator MILLIKIN. We will not be in session, and if California can finish tomorrow it will be deeply appreciated in the hope that we will not be in session on Thursday.

Senator DOWNEY. Mr. Matthew will be our witness this morning.

Senator MILLIKIN. Mr. Matthew, will you please state your name, address, and business.

Mr. MATTHEW. Thank you.

**STATEMENT OF RAYMOND MATTHEW, CHIEF ENGINEER,
COLORADO RIVER BOARD OF CALIFORNIA**

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 duty and responsibility of protecting and preserving the rights and interests of California in and to 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 and/or power from the Colorado River.

California's rights to Colorado River water are based in large part upon appropriations which are among the earliest on the river, supplemented by contracts executed with the Secretary of the 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 use of Colorado River water in an aggregate amount of 5,362,000 acre-feet annually, have been constructed and are in operation. Upon the integrity of these rights depend the irrigation of about 1,000,000 acres of land and the furnishing of a supplemental water supply for domestic and industrial use in the metropolitan areas of southern California with a present population of over 4,000,000.

The Colorado River board appears in opposition to the passage of S. 1175, which seeks to authorize the central Arizona project, for the following reasons:

1. The submission of this project to the Congress for authorization at this time is premature, because:

(a) The reports of the Bureau of Reclamation on the project are preliminary and subject to revision and no final report as to plans and as to engineering and economic feasibility has been made and none can be made until a large amount of additional surveys, investigations, and studies have been completed.

(b) The proposed authorization of this new project by a special bill circumvents the procedure set up in the Flood Control Act of 1944 through the O'Mahoney-Millikin amendments, which provide that an engineering report be prepared on any new project and that such report, before its submission to Congress, be referred to the affected States for review and comment. The procedure of the 1944 Flood Control Act should be followed in order to permit an orderly review and presentation of views and comments by the affected States for consideration by the Congress.

(c) No showing has been made that an adequate water supply will be physically and legally available in the amount contemplated to be diverted from the Colorado River for the proposed project. This is an essential prerequisite to any finding of engineering feasibility of a proposed reclamation project. The legal availability of water supply cannot be shown until a determination has been made of the respective rights of the lower basin States to the waters of the Colorado River

system under the Colorado River compact, the Boulder Canyon Project Act, and relevant statutes, decisions, and instruments.

(d) The estimates of water requirements for the project as set forth in the Bureau's preliminary reports are approximations based upon inadequate data and studies, and the calculations therein of required supplemental water supply are questionable.

2. According to the preliminary financial analyses presented in the Bureau's preliminary report on the project (project planning report No. 3-8b.4-1), the project is far from being economically feasible and self-liquidating under existing reclamation law, and if authorized would involve a large subsidy from the Federal Treasury. The authorization of such a reclamation project would be a drastic departure from the fundamental repayment policy of the reclamation law on which western reclamation is founded and previous projects have been authorized and constructed.

3. The basic estimates presented in the preliminary reports referred to in regard to firm power output and commercial power revenues are preliminary approximations without adequate support. Therefore, the major portion (over three-quarters) of the estimated project revenue, which is dependent on sale of power, is problematical.

4. The Colorado River board and the State of California are in disagreement with the State of Arizona's legal interpretation of the Colorado River compact, the Boulder Canyon Project Act, and related statutes, documents, and instruments, in regard to the amount of Colorado River water to which Arizona is entitled; and are not in accord with the assumption in the Bureau of Reclamation's preliminary report, based alone on Arizona's interpretation of its rights under that compact and related statutes and documents, that 1,200,000 acre-feet annually, or any part thereof, would be available for diversion from the Colorado River into central Arizona, having due regard for the rights of existing and authorized projects and other commitments.

Senator MILLIKIN. Is it your contention that Arizona is not entitled to any additional water from the Colorado River?

Mr. MATTHEW. Our contention, Senator Millikin, is that as to the amount of Water Arizona is entitled to under the compact, the Project Act and the related documents and statutes, a determination must be made in some appropriate way. As I will develop later, it is a fact that the water requirements of the existing and authorized projects in the lower basin will exceed the amount of water that will be available to the lower basin under full river development, and, accordingly, if those water requirements of the existing and authorized projects are fully satisfied, there will be no water available for new projects in the lower basin, and a project such as central Arizona project could be built and water used as contemplated, only at the expense of the existing and authorized projects.

Senator MILLIKIN. Let me ask you again—is it your contention that Arizona is not in lawful position to make any additional diversions from the Colorado River into Arizona?

Mr. MATTHEW. I think that would be our contention—yes. That is yet to be demonstrated.

Senator MCFARLAND. When you refer to existing and authorized projects, you mean in California?

Mr. MATTHEW. No. I mean in California and Arizona and the commitments in Nevada and Utah and New Mexico. There are a good many existing projects in Arizona.

Senator McFARLAND. Oh, yes.

Mr. MATTHEW. 5. Independent of any legal interpretations of the Colorado River compact and related statutes, decisions, and instruments, the water requirements of existing—operating—and authorized projects, together with recognized commitments, in the lower basin, exceed the water supply that can be made available to the lower basin under full development of the Colorado River system. If the requirements of existing and authorized projects are satisfied, in the lower basin, including the proposed Gila project as now contemplated under bills now pending before the Congress, no water will be available for any new consumptive use projects in the lower basin such as the central Arizona project. The proposed diversion and use of Colorado River water by the central Arizona project, if consummated, would be at the expense of projects now operating or authorized or for which commitments have been made.

BUREAU'S REPORTS ON PROPOSED PROJECT

The most recent report of the Bureau of Reclamation on the central Arizona project is Project Planning Report No. 3-8b. 4-1, dated February 1947, on feasibility of Bridge Canyon route, together with a supplement on the feasibility of Parker route and a comparison of the two routes. It was prepared by Regional Director E. A. Moritz and transmitted to the Commissioner of Reclamation on February 14.

This report presents preliminary studies comparing the economic feasibility of those two alternate routes. The conclusion is drawn that "the Parker route is the better of the two alternatives, all factors considered." The only recommendation in the report is "that detailed studies of the central Arizona project be concentrated on the plan employing the Parker route."

On April 11 Commissioner of Reclamation Straus transmitted a copy of this preliminary report to the Governor of California—

pursuant to the provisions of section (1a) of the Flood Control Act of 1944 (58 Stat. 887), which prescribes that the Department of the Interior give to the affected State or States, during the course of the investigations, information developed by the investigations. * * *

In his letter of transmittal, Commissioner Straus stated:

The reports have been designed to present facts to assist in the comparison and selection of the best one of three possible routes for bringing water into the central portions of Arizona. * * * As you will observe, these reports give information as developed to date from our investigations of the central Arizona project. *As these investigations are in a preliminary stage, the values or figures derived and included in the report are not final and have not been approved by the Department.* [Emphasis supplied.]

On April 30 preliminary comments of the State of California were submitted to Regional Director E. A. Moritz by Director of Public Works C. H. Purcell, acting as the State official designated by the Governor of California to handle Federal reports under the Flood Control Act procedure, with the request that they be filed with the Public Lands Committee, holding hearings on the Central Arizona project bill, and

with the further understanding that final views and recommendations of the State of California would be submitted upon the proposed report of the Secretary of the Interior on the central Arizona project after the final report is prepared and sent to the affected States for review. A copy of these preliminary comments was forwarded to Commissioner Straus on the same date. Copies of these communications are annexed hereto as exhibits A and B.

Senator MILLIKIN. Just a minute, Mr. Larson; have the other States furnished their preliminary reactions to your preliminary report?

Mr. LARSON. Yes; they have, Mr. Chairman.

Senator MILLIKIN. All the States affected?

Mr. LARSON. That is right.

Senator MILLIKIN. Will you continue, Mr. Matthew.

Mr. MATTHEW. In spite of the clear statement in the Bureau's most recent report and in Commissioner Straus' letter transmitting said report to the affected States, that "the investigations are in a preliminary stage" and the "figures derived and included in the report are not final," and that the only recommendation in the report is that "detailed studies * * * be concentrated * * * on * * * the Parker route," the bill (S. 1175) has been introduced seeking to authorize this project, involving an estimated cost in round figures of from \$600,000,000 to \$1,000,000,000.

Until a large amount of additional investigations and studies is made in regard to this proposed undertaking, with respect to availability of water, water requirements, engineering plans, hydroelectric power output and disposal, cost estimates, and economic and financial analyses, the information available is entirely insufficient for consideration of authorization by the Congress. Of basic importance to consideration of authorization of any new project, it is essential that a showing be made that there will be an adequate and dependable water supply available therefor. This is the prime prerequisite of engineering feasibility for any new reclamation project. Investigations must be made to determine not only the physical availability of an adequate water supply but also the legality of its proposed use. In the case of this project, no such showing has been made, nor can it be made until the respective rights of the lower basin States to the waters of the Colorado River system have been determined. Obviously, no project should be authorized until the most important basic factor, that an adequate water supply is available, can be satisfactorily demonstrated.

The carefully laid out procedure of the 1944 Flood Control Act should be followed on this as well as other new projects in order that interested States and other departments of the government concerned may have an opportunity to review the plans and other aspects of such proposed projects and to submit their views and comments for the consideration of the Congress.

AVAILABILITY OF WATER SUPPLY FOR PROJECT

The Bureau's preliminary report on the proposed project contains the following statement with respect to available water supply:

(b) Colorado River: The average annual virgin flow of the Colorado River at Lee Ferry, the point of demarcation between the upper and lower Colorado River Basins, is estimated to be 16,270,000 acre-feet. The amount of this flow which

may be diverted for use in the State of Arizona must fall within the provisions of various compacts, agreements, and contracts and a treaty between the United States and Mexico. Many of these documents are subject to conflicting interpretations. It is not the intent of this report to interpret the legal aspects of allocating the water of the Colorado River. Responsible officials of the State of Arizona have made interpretations of existing contracts and compacts for Colorado River water.

On the basis of these interpretations, it is estimated that the Colorado River may be depleted 1,077,000 acre-feet a year for the central Arizona project. It is assumed that diversions from the Colorado River for the central Arizona project may be made to the full extent of the 1,077,000 acre-feet, plus any water which would return to the Colorado River as a result of this development. * * *

Senator DOWNEY. May I intervene with one question? I thought the Bureau here, based upon certain assumptions, did find there was enough water for 1,200,000 acre-feet for the central Arizona project. You used the figure 1,077,000 acre-feet.

Mr. MATTHEW. I am quoting from the Bureau's report. The difference between the two figures is this, Senator: The 1,077,000 acre-feet is determined, based on Arizona's interpretation of compact and related documents, as to the net amount of water she would have available for the central Arizona project and all of her other projects which she is contemplating. The 1,200,000 is computed from this 1,077,000, with allowance for assumed return flow.

Senator MCFARLAND. In other words, is it estimated we depleted the river 1,200,000 acre-feet?

Mr. MATTHEW. That is right. That follows right along here, Senator.

Senator DOWNEY. Thank you.

Senator MILLIKIN. Go ahead, please.

Mr. MATTHEW. I was quoting:

* * * It would ultimately be necessary to release water from the area to maintain proper salt balance. Since the net effect of such a release would be to return about 10 percent of the diverted water to the Colorado River, it is estimated that 1,200,000 acre-feet could be diverted annually.

With respect to the foregoing statement, no mention is made of the fact that responsible officers of the State of California have arrived at a contrary conclusion. The water-supply figures cannot be considered as either definite or certain but merely as a reflection of Arizona's interpretations of the Colorado River compact and related statutes and documents.

The Colorado River Board and the State of California are in complete disagreement with Arizona's legal interpretations of the Colorado River compact and related statutes and documents in regard to the amount of water that Arizona is entitled to.

Arizona contends that, in addition to 2,800,000 acre-feet annually of the waters of the Colorado River system allocated by article III (a) of the Colorado River compact, she is entitled to the entire 1,000,000 acre-feet of water which the lower basin may use under article III (b) of the compact. In addition, Arizona contends that she is chargeable under the compact for the use of Gila River water only to the extent that such use would deplete the flow of the Gila River at its mouth.

Senator DOWNEY. May I ask how much is actually involved in that first item—how much water?

Mr. MATTHEW. Well, it is in two parts: One is the III (a) water of the compact and one is III (b) water.

Senator DOWNEY. I understand about the depletion theory. There is a million acre-feet involved in that. How much is involved in the other one?

Mr. MATTHEW. It has to do with what Arizona is chargeable for on the Gila River—whether on the depletion basis at the mouth or on a consumptive-use basis. The amount of water amounts to another million acre-feet.

Senator DOWNEY. There is 2,000,000 acre-feet involved in Arizona contentions?

Mr. MATTHEW. Yes.

Senator McFARLAND. I don't want to interrupt, and perhaps the witnesses will cover these matters; however, I think that when witnesses present certain data, they should also state the source of that data, instead of merely stating unsupported figures. That isn't any evidence; that is just a conclusion. I think we ought to have the source of the information. Maybe the witness will do so before he gets through. No one should decide the case and resolve anything on statements like that.

Senator MILLIKIN. The witness has made two statements in this paragraph.

Senator McFARLAND. I wasn't referring to his statement. I was talking about the oral statement just made.

Mr. MATTHEW. I can support that statement, Senator, briefly. On a consumptive-use basis, according to California's opinion, Arizona would be chargeable on the Gila River to a consumptive use of 2,300,000 acre-feet. Arizona contends she would be chargeable only for depletion of the Gila River at its mouth.

Senator MILLIKIN. From virgin flow, with the virgin flow as your reference point?

Mr. MATTHEW. Yes, sir. That depletion would be computed from the virgin flow that the Bureau estimates at the mouth of the Gila, or 1,300,000 acre-feet.

Senator McFARLAND. I understand what your contention is. But my contention is, Mr. Chairman, as I pointed out yesterday, that at Granite Reef Dam we divert all the water of the Salt River; then, by return flow, there is more water entering the river; and lower down the river at Arlington all of the water is diverted again for the Buckeye district. The same process takes place at Gila Bend at the Gillespie Dam, and there is a return flow for use and reuse. I don't want to interrupt the witness, but I just say that I don't think that kind of evidence is any good unless it is substantiated by the source.

Senator MILLIKIN. Let me ask you, Senator McFarland: Is this a correct statement of the contention of Arizona? Arizona contends that, in addition to the 2,800,000 acre-feet annually of the Colorado River allocated by article III (a) of the Colorado River compact, she is entitled to the entire 1,000,000 acre-feet of water which the lower basin may use under article III (b) of the compact?

Senator McFARLAND. That is correct. As was pointed out by Mr. Howard here yesterday, if III (b) water is apportioned water, California wouldn't be entitled to any part of it.

Senator MILLIKIN. What I am getting at—is that Arizona's contention?

Senator MCFARLAND. That is correct.

Senator MILLIKIN. Is it Arizona's contention that she is chargeable, under the compact, for use of Gila water only to the extent that such would deplete the flow of the Gila River at its mouth?

Senator MCFARLAND. That is correct.

Mr. MATTHEW. I think I might make one remark. I don't want to be argumentative, but the statement as to the consumptive use of water in central Arizona is just simply this: It has nothing to do with the use or reuse. The inflow into the Phoenix area is in excess of 2,300,000 acre-feet a year according to the Bureau's figures and all of that water is used. I don't think that would be disputed. That is just simple fact.

Senator MCFARLAND. I said we would rather go on facts rather than just a statement from California. We would like to know where the information comes from.

Mr. MATTHEW. That comes out of the Bureau's report, Senator.

Senator MILLIKIN. Go ahead please, Mr. Matthew.

Mr. MATTHEW. In California's opinion, both of these contentions are unsound and cannot be legally supported. The United States Supreme Court has already declared against Arizona's first contention. As to the second contention, it is California's opinion that the compact is clear that Arizona is properly chargeable thereunder with the actual consumptive use of water of the Gila River and its tributaries at actual places of use. If either of these contentions of Arizona proves to be wrong, the result will be an inadequate water supply for the project.

In the synopsis of the Bureau's preliminary report previously referred to, it is stated that "the amount of water available for diversion from the Colorado River to the central Arizona project cannot be precisely determined at this time." The report should also state the reason why, namely, that such determination can only be made after the basic determination has been made of the allocation of waters of the Colorado River system among the Lower Basin States under the Colorado River compact and related statutes and documents, and in turn, the State of Arizona has determined how its share of Colorado River system waters is to be divided among the existing or authorized projects and proposed projects in that State.

Senator MILLIKIN. Mr. Matthew, I would like a further enlightenment on the last part of your preceding paragraph. You said:

* * * and in turn, the State of Arizona has determined how its share of Colorado River system waters is to be divided among the existing or authorized projects and proposed projects in that State.

Assuming merely for the purpose of assumption, that Arizona or the interested parties in Arizona committed themselves to the use of water, water would be diverted from the Colorado for the purpose of this project, is it your contention Arizona would have to go further and achieve determination of all her other water rights in the State?

Mr. MATTHEW. The point is, Senator, that there is a certain total amount of water that Arizona is entitled to yet to be determined, from the Colorado River system. Now, then, within that total entitlement, Arizona has to make the decision as to how she is going to divide water among her projects.

Senator MILLIKIN. Assuming there is impingement on the internal distribution of water by Arizona of the Colorado River over rights of other Arizona parties to the Colorado River, it is no concern to any other outside party how Arizona handles her internal water.

Mr. MATTHEW. That is her business.

Senator MILLIKIN. As far as this project is concerned, merely by way of assumption, by way of enlightenment, if this project were authorized and if it proceeded, and if the amount of water necessary to maintain it were thoroughly committed to the project, so that would be the interest of this committee in how Arizona handled the rest of its internal water problems?

Mr. MATTHEW. Well, the only point is, Senator, that there is just a certain total amount of water that Arizona would be entitled to use.

Senator MILLIKIN. The case that I put to you assumes that at least, in the judgment of Congress, they would be entitled to use water for support of this project, assuming that were determined, would the Congress have any further interest or this committee have any further interest in how Arizona resolved the rest of its internal water problems?

Mr. MATTHEW. I think fundamentally that this committee would be concerned with determining satisfactorily if there was a water supply in fact for this project.

Senator MILLIKIN. Of course.

Mr. MATTHEW. And that depends upon two things—how much water Arizona is entitled to from the Colorado River system, and, secondly, what are the requirements of their existing and authorized projects or any other projects they propose; in other words, to see whether the balance left over is enough for this project.

Senator DOWNEY. Mr. Chairman, if I may intervene. It seemed to be the issue upon the Gila project bill that this committee recently approved and was passed by the Senate. Suppose the Supreme Court should decide that Arizona is entitled to 750,000 acre-feet above the needs of its present projects, then the question would be, if no binding decision has been made by Arizona, would it be the case that the Gila project would be entitled to 600,000 out of the 750,000, or if Congress had also approved the central Arizona project, would this project take the whole?

Senator MILLIKIN. I don't think there is any question. I don't think anyone suggested it isn't the duty of this committee, and, if we go further, ultimately of the Congress, to determine whether there is enough water to build these projects.

Senator DOWNEY. Say above and beyond the Mohawk.

Senator MILLIKIN. I think the way I have stated it answers the question completely. Our job would be to determine whether there is enough water for this project and that further includes a consideration of waters which have been allotted to other projects.

Senator DOWNEY. Mr. Chairman, you have stated it very clearly, but in the Mohawk bill Congress is in a new departure, because that project does not as yet, and may not for a long time, have any contract with the Secretary of the Interior, which is the method prescribed in the existing statute.

Senator McFARLAND. Oh, yes; we have a contract. I might put it in the evidence now, if the Senator hasn't seen it.

Senator DOWNEY. If there is a contract with the Secretary of the Interior on the Mohawk, I had not been aware of it.

Senator MILLIKIN. The Chair is not determining anything now. The Chair is seeking enlightenment now. The Chair is simply saying that obviously this committee and, if it should go further, Congress must determine whether there is enough lawful water to sustain that project.

Senator MCFARLAND. We are not attempting to settle that.

Senator MILLIKIN. Go ahead please.

Mr. MATTHEW. Return flow: The foregoing quotation from the Bureau's preliminary report contains a statement that there would be a return of "about 10 percent of the diverted water to the Colorado River." The amount of such return flow was estimated at 20 percent in a previous preliminary report. If any water passes Gillespie Dam, one of two results will follow——

Senator MILLIKIN. Just a minute. Let me get Gillespie Dam located.

Mr. MATTHEW. That is the lower end of the main Salt River Valley development, Senator.

Senator MILLIKIN. That is the exit to the last stretch of the Gila.

Mr. MATTHEW. Yes, the end of the main development.

Senator MILLIKIN. Go ahead please.

Mr. MATTHEW. (1) Either it will be lost in the wide, sandy bed of the Gila River between Gillespie Dam and Yuma, or (2) if it can be diverted from the river or subterranean flow, it will be taken and consumed on Arizona lands. In view of the realities of the situation, there is no assurance that there would be any return flow to the Colorado River; there is much evidence that there would be none. Accordingly, no allowance should be made for return flow in any such calculation.

WATER REQUIREMENTS

The report under review briefly sets forth certain figures developed by the Ground Water Division of the Geological Survey in regard to the use of ground water and the overdraft on the ground water supply in the project area, and presents a general analysis based on certain assumptions from which the water requirements of the project under ultimate development are estimated at 1,082,000 acre-feet (table II, p. 9 of report). No data are presented in support of the assumptions and figures used in the estimates.

In connection with the estimation of the requirements for supplemental water for the gross area of 662,000 acres as given in the report, the methods employed therefor and the resulting amounts of supplemental water as calculated appear erroneous. Monthly operation studies should be presented setting forth the total annual water requirements by basins for the entire net irrigable area and the local water supplies available, utilizing the storage capacity both in available surface and underground reservoirs and covering a cycle of years.

With respect to the determination of safe yield and overdraft in a ground water basin, such determination involves evaluation of all items entering into the hydrologic equation. Apparently this has not been done. Preliminary estimates from available basic data indicate the overdraft on ground waters is much less than the figure used in the analysis. Importation of water from the Colorado River to the central Arizona project in excess of actual requirements for consumptive uses would necessitate works for artificial disposal of such

excess from the basin to prevent damage to the area. Decrease of proposed diversion, to actual water requirements for water conservation and maintenance of salt balance, may vitally affect revenues, unit costs and feasibility of the importation. Obviously, a plan of comprehensive development of the project area should be preceded by a complete and thorough hydrologic and geologic investigation.

Senator MILLIKIN. Mr. Matthew, you have the statement here, "Apparently this has not been done." Referring to determination as to safe field and overdrafts in a ground water basin.

Preliminary estimates from available basic data indicate the overdraft on ground waters is much less than the figure used in the analysis.

What is the documentation of those preliminary statements?

Mr. MATTHEW. Well, those are based on preliminary analysis that we made to look into this matter. I do not consider personally, as an engineer, that the basic data are sufficient to make the determination at this time, so that such analyses as we made I consider very preliminary, just as preliminary as the figures in the Bureau's reports.

Senator MILLIKIN. Mr. Larson, have you made a detailed study of the safe yield well history in the area?

Mr. LARSON. We made a study based upon the records of the Geological Survey. The Ground Water Division has made some studies in the area to determine annual yield of the basin. Some of the basin studies are in detail, some are not. Safe annual yield as they indicate, in my opinion, is reasonably close.

Senator MILLIKIN. Is there in your opinion any question as to depletion and the rate of depletion and the amount of depletion of the water tables that we are discussing?

Mr. LARSON. I think the rate of depletion as set up in my statement is reasonably close. It may vary a little and the results of more detailed investigation would be changed to some extent, but as far as the feasibility of the project is concerned, it would have little effect for this reason. The main feature that will determine the feasibility of the project, that is, the repayments, is in the sale of power. For example, under our present reclamation law the project would pay out at 5½ mills. A different modification of that repayment plan would modify the necessary rate that power would have to be sold for to pay out the project.

Senator MILLIKIN. I wasn't quite driving at that. The point has been made here that the underground reservoir is suffering great depletion and that the effect of that is to retire from irrigation a considerable portion of land, and that this will increase unless lands are progressively retired from irrigation. Have you enough well data upon which to satisfy yourself that that is correct?

Mr. LARSON. That is right. Yes, they are greatly overdepleting the ground water supply.

Senator MILLIKIN. And, does that rest upon study of individual well records, in your opinion?

Mr. LARSON. Yes, that is correct.

Senator MILLIKIN. And, is it your contention, Mr. Matthew, that information is inadequate?

Mr. MATTHEW. It is very definitely so.

Senator McFARLAND. Would you suggest, Mr. Matthew, that we dig more wells?

Mr. MATTHEW. Oh, it has nothing to do with that, Senator.

Senator McFARLAND. What does it have to do with?

Mr. MATTHEW. I have read the preliminary reports of the Geological Survey. I have talked with their engineers. I know that their investigations have hardly started there, and that this computation of safe yield and overdraft is a very rough approximation.

Senator MILLIKIN. Proceed please.

Senator McFARLAND. I would like him to state what needs to be done in order to determine these things. What is required? I think he should tell us.

Senator MILLIKIN. I wouldn't say he has the burden of that.

Senator McFARLAND. That is all right. I withdraw the question.

Senator MILLIKIN. He should consider whether his testimony will be strengthened if he did do it.

Senator McFARLAND. I withdraw it.

Mr. MATTHEW. It is not any opinion of mine. It is the statement of the Geological Survey people I have talked with, that investigations are only just started, sir, and I know that the data are not available with which to make this analysis on a proper basis.

Senator McFARLAND. I was only interested. If your information is only through hearsay—

Senator MILLIKIN. Will you come in here with your own data to rebutt the statements which have been made as to the underground reservoir depletion?

Mr. MATTHEW. Well, sir, in my opinion the information is not complete enough to make a worthwhile engineering analysis of the situation.

Senator MILLIKIN. In other words, you won't come in here with it?

Mr. MATTHEW. I don't think it can be done. I don't think reputable engineers would undertake it.

Senator MILLIKIN. I am just suggesting. I am trying to see whether the issues are joined and how they are joined. I am not asking you to do it. I am simply asking you whether you will do it.

Mr. MATTHEW. I didn't intend to, Senator.

Senator MILLIKIN. Very well.

Senator DOWNEY. Mr. Chairman, may I intervene with one comment. I believe a Bureau witness, Mr. Warne, Assistant Secretary, did state it would take a full year to complete this investigation.

Senator McFARLAND. Now, Mr. Chairman, I think we are getting afield somewhat but all this data is in and I think it will include Mr. Mr. Warne's statement.

Senator MILLIKIN. The testimony will speak for itself.

Mr. MATTHEW. I will supply a statement as to the inadequacy of the figures that are in the Bureau's report on this matter.

Senator MILLIKIN. I am not asking that you do it. However, if you do it, it will be received and put in the record.

(This information appears as supplemental statement No. 1 at conclusion of Mr. Matthew's presentation.)

Mr. MATTHEW. I would be very glad to do it.

Senator MILLIKIN. Will you go ahead, please.

Mr. MATTHEW. A large amount of additional investigations and studies will be required as to supplemental water supply to take care of developed areas. Final plans for the proposed project cannot be made until these additional studies are completed and the water requirements determined.

FINANCIAL ASPECTS

Bureau report: The report of the Bureau of Reclamation on the central Arizona project (Project Planning Report No. 3-8b.4-1, dated February 1947) presents preliminary plans, cost estimates and financial analyses of two alternate routes. The conclusion is drawn that "the Parker route is the better of the two alternatives, all factors considered." The capital cost of the project, based on the Parker route, is estimated by the Bureau at \$604,717,000.

The financial analyses presented in the report as to the Parker route demonstrate that the probable returns of the project from sale of hydroelectric power and water will not be sufficient to meet the repayment requirements of existing reclamation law. Power revenues are based upon 4 mills per kilowatt-hour delivered at load centers; and water revenues at prices of \$4.50 per acre-foot delivered at farm headgate for irrigation and 15 cents a thousand gallons for municipal water supply. The Bureau's analyses show that, in order to make the project self-liquidating with the repayment of all reimbursable costs in 50 years, the price of power would have to be 5½ mills per kilowatt-hour at load centers. They also show that the repayment period would have to be extended to 87 years under the rates for water of \$4.50 per acre-foot and power at 4 mills per kilowatt-hour.

The report further shows that if, in addition to flood control and fish- and wild-life, costs allocated to silt control and recreation were made nonreimbursable, and if the interest rate on commercial power investment were reduced from 3 percent to 2 percent and the repayment period for costs allocated to irrigation were extended to 80 years, the estimated average annual returns would be about equal to the estimated average annual costs. These proposed modifications were incorporated in a bill (S. 2346, 79th Cong., 2d sess.) and the Bureau's study contained in the report, on the basis of these modifications, was made pursuant thereto.

However, both of these financial analyses, either under existing reclamation law or indicated modifications thereof, are based upon the assumption that the interest component on the commercial power investment charged in power rates is properly applicable to repayment of the capital costs allocated to irrigation, and the foregoing indicated results as to feasibility reflect that assumption. In effect, such an application of the interest component on power investment means that no interest on power would be paid into the United States Treasury and the result would be that all reimbursable costs including the costs allocated to commercial power would be interest-free. The figures shown in the Bureau's report of estimated annual costs do not include interest on the power investment.

Senator McFARLAND. May I just ask one question. Is that the component used in the Central Valley project for California?

Mr. MATTHEW. The Bureau of Reclamation has a report out, Senator, in which that is indicated.

Senator McFARLAND. That is all.

Mr. MATTHEW. The question as to whether the interest component on commercial power investment is properly applicable to repayment of capital costs of irrigation or other project costs under existing Reclamation law, or should be so applied, has been and is still under consideration by Congress. It is believed, however, to be the clear intent

of existing law that the interest component on commercial power investment which is included in commercial power rates and collected in commercial power revenues is to be paid as such into the United States Treasury and, therefore, should be considered as a fixed charge to be paid by any project in connection with studies of feasibility.

REVISED FINANCIAL ANALYSIS UNDER EXISTING RECLAMATION LAW

Financial analyses are presented herein based on the assumption that the interest component on power investment charged in commercial power rates and collected in commercial power revenues is not applicable to repayment of the capital costs of irrigation and other project costs, and that such interest component is a necessary part of project costs in addition to repayment of all reimbursable capital costs, operation and maintenance expenses, and replacement. Otherwise, the analyses are based upon capital and annual costs and power and water revenues as estimated by the Bureau of Reclamation in the report referred to.

Annual returns and costs: Estimates of annual costs under existing Reclamation law assume repayment of commercial power investment in 50 years at 3 percent interest, municipal water supply investment in 40 years at 3 percent, and irrigation investment in 50 years without interest. In these analyses that I am presenting, Mr. Chairman, there is one item of annual cost that is treated differently than by the Bureau. The Bureau in their study assumes a repayment period of 50 years for municipal water supply. In this study we have assumed 40 years, considering that this is what the Reclamation Project Act of 1939 provides.

The estimated average annual costs would be \$23,762,700, including interest on the commercial power at \$4,652,400. The estimated annual average returns would be the same as estimated by the Bureau, namely, \$14,810,300. The resulting return-cost ratio would be 0.62 to 1.

In order to provide sufficient revenue to secure repayment in 50 years, one of three alternatives would be required:

1. With irrigation-water revenue based on \$4.50 per acre-foot at farm headgate, the commercial power rate would have to be increased to 7.13 mills per kilowatt-hour at load centers; or

2. With commercial power revenues based on 4 mills per kilowatt-hour at load centers, the charge for irrigation water at farm headgate would have to be increased to \$18.56 per acre-foot; or

4. With commercial power revenues based on 4 mills per kilowatt-hour at load centers and irrigation water revenues based on \$4.50 per acre-foot at farm headgate; as assumed in the Bureau's report, a capital subsidy from the United States Treasury of \$447,545,000 would be required.

Estimated annual costs include \$5,130,600 for operation and maintenance and \$1,985,700 for replacement reserve or a total expense for these items of \$7,116,300. The net average annual revenue available after deducting these expenses is less than 3 percent of the commercial power investment. Accordingly, it is found that no repayment could be made on the reimbursable capital costs. In other words, the project could never repay the reimbursable costs under existing law.

Senator MILLIKIN. Are you in agreement with the Bureau on the Bureau's assumptions as to repayment periods?

Mr. MATTHEW. Substantially so, yes, sir; that is, where they are assuming the interest component on commercial power investment is properly applicable to retirement of capital or, in other words, there is no interest charges for commercial power investment at all.

Senator MILLIKIN. You are contrasting the Bureau's theory against the present state of the law, as you see it?

Mr. MATTHEW. Yes, sir.

Senator MILLIKIN. Let me suggest a 5-minute recess at this time.

(A short recess was taken.)

Senator MILLIKIN. The meeting will come to order.

Senator DOWNEY. Mr. Chairman, before the witness leaves that point, I would just like to bring out a fact or two. What was done with the interest component in the project program of Hoover Dam, as far as power is concerned?

Mr. MATTHEW. Well, in the case of Hoover Dam, Senator, the original act provided that 4-percent interest should be paid into the United States Treasury, in addition to repaying the entire capital cost of the dam, reservoir, and power plant in 50 years. That was changed a little by the Adjustment Act of 1940. The interest rate was reduced to 3 percent. It was all paid in to the United States Treasury and none of the interest used to repay capital.

Senator DOWNEY. Mr. Chairman, if you don't want me to develop this, I would desist. I understand there is a bill pending in the House of Representatives known as the Rockwell bill which has been favorably acted upon by the Subcommittee on Public Lands over there; is that right, Mr. Matthew?

Mr. MATTHEW. That is correct.

Senator DOWNEY. What does that bill attempt to do?

Senator MCFARLAND. The bill will speak for itself.

Senator MILLIKIN. The Chair is roughly familiar with the bill.

Senator DOWNEY. I assumed so. The chairman knows a great deal about what is going on. I want to leave the suggestion with the committee, if we are going to make any special arrangements with the interest component of power, it ought to be in a general rather than a specific bill, and that those projects that had been built and are now being charged with that interest component should be relieved of it by the gracious generosity of the Federal Government.

Senator MILLIKIN. Proceed, please.

Mr. MATTHEW. Irrigation costs and revenues: Comparative data with respect to costs chargeable to irrigation and irrigation revenues are set forth in the following: I may say, Mr. Chairman and members of the committee, again, that all these figures on capital cost and annual cost are those estimated by the Bureau.

Construction cost allocated to irrigation.....	\$328,547,000	
Gross area benefited in acres.....	627,560	
Equivalent area served on full supply basis in acres.....	152,000	
Construction cost per acre benefited.....	\$524	
Construction cost per acre served on full supply basis.....	\$2,160	
Water delivered to farm head gates, average annual acre-foot.....	636,000	
Annual cost of irrigation:	Total	Per acre-foot
Repayment of principal.....	\$6,570,900	\$10.33
Operation, maintenance, and replacements.....	3,914,100	6.15
Total.....	10,485,000	16.48
Annual irrigation revenue available.....	2,862,000	4.50

The construction cost allocated to irrigation amounts to \$524 per acre benefited and over \$2,000 per acre of equivalent area which could be served on a full water supply basis. These may be compared to normal values of improved farm lands in the project area averaging \$300 an acre.

The cost per acre-foot of water delivered at farm head gates would be \$16.48 as compared to a proposed charge of \$4.50 per acre-foot.

It is particularly noteworthy that the cost of operation and maintenance and replacements chargeable to irrigation exceeds the irrigation revenue. That amounts to \$3,914,100 in the above tabulation.

The cost of operation and maintenance and replacements, alone, amount to \$6.15 as against a proposed charge for water of \$4.50 per acre-foot. This does not include the capital costs chargeable each year to the furnishing of power for project pumping, which amounts to \$2,161,700. Since electric energy for project pumping may be more properly considered as an operating charge, the costs of operation and maintenance and replacement chargeable to irrigation, including all costs applicable to power for project pumping, would amount to \$6,075,800 a year or \$9.55 per acre-foot of water delivered.

The proposed central Arizona project is unique, to say the least, in that the irrigator not only is unable to repay any part whatever of the capital cost allocated to irrigation, but is also unable to pay even one-half of the cost of operation and maintenance (inclusive of cost of power for pumping) of the irrigation system. Either the Federal Treasury or the power user, primarily in the southern California power market, would have to provide a large enough subsidy to pay all of the irrigation capital costs plus one-half of the irrigation operation and maintenance. The scheme set up invites the power consumers of the Los Angeles area to meet most of the capital cost of the central Arizona project, so that this new aqueduct may carry away the water upon which the existing aqueduct of the Metropolitan Water District of Southern California is dependent, and moreover to pay half the cost of pumping this water into Arizona.

Commercial power costs and revenues: The average annual cost of commercial power delivered at load centers as compared to the average annual revenue therefrom would be as follows:

Energy delivered at load centers average annual in million kilowatt-hours		2,885.1
Capital cost allocated to commercial power	\$248,551,000	
Average annual cost of commercial power:		
	Total	Mills per kilowatt-hour
Repayment of principal	\$4,931,000	1.727
Interest on unpaid balance	4,652,400	1.630
Operation, maintenance, and replacements	3,158,700	1.106
Total	12,742,100	4.463
Average annual commercial power revenue	11,420,400	4.000

It will be noted that, based on the Bureau's own cost estimates, the actual cost of commercial power delivered at load centers, including interest at 3 percent and 50-year amortization on the commercial power investment, amounts to 4½ mills per kilowatt-hour, as compared to an assumed power rate of 4 mills per kilowatt-hour.

Project power cost: The financial analyses of the Bureau of Reclamation do not show any charge, as such, for electric power used for

project pumping. Instead, capital and annual costs of facilities used to produce and transmit project power are included in the costs allocated to irrigation to be repaid without interest. Based upon those allocated costs, the cost of power for project pumping is estimated as follows:

Energy required at Havasu pumping plants, average annual million kilowatt-hours.....		1295.5
Capital cost for project power.....		\$108,085,000
Average annual cost:	Total	Mills per kilowatt-hour
Repayment of principal.....	\$2,161,700	1.669
Operation, maintenance, and replacements.....	1,376,100	1.062
Total.....	3,537,800	2.731

In other words, taking the Bureau's allocations and direct cost of furnishing project power on an interest-free basis, the computed cost of power delivery for project pumping would be 2.731 mills per kilowatt-hour.

FINANCIAL ANALYSES UNDER S. 1175

I might say, parenthetically, Mr. Chairman, that the Bureau's witnesses have not testified on the bill before this committee.

S. 1175, as now pending, differs from the existing reclamation law in providing for additional nonreimbursable allocations to silt control and recreation, and in extending the period of repayment by the irrigation water users for an indefinite period, defined as "a reasonable period of years not to exceed the useful life of the project." However, since it otherwise provides for repayment within the periods prescribed by Federal reclamation laws, and further provides that the production and sale of electric power shall be governed by the Federal reclamation laws, the provisions of existing law with regard to repayment of commercial power investment would govern, namely, 3 percent interest and repayment in 50 years.

Because of the resulting reduction in reimbursable costs, annual fixed charges are decreased and the financial feasibility of the project is improved to some extent under S. 1175 as compared to existing law. Financial analyses with respect to the Parker route show that the return-cost ratio would be 0.67 to 1 under the provisions of S. 1175 as compared to 0.62 to 1 under existing law. They further show that with the revenues for power and water as estimated by the Bureau, the repayment of capital cost of municipal water supply could be made in 40 years, and of commercial power in 81 years, instead of the required 50 years. Repayment of the capital cost of irrigation would not start until after 81 years, and would require 53 years thereafter. The total repayment period would be 134 years. That is under the bill as pending before this committee.

ACCURACY OF BUREAU'S ESTIMATES OF COSTS AND REVENUES

The foregoing analyses are based upon the Bureau's estimates of costs and revenues without regard to the accuracy of the Bureau's figures. The Bureau's report on the central Arizona project, as has been stated by the Commissioner and the Bureau engineers, presents surveys and studies of a preliminary nature which were made for the

chief purpose of comparing the relative feasibility of two alternate routes. For this comparative purpose, such preliminary estimates may be considered as satisfactory. However, the figures are not final and have not been approved by the Department of the Interior.

Therefore, with respect to a particular project, the cost estimates and financial analyses are, as stated, preliminary and subject to revision, and must be considered as preliminary approximations. Final surveys and plans have not been made for much of the project works. It may be expected that after surveys, explorations, and more detailed designs can be made, cost estimates will be greater rather than less than the preliminary estimates prepared in the Bureau's report. This is of particular significance in connection with the estimates of cost of power facilities, power output, and power revenues.

Cost of power facilities: The Bureau's report sets forth a lump sum estimate for the cost of the "power transmission system" of \$86,113,000 for the Parker route under existing reclamation law. This transmission system would deliver power to "load centers" at a price of 4 mills per kilowatt-hour. The location of the load centers is not revealed in the report.

Considering that the chief market for power to be produced by the Bridge Canyon plant would be in the metropolitan area of southern California, involving long and costly transmission—

Senator MILLIKIN. How long would the transmission be?

Mr. MATTHEW. The distance from Bridge Canyon Dam, sir—I believe is around 300 to 350 miles. I am informed it is 400 miles.

The question arises whether the cost estimates for transmission are adequate for that purpose in addition to providing a transmission network to numerous points of delivery throughout Arizona and southern Nevada and Utah covering the assumed market area. Further question arises as to whether power could be delivered to points as far distant as Los Angeles at a price of 4 mills per kilowatt-hour for firm power and cover the cost of transmission and other commercial power costs. Inquiry reveals that the cost estimate for transmission is a preliminary approximation in advance of surveys and planning. Therefore, the actual cost may well be greater than the preliminary estimate indicates.

Senator MILLIKIN. Are you prepared at the present time to put in any rebuttal figures on those costs?

Mr. MATTHEWS. No, sir.

Power output and revenue: Power revenue is of predominant importance to the economic feasibility of the central Arizona project, since it constitutes, according to Bureau estimates, about 77 percent of the total revenue. The possibility of securing power revenues in the amount estimated rests upon two factors, namely, the rate at which it is or can be sold, and the power output available for commercial sale.

The chief source of power on the central Arizona project is the Bridge Canyon power plant which, according to Bureau estimates, would produce 98 percent of the total energy output of the project. Power revenues from commercial power disposal are based upon an average annual output at the plants of 3,070 million kilowatt-hours during the first 50 years and 2,543 million kilowatt-hours after 50 years. The amount of energy delivered at load centers is estimated by the Bureau at 7 percent less than the output at the plants.

Senator DOWNEY. May I intervene with this question? Did the Bureau's estimates include any allowance for interest charges of any kind during construction work?

Mr. MATTHEW. I believe not, sir, not as such.

Senator MILLIKIN. Mr. Larson, could you answer that question?

Mr. LARSON. I didn't hear the question.

Senator DOWNEY. Did the Bureau's estimates include any allowance for interest charges of any kind during the construction period?

Mr. LARSON. On these we have not.

Senator DOWNEY. We were charged for interest during the construction period in the Boulder Canyon project, weren't we?

Mr. LARSON. I am not sure, but it is my understanding that interest was not charged during the construction of the dam but began when the power plant went into operation.

Senator DOWNEY. I understand from a witness who knows as much about the Boulder project that we were charged for interest during period of construction of that project.

Senator MILLIKIN. Proceed.

Mr. MATTHEW. The available output at the Bridge Canyon plant is based upon an operation study made by the Bureau and presented in the initial preliminary report on the central Arizona project, entitled, "Comparison of Diversion Routes," in 1945. The operation study has since been modified to some extent according to information received from Bureau engineers. Based upon the 10-year period, 1931-40, the estimated annual energy output, according to the revised preliminary figures furnished by the Bureau, ranges from a minimum of 3,238 million kilowatt-hours to a maximum of 5,758 million kilowatt-hours with an average for the 10-year period of 4,685 million kilowatt-hours.

The Bureau proposes to firm up the Bridge Canyon output by coordinating and combining the outputs of the power plants at Bridge Canyon Dam, Hoover Dam, Davis Dam, and Parker Dam. It is proposed to utilize 100 percent of the capacity of Hoover Dam, with the large storage at Lake Mead, in this coordinate operation, although the Hoover Dam power output is now completely disposed of under existing contracts, which might not permit of such assumed coordination.

Senator MILLIKIN. Are you prepared to say they don't permit of it?

Mr. MATTHEW. No, sir. We haven't had an opportunity to go into that study sufficiently. It may be that one of our succeeding witnesses may be able to testify in that regard.

Aside from the question whether Hoover Dam power could be coordinated as assumed, the scheme would involve the utilization of Lake Mead and other reservoirs and the capacity and energy of Hoover, Davis, and Parker power plants, with none of the cost of such facilities charged to the proposed central Arizona project. Thereby, the project would be credited with revenues resulting from operations of other hydroelectric plants and reservoirs, with no cost to this project. It would appear that if such a program of coordinate operation could be consummated, the Bridge Canyon-Central Arizona project should be charged with its proper share of the cost of these other plants and storage works required to firm up the Bridge Canyon power output.

The Bridge Canyon plant would add nothing to the output capability of Hoover Dam power plant and would offer no advantage to

the users of Hoover Dam power, to compensate for its proposed use to firm Bridge Canyon power. On the contrary, it would deprive the Hoover Dam power contractors of rights and benefits which they now have and are paying for under existing contracts.

Senator MILLIKIN. Just a minute, please. I would like a little clarification on that last sentence. How would the Hoover Dam power contractors be deprived of rights and benefits which they now have and are paying for under existing contracts?

Mr. MATTHEW. Senator, if you will permit, I would like to have your question in that regard answered by one of our witnesses who will appear afterward who is much more familiar with those contracts. He is a power expert and an executive of the Department of Water and Power of the city of Los Angeles.

Senator MILLIKIN. Proceed.

Mr. MATTHEW. According to the estimates contained in the Bureau's revised preliminary study of Bridge Canyon power plant output, the output for the months June to December in 1934, in million kilowatt-hours, would be as follows:

Bridge Canyon power output (these are all in million kilowatt-hours); June, 126; July, 114; August, 137; September, 137; October, 142; November, 166; and December, 187.

The monthly energy required for project pumping in million kilowatt-hours is 126.

Senator MILLIKIN. I believe I have dropped a stitch here. What is the purpose of using 1934?

Mr. MATTHEW. That is the year with the months of minimum output at Bridge Canyon power plant during the 10-year period 1931 to 1940.

Senator MILLIKIN. Thank you.

Mr. MATTHEW. The Bureau's report and the bill S. 1175 contemplate that the Bridge Canyon plant shall be used first to supply the energy requirements for project pumping. The energy requirements for project pumping are estimated by the Bureau at 1,393 million kilowatt-hours annually, that is, at point of generation. It is understood that project pumping would be carried on continuously for 11 months of the year. Accordingly the average monthly requirement for project pumping would amount to 126 million kilowatt-hours. Comparing this figure with the estimated outputs for the 7 months in 1934, it is evident that the Bridge Canyon output for July 1934 would be less than project pumping requirements, equal thereto in June 1934 and not materially in excess thereof for the remaining 5 months of that year. Consequently, it would appear from the Bureau's studies that the Bridge Canyon plant, for at least 7 months during the 10-year period such as 1931-40, would be able to contribute little if any power for commercial disposal under the plan of coordinate operation.

This minimum output of the Bridge Canyon plant would govern the dependable capacity and hence the value of the Bridge Canyon output. If, as it appears, the Bridge Canyon plant could not take care of its proper proportion of the commercial load to be served by the combined plants in a critical year such as 1934, its average energy output could not be considered as firm and, therefore, would not have a value of 4 mills per kilowatt-hour as firm power. Hence, unless the cost of the project was materially increased to provide necessary

facilities by way of required stand-by capacity or additional upstream storage, it would appear that the value of Bridge Canyon power output and, accordingly, the estimated power revenues of the central Arizona project, are subject to material discount.

Senator MILLIKIN. That is on the assumption that it stood by itself?

Mr. MATTHEW. No, sir; as a plant in the coordinated system. If it couldn't carry its own share of the load its power output would not be of value to the combined system on a firm basis. It would simply not be good for commercial power acting independently.

Senator MILLIKIN. Would the power purchaser look behind the coordinated power to estimate the value of the separate contributions of power?

Mr. MATTHEW. I certainly believe he would. Any utility contractor who would propose to contract for the output of Bridge Canyon plant would want to be assured that he would be able to obtain this power on a sure, dependable basis, both as to kilowatts and kilowatt-hours.

Senator MILLIKIN. I am not arguing with you. I want to know whether or not the coordinated power theory is correct?

Mr. MATTHEW. Yes, sir.

Senator MILLIKIN. But, merely assuming that it is correct, and assuming the coordinated power is dependable power and furnishable, would the power purchaser ever go behind that study to see what constituted that coordinated power?

Mr. MATTHEW. I doubt from the indications of this study that the output capacity of the coordinated system would be dependable.

Senator MILLIKIN. Do you make that point?

Mr. MATTHEW. I do. That is inferred in my testimony here.

Senator MILLIKIN. Proceed, please.

Mr. MATTHEW. Conclusion: Considering its financial aspects as revealed by the foregoing financial analyses, it is apparent that the proposed central Arizona project is of questionable justification from an economic standpoint. A less costly solution of the problems involved should be sought.

AVAILABLE WATER SUPPLY AND REQUIREMENTS

The development and utilization of Colorado River system waters in the lower basin has already progressed to such an extent that the water requirements of existing and authorized projects, together with recognized commitments in the lower basin exceed the water supply that will be available to the lower basin under full development, after the Mexican water treaty obligation is satisfied.

Table 1 shows estimates of available water supply in the lower basin during critical periods such as 1931-40, inclusive, or 1930-46, inclusive, and estimates of the consumptive use requirements of existing—operating—and authorized projects, including recognized commitments for projects in the lower basin. The analysis presented involves no legal interpretations of the compact, Boulder Canyon Project Act, and relevant statutes, decisions, and instruments but points up the necessity of there being a final determination of the rights of the States of the lower basin before any new projects, such as the proposed central Arizona project, are authorized.

Mr. Chairman and gentlemen, then follows table I and the text will go along explaining table I, item by item, as numbered in the table.

(The table is as follows:)

TABLE I.—Estimated available water supply and requirements of existing projects in lower basin (based on critical periods such as 1931-41, inclusive, or 1930-46, inclusive)

	<i>Average annual flow in acre-feet</i>
Available water supply for lower basin:	
1. Colorado River at Lee Ferry-----	7,500,000
2. Net from tributaries—Lee Ferry to mouth of Gila River----	300,000
3. Gila River and tributaries (available for consumption)-----	2,300,000
4. Total available supply-----	10,100,000
5. Required to deliver Mexican treaty guarantee-----	1,700,000
6. Available water supply for projects in lower basin----	8,400,000
	<hr/>
Requirements of existing (operating) and authorized projects:	<i>Annual consumptive use in acre-feet</i>
7. Main stream reservoir projects (net evaporation losses)-----	¹ 780,000
NEVADA, UTAH, AND NEW MEXICO	
8. Projects in lower basin-----	440,000
ARIZONA	
9. Projects using water of Gila River and tributaries-----	2,270,000
10. Projects on other tributaries-----	130,000
11. Colorado River Indian Reservation (Parker project)-----	300,000
12. Yuma project in Arizona-----	250,000
13. Gila project (proposed)-----	600,000
14. Total, Arizona projects-----	3,550,000
CALIFORNIA (AS LIMITED BY EXISTING CONTRACTS)	
15. Palo Verde Irrigation district-----	300,000
16. Yuma project in California-----	50,000
17. All-American Canal project-----	3,800,000
18. Metropolitan water district and San Diego County Water Authority-----	1,212,000
19. Total California projects-----	5,362,000
20. Total requirements of existing projects in lower basin-----	10,132,000
Say-----	10,130,000
21. Indicated average annual deficit without withdrawal from hold-over storage during critical period-----	1,730,000
22. Assumed additional water supply available from hold-over storage-----	1,500,000
23. Indicated average annual deficit with withdrawal from hold- over storage-----	230,000
24. Required total withdrawal from hold-over storage:	
(a) 10-year period, 1931-40-----	15,000,000
(b) 17-year period 1930-46-----	25,500,000

¹ Does not include losses from proposed Bridge Canyon and Marble Canyon Reservoir projects, estimated to total 90,000 acre-feet annually.

Senator MILLIKIN. Let me take a quick look at the table. I am not quite clear on the contents of table I in relation to your statement on the preceeding page:

The analysis presented involves no legal interpretations of the compact, Boulder Canyon Project Act and relevant statutes, decisions, and instruments, but points up the necessity of there being a final determination of the rights of the States of the lower basin before any new projects, such as the proposed Central Arizona project, are authorized.

Aren't there some projects listed in table I with indicated claims for water that do depend for their validity upon the compact, Boulder Canyon Project Act and relevant statutes, decisions, and instruments?

Mr. MATTHEW. Senator, not the way this table is made up. The answer is "No." I suppose you may be referring to the amounts set up for the California projects. Those represent water requirements—in fact, minimum water requirements for those California water projects, regardless of the fact those amounts are also incorporated in contracts with the Secretary of Interior. They do represent, as far as this table is concerned, water requirements. In fact, the water requirements of those California projects might be estimated as more than that. In the Bureau's comprehensive report on the Colorado River, the requirements of those California projects were estimated by the Bureau in excess of 5,362,000 acre-feet, and we have no quarrel with that at all. As a matter of fact, a good deal more water could be used than is covered by the amounts here. But these are and do represent and constitute the minimum water requirements of each of those projects, individually and collectively.

Senator MILLIKIN. But you are not asserting that the validity of those requirements is not in question?

Mr. MATTHEW. I am not indicating one way or another here whether they are valid or not. They are water requirements, independent of any question of validity.

Senator McFARLAND. Mr. Chairman, I see no object in arguing with the witness about the figures or about the law. The way the tables are set up, there are items very much in dispute, and we contend, according to our theory, that California isn't justified in executing them. And particularly is that true in regard to the item of Gila River of 2,270,000 acre-feet. I think, Mr. Chairman, that is also true in regard to the 5,362,000 total set up for California. That is beyond the amount for which they have a contract. As I say, there is no object in arguing these points now. It just takes a lot of time.

Senator DOWNEY. Mr. Chairman, may I inquire of the witness? It really makes no difference in these tables what amounts you set up for the Gila. You set up the same amounts both on the debit and credit side of the ledger; don't you?

Mr. MATTHEW. That is correct.

Senator DOWNEY. It doesn't make any difference if you enter the maximum or minimum figure, you get the same results?

Mr. MATTHEW. That is right.

Senator DOWNEY. You have here, item No. 3, "Gila River and tributaries (available for consumption), 2,300,000" and then on item No. 9 you have, "Projects using water of Gila River and tributaries, 2,270,000." The two balance?

Mr. MATTHEW. That is correct.

Senator DOWNEY. If you put that in million acre-feet on both sides as a credit and debit, you would get the same final conclusions?

Mr. MATTHEW. That is right.

Senator DOWNEY. May I ask this: Mr. Matthew, do I understand that as far as California items are concerned here, those are all covered by contracts from the Secretary of the Interior?

Mr. MATTHEW. That is correct. I want to make it clear, Mr. Chairman and gentlemen, that this table is an engineering table. It is not a legal table at all. These are estimated water requirements of these projects and they are based upon the amount of water required to serve the areas in each of the projects.

Senator MILLIKIN. Would it not be more accurate on your page 20 to state that the analysis presented is independent of legal interpretation?

Mr. MATTHEW. That, perhaps, might be a more apt way of stating it.

Senator MILLIKIN. I am testing the accuracy of that sentence. I would like to know whether you adhere to that sentence or would you like to modify it?

Mr. MATTHEW. I have no reason to modify it, Senator. It is meant to be clear. This is an engineering table—data on water supply and water requirements. As I say, the requirements of California projects might be estimated in more than that, particularly item 18—1,212,000 for the metropolitan water district and the areas of southern California. Those requirements could be estimated at considerably more than that.

Senator MCFARLAND. Mr. Chairman, I wouldn't want to argue this. We would certainly not agree with these figures of 2,300,000 acre-feet and the other matter. They are engineering data set up for the purpose of basing legal interpretations. I just want to "flag" that figure now and say no more about it at this time.

Mr. MATTHEW. That wouldn't affect the computation of the indicated deficit.

Senator MCFARLAND. From your viewpoint.

Mr. MATTHEW. Just mathematically.

Senator MCFARLAND. How much water are you using annually from the Colorado River water?

Mr. MATTHEW. California?

Senator MCFARLAND. California.

Mr. MATTHEW. California is using now something like 3,000,000 acre-feet.

Senator MCFARLAND. Yes. That is all.

Mr. MATTHEW. But that isn't all the water requirements of the total irrigated area of 1,000,000 acres. About half is being irrigated now. These requirements are made up for the projects as they are constituted.

Senator MCFARLAND. As you want it constituted?

Senator MILLIKIN. I believe the Chair has a sufficient understanding of what is involved in the various items, so if you will proceed.

Mr. MATTHEW. I don't know just how best to proceed with this, Mr. Chairman, but we will have to refer to the table in explanation of these items. The explanation follows:

Item 1 shows the average annual flow in acre-feet of the Colorado River at Lee Ferry in the average amount of 7,500,000 acre-feet

annually, which constitutes the minimum residual flow under the terms of the Colorado River compact.

Item 2 is the estimated net inflow—inflow less channel losses in main river under full development—into the Colorado River from tributaries between Lee Ferry and the mouth of the Gila River. This figure is based chiefly on estimates of the Bureau of Reclamation.

Item 3 is the estimated water supply available for consumptive use on the Gila River and its tributaries; or, in other words, the safe annual yield. It is based chiefly on Bureau estimates of the natural inflow into the Phoenix area as shown in table CXLVI of the Colorado River report, set forth as averaging 2,279,000 acre-feet. This entire average supply is regulated by surface and underground storage and fully utilized.

Item 4 shows the total available supply in the lower basin for such critical periods in the amount of 10,100,000 acre-feet, which is the sum of items 1, 2, and 3.

Senator O'MAHONEY. Is there any dispute about that figure?

Mr. MATTHEW. I think there is a dispute as to whether the Gila River shall be considered as the water supply at its mouth or the water supply available for consumptive use and actually put to consumptive-use purposes. That is what Senator McFarland referred to.

Senator McFARLAND. I might say we contend that any State, including the State of Arizona, should only be charged with the amount of water that we actually deplete the Colorado River. The virgin flow of the Gila at its mouth is 1,270,000 acre-feet. We deplete it less than that. We contend that we are only chargeable with that amount of water which the other States could be affected by our use.

Senator O'MAHONEY. This figure 2,300,000 is in excess of that?

Senator McFARLAND. Yes.

Senator O'MAHONEY. That is agreed?

Mr. MATTHEW. The figure 2,300,000 acre-feet is the inflow into the affected areas and it is all used, so it is set up as water supply available for consumptive use on the Gila River and its tributaries. The flow at the mouth of the river is far below the area in which the water is used.

Senator O'MAHONEY. That is a matter of argument. I am just trying to determine what this figure 2,300,000 includes. Do I understand from you that what you mean by that figure is not only the water which is delivered from the Gila into the Colorado but the water which is used in the basin of the Gila?

Mr. MATTHEW. It is the water available in the basin of the Gila for consumptive use.

Senator O'MAHONEY. As well as that which is delivered?

Mr. MATTHEW. Yes; it includes water delivered.

Senator O'MAHONEY. Thank you, sir.

Mr. MATTHEW. Item 5 is the estimated amount of water required to satisfy deliveries of water required by the Mexican water treaty. The treaty guarantees Mexico 1,500,000 acre-feet annually from the Colorado River System. Because of the difficulty of measuring accurately the large quantities involved and of controlling precisely the rate of flow from points of release in the United States to the international boundary, it is estimated that a minimum additional amount of 200,000 acre-feet will be required for regulation purposes, making

a total demand on the river of 1,700,000 acre-feet annually for this requirement.

Item 8 shows the available water supply for consumptive use of projects in the lower basin—item 4 minus item 5.

Items 7 to 19 show the estimated consumptive use requirements in acre-feet annually for existing—operating—and authorized projects in the lower basin.

Senator MILLIKIN. With reference to your 200,000 acre-feet required for regulation purposes, is that as of the present time or at the time of the river development?

Mr. MATTHEW. That would be as of the time when the treaty comes into operation on the Colorado River, sir, and deliveries are made under the treaty to satisfy demands up to 1,500,000 acre-feet a year for delivery at the international boundary in accordance with the terms of the treaty.

Senator MILLIKIN. As of that time?

Mr. MATTHEW. Yes.

Senator DOWNEY. Mr. Chairman, did you say "until that time"?

Senator MILLIKIN. I asked whether this statement referred to the present or whether it refers to the time the river is fully developed?

Mr. MATTHEW. Well, I would say simply that it does refer to the time when the river is fully developed, but I don't know when the treaty is going into full effect.

Senator MILLIKIN. I suggest that when the river is fully developed, the whole coordinated system of reservoirs will make it unnecessary to set any particular amount for regulation of that requirement.

Mr. MATTHEW. The question as to delivery of water from the sources in the United States, the nearest source of water to satisfy the Mexican treaty will be the Davis Dam which is far upstream, and anyone having experience with handling large flows such as in the Colorado River would know that you can't regulate precisely, particularly in view of the fact the treaty provides that Mexico can get its delivery of that water in certain daily amounts, according to what they want to take, within certain limits. At any rate, it is our judgment that the draft on the river for the Mexican treaty will be more than 1,500,000 acre-feet.

Senator MILLIKIN. Proceed.

Mr. MATTHEW. Item 7 is the estimated net evaporation loss of main stream reservoir projects, Bureau estimates. It may be noted that this figure does not include the estimated net evaporation losses for the proposed Bridge Canyon and Marble Canyon Reservoirs, which, if and when built, would involve an additional net evaporation loss of 90,000 acre-feet, Bureau estimates.

Senator MILLIKIN. By "net loss" you mean the difference between what would be lost by virgin flow and what is lost by reason of storage?

Mr. MATTHEW. Yes.

Senator MILLIKIN. May I interrupt again? Is it California's contention that those evaporation losses should be distributed to those who have the benefit of storage water?

Mr. MATTHEW. No, sir. California considers that the reservoir evaporation losses are charged against the lower basin; that such reservoir losses have to be taken out of the total available water supply.

Senator McFARLAND. California wants to be charged with evaporation for storage within the boundaries of California; is that the idea?

Mr. MATTHEW. Well, Senator, I am not making a legal presentation here.

Senator McFARLAND. Go ahead.

Senator MILLIKIN. Let me probe that a little further. Are you charging the beneficiaries of water from a storage installation with the evaporation loss?

Mr. MATTHEW. Senator, the Boulder Canyon Project Act and the California Limitation Act provide for California limiting itself to certain quantities of water defined as diversion less returns to the river; nothing is said about reservoir evaporation loss. The contracts between the Secretary of the Interior and the various agencies in California call for the storage and the delivery at stated points on the river of necessary quantities of water. Now, that is the background of California's viewpoints—those documents.

Senator MILLIKIN. Do you contend that the loss by evaporation should be charged against beneficiaries of the water from the reservoir?

Mr. MATTHEW. Generally speaking; yes.

Senator MILLIKIN. All right.

Senator DOWNEY. Mr. Matthew, it is plain it would be charged against the lower basin?

Mr. MATTHEW. Yes.

Senator DOWNEY. That would reduce the available supply for distribution among States of the lower basin?

Mr. MATTHEW. Yes.

Senator DOWNEY. If we had 10,000,000 acre-feet gross, with a million acre-feet charged to the lower basin, that would leave 9,000,000 acre-feet to divide among us all?

Mr. MATTHEW. Yes, sir.

Senator MILLIKIN. Is it California's position that you divide that evaporation loss in some proportional way?

Mr. MATTHEW. California's viewpoint is that, as I say, under the terms of the Boulder Canyon Project Act and the California Limitation Act and the contracts, the quantities of water called for are diversions from the river less return to the river.

Senator DOWNEY. Would it not be California's contention to charge Arizona particularly for the 90,000 acre-feet for evaporation loss in the Bridge Canyon Reservoir if that is built? That would be identical to the other evaporation losses and thereby reduces the amount of water that would be available for lower basin use.

Mr. MATTHEW. It has to be charged to the whole lower basin and as a reduction of the water supply available.

Senator McFARLAND. As a matter of fact, the real fact is that you want Arizona to bear all the loss and California take none?

Mr. MATTHEW. We wouldn't want Arizona to.

Senator McFARLAND. Those are facts, Mr. Matthew. You can answer "yes" or "no."

Mr. MATTHEW. No. We are just operating under what we consider the law to be.

Senator McFARLAND. You didn't want to talk about the law a minute ago, and now you want to talk about the law.

Mr. MATTHEW. You made me.

Senator McFARLAND. Your statement speaks for itself; that is, in the net results you are asking.

Senator MILLIKIN. The committee will estimate the net result. You may proceed, Mr. Matthew.

Mr. MATTHEW. Item 8 covers projects in the lower basin in the States of Nevada, Utah, and New Mexico in the amount of 440,000 acre-feet annually, comprising existing projects and commitments for projects in these States, including contracts under the Boulder Canyon Project Act between the United States and the State of Nevada for 300,000 acre-feet annually. It also covers miscellaneous projects in portions of Utah and New Mexico within the lower basin based on estimates of the Bureau. So far as known, there has never been a question raised as to such allocation to these States.

Item 9 is the estimated consumptive use of projects using the water of the Gila River and its tributaries in Arizona. The amount is estimated as 2,270,000 acre-feet, or 30,000 acre-feet less than the total water supply of the Gila River and its tributaries shown in item 3. This 30,000 acre-feet is the estimated requirement for projects in New Mexico and is included in item 8. Existing projects in Arizona are using the entire supply available from the Gila River and its tributaries; in fact, are now overdrawing the safe yield.

Item 10 is the estimated consumptive use requirement of existing projects on other tributaries of the Colorado River in Arizona, which aggregate 44,000 acres, as shown in the Colorado River report, and based upon a consumptive use of 3 acre-feet per acre per annum.

Item 11 is the estimated consumptive-use requirement for the 100,000 acres of irrigable land in the Parker Indian Reservation. This project was started in the seventies and is presumed to have a right covering the entire irrigated area.

Items 12 and 13 cover, respectively, the estimated consumptive-use requirements of the Yuma project in Arizona and the Gila project as now proposed.

Item 14 shows the total requirements of existing projects in Arizona, amounting to 3,550,000 acre-feet annually.

Items 15, 16, 17, and 18 set forth the estimated consumptive-use requirements of the existing projects in California. The amounts shown in the tabulation, aggregating 5,362,000 acre-feet annually (item 19) are based upon contracts executed from 1930 to 1934 under the Boulder Canyon Project Act.

Item 20 shows total estimated consumptive-use requirements of all existing projects in the lower basin amounting to 10,130,000 acre-feet annually (rounded figure).

Comparing this total (item 20) with the total available water supply for projects in the lower basin (item 6), there is an indicated average annual deficit during such critical periods, without withdrawal from hold-over storage, of 1,730,000 acre-feet.

The water supply that can be made available to the lower basin during such critical periods may be augmented by withdrawals from hold-over storage provided by Lake Mead and other reservoirs under construction or proposed in the lower basin. According to estimates of the Bureau of Reclamation (see data presented by Commissioner Bashore in S. Doc. 39, p. 8, 79th Cong., 1st sess.), plans contemplate sufficient hold-over storage to provide a withdrawal therefrom of an acreage of 1,500,000 acre-feet annually during a critical period such as 1931 to 1940, inclusive.

Item 22 is this assumed amount of additional water supply available from hold-over storage during such critical period.

Item 23 shows an indicated average annual deficit, after an assumed withdrawal from hold-over storage, in the amount of 230,000 acre-feet per annum.

As set forth in item 24, in order to obtain this additional supply, the total withdrawal from hold-over storage for the 10-year period 1931 to 1940, inclusive, would aggregate 15,000,000 acre-feet. However, the estimates of flow at Lee Ferry show that the controlling critical period of record for the lower basin continued through the 17 years 1930 to 1946, inclusive, with only the minimum flow of 7,500,000 acre-feet annually, on the average, available at Lee Ferry. This is assuming full upper basin development. The required withdrawal from hold-over storage for the 17-year period 1930 to 1946, inclusive, would aggregate 25,500,000 acre-feet.

Senator O'MAHONEY. May I interrupt to suggest that it would be helpful to me if you will review items 9 to 18, inclusive, and indicate which ones of those are actually existing and utilizing water and how much, and which ones of those are not presently operating and not using the water set forth in respective figures.

Mr. MATTHEW. Yes, sir. Item 9, "Projects using water of Gila River and tributaries." Those projects are in existence and using all of that water in central Arizona.

Item 10, "Projects on other tributaries." That is the Bureau's estimate. It is my understanding that those projects all exist and are using most of that water. Those projects are on tributaries such as the Little Colorado River, and so forth.

Item 11, "Colorado River Indian Reservation (Parker project)." That project exists. They are only irrigating part of it now, but it has been under operation for many years.

Senator O'MAHONEY. What is the actual use of water?

Mr. MATTHEW. They are irrigating about six to ten thousand acres there, so their actual use of water on crops—consumptive use—would be in the neighborhood of 30,000 acre-feet.

Item 12, "Yuma project in Arizona," is existing and is an old-time reclamation project, and they are using substantially that total quantity of water.

The "Gila project (proposed)"—that project is authorized and under construction, and they are using some water; a small amount.

Senator MILLIKIN. How much water is the Gila using at the present time?

Senator MCFARLAND. Perhaps Mr. Debler can answer that. How much is being used on the Gila project?

Senator DOWNEY. The lower Gila project—at the existing authorized Gila project at the present time.

Mr. LARSON. The figure I have would be the 1940-44 average.

Mr. DEBLER. The Gila project is consuming 20,000 acre-feet a year.

Senator MCFARLAND. Could you give us the amount in the Indian Reservation project?

Mr. DEBLER. About 50,000. That is in the testimony I gave the other day.

Senator O'MAHONEY. That is the Parker project?

Mr. MATTHEW. That is right.

Senator O'MAHONEY. And the Gila, 20,000. Now, Mr. Matthew, the next item.

Mr. MATTHEW. The Palo Verde irrigation district is one of the older projects on the river in California, with rights dating back to the seventies. They are now irrigating about 60,000 acres out of a 100,000 gross, so that they are probably using about 200,000 acre-feet.

Senator O'MAHONEY. You want to put that down as 200,000?

Mr. MATTHEW. I don't want to put that down. I am giving you the information you requested.

Senator O'MAHONEY. In response to my question?

Mr. MATTHEW. Yes.

The Yuma project in California is a part of the United States Bureau of Reclamation project, the part in California. They are now irrigating 6,000 to 8,000 acres. It would take, perhaps, about twenty-five or thirty thousand acre-feet, I would say.

Senator O'MAHONEY. We will put that down at 30,000?

Mr. MATTHEW. I think that will be sufficient.

The All-American Canal project is now using about 2,700,000 acre-feet.

Senator McFARLAND. That is, items 15, 16, 17, and 18?

Mr. MATTHEW. No, sir. That is item 17. That is for irrigation of about 500,000 acres out of a million acres provided by the All-American Canal project.

The metropolitan water district and San Diego County Water Authority's present diversion from the river is about 80,000 to 100,000 acre-feet.

Senator O'MAHONEY. Give me that figure again.

Mr. MATTHEW. Somewhere between 80,000 and 100,000. Mr. Elder, can you give the latest figure?

Mr. ELDER. One hundred thousand acre-feet this year.

Senator O'MAHONEY. Being used in the metropolitan water district and San Diego County Water Authority.

Senator DOWNEY. For the further information of the Senator, I might say that the Federal Government has just assisted in the completion of an aqueduct to bring Colorado River water into San Diego, where it is vitally needed. The contract calls for a total of 112,000 acre-feet. The aqueduct is to be completed this fall.

Senator O'MAHONEY. That suggests another inquiry. Will the Palo Verde irrigation district at any time have more than 300,000 acre-feet?

Mr. MATTHEW. That is an estimate of consumptive-use requirement for the entire area there, Senator.

Senator O'MAHONEY. That is the maximum?

Mr. MATTHEW. Yes.

Senator O'MAHONEY. Is 50,000 the maximum for the Yuma project?

Mr. MATTHEW. Yes.

Senator O'MAHONEY. Is 3,800,000 a maximum for the All-American Canal project?

Mr. MATTHEW. That is our estimate of the ultimate consumptive-use requirement.

Senator O'MAHONEY. In other words, it is your maximum?

Mr. MATTHEW. Yes.

Senator DOWNEY. That is the amount of water fixed in the contract from the Secretary of the Interior?

Mr. MATTHEW. That relates to the contract.

Senator DOWNEY. As prescribed in the Boulder Canyon Project Act?—I will withdraw that.

Senator O'MAHONEY. It is the maximum, is it not?

Mr. MATTHEW. That is our estimate as related to the contract, sir. As I said before, the Bureau of Reclamation presented larger estimates, and we have no quarrel with that.

Senator O'MAHONEY. My questions are directed to develop some simple information. Is that a maximum or is it not? Do you ever expect to ask for more water?

Mr. MATTHEW. We don't expect to ask for more water.

Senator O'MAHONEY. Then it is a maximum?

Mr. MATTHEW. Yes.

Senator O'MAHONEY. That is all I was asking. I will ask the same question with respect to item No. 18. That is a maximum?

Mr. MATTHEW. That is right.

Senator O'MAHONEY. In other words, you don't think there will be in the future a draft upon the Colorado River's lower basin for more water than that for those particular purposes?

Mr. MATTHEW. That is correct.

Senator O'MAHONEY. Thank you, sir.

Senator MILLIKIN. Do you know how much water initially from San Diego is used through the aqueduct which Senator Downey referred to?

Mr. MATTHEW. She will be using about half of her allotment—about 75 second-feet.

Senator MILLIKIN. How many acre-feet?

Mr. MATTHEW. About 50,000 acre-feet a year.

Senator MILLIKIN. That is the start?

Mr. MATTHEW. Yes.

Senator MILLIKIN. The ultimate?

Mr. MATTHEW. The ultimate is 112,000 acre-feet, under the contract with the Secretary of Interior. The metropolitan water district is for 1,212,000, including San Diego.

Senator MILLIKIN. So should 50,000 acre-feet be added to this 100,000 acre-feet that the aqueduct is now taking?

Mr. MATTHEW. Oh, no, sir. That was in answer to Senator O'Mahoney—the present diversion through the Colorado River aqueduct to the metropolitan water district. It is growing every year, and it would increase up to that amount of 1,212,000.

Senator MILLIKIN. Does that include the San Diego County Water Authority?

Mr. MATTHEW. Yes.

Senator MILLIKIN. What will it be when the aqueduct comes into being—what will it be then, the total diversion from the Colorado River on account of those two projects?

Mr. MATTHEW. Then I would say that the diversion would immediately be increased to 150,000. San Diego needs all of that water and more, too, right now. She is suffering a very severe shortage.

Senator MILLIKIN. The total of the metropolitan water district and the San Diego County Water Authority, as soon as the aqueduct is in operation, will be how much—can you estimate?

Mr. MATTHEW. I would say one hundred and fifty to 200,000 thousand in the next couple of years, as soon as the San Diego aqueduct is completed.

Senator MILLIKIN. What is the status of that aqueduct?

Senator DOWNEY. It will be completed within the next 3 or 4 months. I might say that as soon as that is completed it will require about the flow of that aqueduct and the balance within the next 30 years.

Senator MILLIKIN. The aqueduct runs from where to where?

Senator DOWNEY. Mr. Matthew, where does it run from where it connects with the supply canal of the Metropolitan irrigation district—about 80 miles from San Diego, does it not?

Mr. MATTHEW. About that. It joins up with the main aqueduct of the Metropolitan water district, which is called the Colorado River aqueduct, at the westerly end of the San Jacinto tunnel.

Senator DOWNEY. If I might mention, the municipal water-supply priority of the San Diego aqueduct is the lowest priority of any water rights we have in California. That water is considered essential by the military authorities of the Government for use in San Diego—the full 112,000 acre-feet, to maintain the existing civilization and military installations which require about one-half of the total amount of water.

I would like to also point out to the committee that the transportation units of the Metropolitan water district have, in the main, been wholly constructed now, and the cost has been expended under a contract, given by the Bureau of Reclamation, for the full amount of 1,100,000 acre-feet.

Senator O'MAHONEY. Does this affect the answer to my question?

Senator DOWNEY. No.

Senator O'MAHONEY. This 150,000 for San Diego will all be within the 1,212,000 set forth in item 18?

Senator DOWNEY. That is right, Senator. Probably Mr. Matthew is right in describing these allocations as the maximum amount and probably I am wrong, but I thought the figures down here agree with the figures given in the contracts by the Bureau of Reclamation to these different agencies in the State of California. Am I right or wrong?

Mr. MATTHEW. You are correct in that.

Senator DOWNEY. Understand, we are not saying we could not use much more Colorado River water in California.

Mr. MATTHEW. California did not want to limit itself to any use of water but it had to do so in 1928, to secure the passage of the Boulder Canyon Project Act. There are many projects in California upon which greater use of water could be made than is covered by these contracts.

Senator McFARLAND. There is one question I would like to ask in regard to this All-American Canal project. You say they are using 2,700,000 acre-feet of water now?

Mr. MATTHEW. Yes.

Senator McFARLAND. How much of that water goes into the Salton Sea?

Mr. MATTHEW. I can't tell you exactly how much. My understanding is together with the outflow from the Mexicali Valley in Baja

California, which amounts to a very sizeable figure, there is somewhere around 700,000 to a million acre-feet gets into Salton Sea, that is, when there is a lot of surplus water in the river.

Senator McFARLAND. Now, how much more new land do they hope to put in crops under this project?

Mr. MATTHEW. Under the All-American Canal project?

Senator McFARLAND. Yes.

Mr. MATTHEW. That would be about 100,000 acres in the Coachella Valley and 300,000 acres in the Imperial Valley.

Senator McFARLAND. All that California has to do is not put in 300,000 acres of new land and they will have all the water they need, won't they?

Mr. MATTHEW. It so happens that the Imperial Valley lands have one of the first water rights on the river, dating back to the nineties.

Senator McFARLAND. But not these new lands?

Mr. MATTHEW. These are also incorporated in the original water filings made for that project back in the nineties.

Senator McFARLAND. Have these lands ever been irrigated?

Mr. MATTHEW. They haven't been irrigated.

Senator McFARLAND. All your contracts for water are subject to availability, aren't they?

Mr. MATTHEW. Available under the compact.

Senator McFARLAND. Subject to availability of water for use?

Mr. MATTHEW. Oh, any project is subject to availability of water.

Senator McFARLAND. I understand. All you have to do to get all the water California needs is just fail to put in that 300,000 acres of new land?

Mr. MATTHEW. Senator, the original appropriations on the river for that area call for 10,000 second-feet and this right has been preserved for that area, by due diligence.

Senator McFARLAND. I wasn't trying to argue the law. Maybe we have differences as to the rights. We feel Arizona has some rights on the river, too. But I was just asking a factual question.

Senator MILLIKIN. Mr. Matthew, California has a system of priorities to govern its own internal distribution of water from the Colorado?

Mr. MATTHEW. That is right.

Senator MILLIKIN. It might be well to put that in the record at some stage of the proceedings. (Information in supplemental statement No. 2, at conclusion of Mr. Matthew's presentation.)

Mr. MATTHEW. I would be very glad to.

Senator DOWNEY. I should like to attempt to clarify an answer to one of Senator O'Mahoney's questions. As Senator McFarland just stated, it is the claim of Arizona that it is only chargeable under the compact and the Boulder Canyon Project Act with a million acre-feet of water which was the amount that came down the Gila River in virgin flow. But, it is true that Arizona on the Gila River is getting a beneficial consumptive use of 2,270,000 acre-feet, and it is our legal view that Arizona is charged with beneficial consumptive use and not upon the theory of depletion. Consequently, Mr. Matthew in preparing item No. 3 gave as an item of available water supply for the lower basin 2,300,000 acre-feet which is the consumptive use on the Gila, but in setting up the requirements for existing and authorized

projects he used the figure 2,270,000. They virtually wash each other out.

Taking Arizona's theory that Arizona should only be charged with a million acre-feet or 1,270,000 acre-feet on the Gila, each of these items the two items in the table of 2,300,000 and 2,270,000—would have to be changed correspondingly, so there will be no difference in the final result of this particular computation.

Senator McFARLAND. I don't want to leave the impression that we were using 2,300,000 acre-feet of water or anywhere near that. We are not using that amount of water or anywhere near that figure. We will have engineering data to show that.

Senator DOWNEY. I thought your witness, Mr. Debler, and Mr. Larson testified that the present beneficial consumptive use is about 2,300,000.

Senator McFARLAND. We divert all the water from the Salt River at Granite Reef, every drop of it, and by return flow there is more water comes back into the river. We divert it again at Buckeye.

Senator O'MAHONEY. That is clear, Senator.

Senator MILLIKIN. The conflict here, as near as I understand, Senator, California contends that you must measure the consumptive use that is made on every tributary of the Colorado and charge the State with that consumptive use. Arizona contends that the question is what is the amount of depletion of the Colorado River as against virgin flow.

Senator O'MAHONEY. That is clear.

Senator MILLIKIN. What is the charge Arizona claims should rightfully be made against her on account of depletion on the Gila River?

Senator McFARLAND. 1,100,000 acre-feet.

Senator MILLIKIN. If you did not have your inflow on the Gila River, if you were not irrigating on the Gila River 1,100,000 acre-feet, more water would reach the Colorado than now reaches it, is that correct?

Senator McFARLAND. That is correct; this water couldn't be used by the other States, but the other States are affected inasmuch as it would go down to supply water for Mexico.

Senator MILLIKIN. Please proceed.

Senator O'MAHONEY. There were two questions I wanted to ask. Mr. Matthew, in responding to my questions with respect to item 17, I understood you to say that 3,800,000 is the maximum estimated use. As at the present you are using only 2,700,000 acre-feet, and this irrigates 500,000 acres out of a million acres capable of irrigation, is that right?

Mr. MATTHEW. Yes. But when I say a million acres I am including all of the irrigated area in California including the Palo Verde project and the Yuma project.

Senator O'MAHONEY. Which was to be supplied out of this water?

Mr. MATTHEW. No, sir. I say out of the million acres there, there is about 900,000 acres under the All-American Canal.

Senator O'MAHONEY. That introduces another uncertainty. Is it proposed to irrigate this extra 500,000 acres by the difference between 2,700,000 acre-feet presently being used and 3,800,000 acre-feet which you have told us in your maximum anticipated use?

Mr. MATTHEW. It will be irrigated.

Senator O'MAHONEY. That difference between 1,100,000 acre-feet?

Mr. MATTHEW. It would be irrigated by the total of those under irrigation which amounts to 4,150,000 acre-feet. That is a rough figure, covering the Palo Verde and Yuma and All-American Canal project.

Senator O'MAHONEY. Well, 3,800,00 is a maximum.

Mr. MATTHEW. That amount is 4,100,000.

Senator O'MAHONEY. Where does that figure appear?

Mr. MATTHEW. That is the sum of 300,000, 50,000, and 3,800,000.

Senator O'MAHONEY. I see. So that difference between 3,800,000 acre-feet and 2,700,000 acre-feet, namely 1,100,000 acre-feet is to be used on how many acres?

Mr. MATTHEW. I testified they are irrigating about 60,000 in Palo Verde and 10,00 acres in the Yuma project. That is 70,000. There will be an increase of 400,000 acres.

Senator O'MAHONEY. Four hundred thousand acres additional. Thank you.

Senator MCFARLAND. Mr. Matthew, just so we won't be misunderstood. Are these contracts that you have with the Secretary of the Interior all subject to the availability of water under the compact?

Mr. MATTHEW. That is right. No, I don't deny that.

Senator MILLIKIN. Mr. Matthew, just to formalize the answers put to inquiries to Senator O'Mahoney, will you furnish us a table giving your own estimates of present use of water of all Colorado River system projects in the lower basin.

Mr. MATTHEW. I will be glad to do that, sir. (Table in supplemental statement No. 3, at conclusion of Mr. Matthew's presentation.)

Senator MILLIKIN. Will you proceed.

Mr. MATTHEW. The figures set forth in table I show that even with the amount of withdrawal from holdover storage estimated by the Bureau of Reclamation, the requirements of existing and authorized projects in the lower basin exceed the water supply that will be available. As yet, no studies have been made to demonstrate that the long-time average flow of the Colorado River can be fully equated and that holdover storage can be provided which will furnish the amounts of water required to be withdrawn during a critical period such as 1930-46, inclusive.

The important facts revealed by the analysis are that the consumptive use requirements of existing and authorized projects in the lower basin exceed the water supply that will be available to the lower basin under full development and that no water will be available for any new consumptive use projects in the lower basin. New projects in the lower basin could be provided with water for consumptive use only at the expense of the projects now operating or authorized, or for which commitments have been made.

California has no desire or interest in entering into the question of where or on what projects Arizona may decide to use the water to which she may be entitled from the Colorado River system.

Senator MILLIKIN. Going back to that last sentence of the preceding paragraph, of course, when you refer to something being done at the expense of something else, correctly interpreted, that would mean according to the legal rights of all the interested parties. If California has a legal right to something and Arizona takes it away from her, that is at the expense of California. Or, if Arizona has a legal right to

something and that is taken away from California, that would be at the expense of Arizona?

Mr. MATTHEW. Yes; except, as I say, this is an engineering analysis and the point is simply that if these requirements were fully satisfied, then there would be no water available for any other project.

Senator MILLIKIN. Is that another way of saying all the claims on the river were satisfied?

Mr. MATTHEW. The claims on the river, sir, probably exceed these, I think. They would exceed this estimate of water requirements and that would be another matter, I believe. This is merely the estimated water requirements as compared to the water supply.

Senator MILLIKIN. Proceed, please.

Mr. MATTHEW. However, in the light of the analysis presented, it is desired to point out that in the opinion of California, with the completion of the Gila project as proposed by the bill, S. 483, now before Congress, no water will be available to supply any other new irrigation project in Arizona, such as the proposed central Arizona project.

NEW LAND DEVELOPMENT TO BE "RESCUED"

Considering that the proposed project is represented as being solely designed for the purpose of furnishing supplemental water supplies to meet water shortages on presently developed land or in other words a "rescue" project, it is proper to take into account the reasons for the existing water shortage. It is well known and recognized that there has been an overdevelopment of water resources in central Arizona due to rapid expansion of irrigated lands in recent years. Most of the overexpansion has been brought about by extensions of underground pumping. It has occurred with full knowledge on the part of the responsible water users, and the officials concerned with water in Arizona, as to the amount of water available for use and the practical limit of development from the waters of the Salt and Gila Rivers and tributaries.

There has been an intense activity to develop new irrigated lands during the last 7 years. This has resulted partly from the speculative opportunity for large profits from high-crop prices with the knowledge that the scanty ground-water supplies were being "mined," but with the expectation that the investment would be more than rapid before the water was exhausted. It is understood also that the activity resulted partly from the desire to establish rights to the use of water prior to the passage of a State water code. Had such a code been in effect, limiting pumping to the safe yield of a basin, it would have prevented such overexpansion of underground pumping.

The indicated over-all water shortage in the main service area of the proposed central Arizona project is not uniform throughout the area. The old established irrigation districts in the Salt River Valley have a water supply from surface and underground sources which is relatively adequate. The shortage in these areas is a relatively small part of the indicated over-all total. Such shortage as exists in these older projects is attributable to diversions to newer projects adjoining the older projects and to uncontrolled development of underground water for the irrigation of areas adjacent to the original Salt River project. This has resulted in drafts on the basin which have reduced the water supply previously available to the older projects.

Most of the over-all indicated water shortage in the main service area of the proposed project is in regions of known limited underground water supplies where irrigation pumping development has been the greatest. A large part of this pumping development is in the Eloy area and the Maricopa area in Pinal County, adjacent to the San Carlos project. The result of this pumping development has been a substantial draft on the ground water underlying the San Carlos project, using waters which are needed on that project. The San Carlos project was forced to come to Congress this year to request an appropriation of \$300,000, which was granted, to drill new wells and deepen others within the project area in order to compete with the adjacent newly developed lands in the race for the rapidly diminishing underground water supply.

From my own personal observation of the central Arizona area as late as February of this year, the drilling of new irrigation wells and the leveling and the development of new lands is still going on in the Eloy area in the face of known shortage of underground supplies.

Senator MILLIKIN. Do I detect an inconsistency in what you are saying now with your earlier statement as to which I questioned you, that the statements of the Bureau as to shortage of underground supplies is not sustainable?

Mr. MATTHEW. I don't think so, sir. I don't think there is a question of a doubt that they are overdrawing the surface and underground water supplies of the area.

Senator MILLIKIN. I thought you were challenging a similar statement of the Bureau of Reclamation.

Mr. MATTHEW. I was challenging it as to the estimate of the amount of the overdraft or water shortage there. The result of this pumping development has been a substantial draft on the underground water on the San Carlos project using water that is needed on that project. The San Carlos project was forced to come to Congress this year to request an appropriation of \$300,000, which was granted, to drill new wells and deepen others within the project area in order to compete with the adjacent newly developed lands in the race for the rapidly diminishing underground water supply.

Senator MILLIKIN. You say there is no inconsistency?

Mr. MATTHEW. I don't believe so, sir.

Senator MILLIKIN. Go ahead please.

Mr. MATTHEW. The amount of underground water in that general area is relatively small.

Senator MILLIKIN. Proceed, Mr. Matthew.

Mr. MATTHEW. Many of these newly developed lands have been either purchased or leased by the operators from the State of Arizona. Few farm homes are seen on these newly developed lands.

In a report of the United States Geological Survey on the underground water resources of the Santa Cruz Basin, dated March 11, 1947, the following statement appears:

The development of ground water in the Santa Cruz Basin has continued at an excessive rate since 1942. * * * The amount of water pumped has increased each year and has exceeded the annual safe yield in all parts of the basin. * * * The pumpage in 1945 was * * * 11 times the safe yield in the Eloy area, 18 times the safe yield in the Maricopa area. * * *

To a lesser extent, similar expansion of irrigation pumping has occurred in recent years in other areas, including lands around the perimeter of the Salt River project.

From the best information available, not less than 150,000 to 200,000 acres in central Arizona have been put under pump irrigation in the last 7 years in these areas of known limited underground water supplies and from my personal observation the process is still going on. Most of the indicated over-all water shortage of central Arizona is represented by this over-expansion of underground pumping in the last 7 years.

The Bureau of Reclamation has for several years been urging that, before a central Arizona project is approved, the State adopt an effective water code to restrict pumping to the safe yield of the basin. Such legislation was introduced in the Arizona Legislatures of 1945 and 1947, but has not been enacted.

It appears that the main effect of S. 1175 would be to "bail out" about 150,000 acres of new lands. Even this effect would be temporary, for, as testified by Assistant Commissioner Warne on June 23 in these hearings:

In fact, without adequate control of the ground water, the State would probably find itself in a short time again faced with the situation which now exists.

CONCLUSIONS

In conclusion, it is submitted that the bill S. 1175, which seeks to authorize the central Arizona project, should not be acted upon at this time, but if it is acted upon, should be disapproved for the following reasons:

1. The submission of this project to the Congress for proposed authorization at this time is premature, because:

(a) The reports of the Bureau of Reclamation on the proposed project are preliminary and the cost estimates and financial analyses therein are preliminary approximations subject to revision. A large amount of additional investigations and studies must be completed before a final report as to plans and as to engineering and economic feasibility can be made.

(b) In view of the magnitude of the proposed project, contemplating an expenditure of Federal funds in the amount of \$600,000,000, and ultimately \$1,000,000,000, and considering the complicated economic and legal problems involved, it should not be considered for authorization until a full report by the Secretary of the Interior has been submitted to the affected States for review and the comments of the States are submitted to the Congress, in accordance with the orderly procedure set up in the Flood Control Act of 1944 by the O'Mahoney-Millikin amendments. Otherwise, the Flood Control Act is circumvented.

Senator MILLIKIN. What is this figure of a billion dollars?

Mr. MATTHEW. The bill, S. 1175, would authorize a system of works, including Bridge Canyon Dam, and a tunnel to divert water from the Bridge Canyon Dam of some 80 miles in length.

Senator MILLIKIN. You are adding that?

Mr. MATTHEW. The total project is estimated at about \$1,000,000.

Senator McFARLAND. What you mean is the whole project. It would be about a billion dollars. We are not asking that the entire project be built now. We feel that construction costs are too high now and we can build for much less money at a later date. We ask

that construction of the tunnel be deferred until such time as economical conditions would justify it.

Senator MILLIKIN. Proceed, Mr. Matthew.

Mr. MATTHEW. (c) No showing has been made that the water supply contemplated to be diverted from the Colorado River for the proposed project will be physically and legally available. This is an essential prerequisite in any showing of engineering feasibility of a proposed irrigation or water-supply project. The legal availability of water supply for the project can only be ascertained through a determination yet to be made of the respective rights of the lower basin States to the water of the Colorado River system under the Colorado River compact, the Boulder Canyon Project Act; and relevant statutes, decisions, and instruments.

(d) The estimates of water requirements for the proposed project as set forth in the Bureau's preliminary report are approximations based upon inadequate data and studies, and the calculations therein of required supplemental water supply are questionable.

2. Preliminary cost estimates and financial analyses set forth in the preliminary report of the Bureau of Reclamation on the proposed project show that the proposed undertaking will not be self-liquidating with the probable revenues from hydroelectric power and water, under the provisions of existing reclamation law or reasonable modifications thereof. The project, if authorized and built, would require a large direct subsidy from the Federal Treasury in addition to interest-free funds for irrigation and the nonreimbursable costs presently allowed under existing law. The preliminary financial analyses reveal that the proposed project is so costly that it is of questionable justification from an economic standpoint, and indicate that a less costly solution of the problems involved should be sought.

3. The basic estimates presented in the Bureau's preliminary report on the proposed project, in regard to firm power output and power revenue, are preliminary approximations without adequate support and, therefore, the major portion—over three-quarters—of the estimated project revenues anticipated to be received from sale of hydroelectric power is problematical.

4. The Colorado River Board and the State of California are in disagreement with the State of Arizona's legal interpretation of the Colorado River compact, the Boulder Canyon Project Act, and related statutes, documents and instruments, in regard to the amount of Colorado River water to which Arizona is entitled; and are not in accord with the assumption in the Bureau's preliminary report, based solely on Arizona's interpretations of that compact and related statutes and documents, that 1,200,000 acre-feet annually, or any part thereof, would be available for diversion from the Colorado River into central Arizona.

5. Independent of any legal interpretations of the Colorado River compact and related statutes and documents, the water requirements of existing—operating—and authorized projects together with recognized commitments in the lower basin exceed the water supply that can be made available to the lower basin under full development of the Colorado River system. If the requirements of the existing and authorized projects are fully satisfied, no water will be available for any new consumptive-use projects in the lower basin, such as the

central Arizona project. The proposed diversion and use of Colorado River water by the central Arizona project, if consummated, would be at the expense of projects now operating or authorized, or for which commitments have been made.

6. The main effect of the central Arizona project would be to "rescue" land which has been developed, largely on a speculative basis, within the last 7 years in competition with the old established projects in central Arizona. This effect would be only temporary, so long as the State does not enact an underground water code.

Therefore it is respectfully requested and urged that action be deferred on S. 1175 seeking to authorize the central Arizona project, or if acted upon, that the bill be disapproved.

Senator MILLIKIN. Any questions?

Senator McFARLAND. Mr. Chairman, I would like to have the privilege of going over this testimony. I don't think I will have many questions. Mr. Matthew, you talked about the power paying for the cost of this project. In that respect it is not any different from the Central Arizona project. I understand on the Central Valley project in California, the estimated construction cost is \$384,314,000, and \$221,055,600 of this is allocated to irrigation. A total of \$108,822,876 of the irrigation portion will be repaid from the power revenue in addition to \$104,143,600 which has been allotted for power features. So, in that respect, our project is the same as the Central Valley of California, isn't it?

Mr. MATTHEW. We have no brief for the Bureau of Reclamation's report, Senator, on the Central Valley project. I don't think it has been approved by Congress as yet. That is what you are quoting from.

Senator McFARLAND. I will put in more information showing the relationship of this project with others, Mr. Chairman, when we get to our rebuttal. Does California have an underground water code?

Mr. MATTHEW. No.

Senator McFARLAND. That same argument would apply to the Central Valley project of California, wouldn't it, in regard to the underground water. That is, exhausting the supply that is returned to put in the project?

Mr. MATTHEW. To some extent that is one of the main purposes. There were many other purposes.

Senator McFARLAND. You spoke of 152,000 acres of land which would be benefitted. The only way that 152,000 was used was that was all the water that could be charged for in the first instance. There would be a reuse there and if you are much further inland, there would be much greater benefit.

You talked about southern California paying for the power, buying the power. She doesn't have to make a contract that isn't to her economic advantage to do so under this bill, does she?

Mr. MATTHEW. That is the way she understands.

Senator McFARLAND. Well, we are not going to compete with California. Mr. Chairman, most of these figures are engineering figures and I would like to go over them and I would like to have the opportunity to ask one or two other questions at our next meeting.

Senator MILLIKIN. Will you be here tomorrow, Mr. Matthew?

Mr. MATTHEW. Yes, sir.

Senator MILLIKIN. If there are no further questions, we will recess until 10 o'clock tomorrow morning.

(Whereupon, at 1 p. m., the meeting recessed until 10 a. m., Tuesday, July 1, 1947.)

(Senator McFarland was given permission to file as part of the record the following documents.)

UNITED STATES ATOMIC ENERGY COMMISSION,
Washington 25, D. C., July 1, 1947.

Senator ERNEST W. MCFARLAND,
Senate Office Building, Washington, D. C.

DEAR SENATOR MCFARLAND: You have the Commission whether, on the basis of the best available knowledge in our hands, it appears likely that hydroelectricity, such as that contemplated in the Central Valley project of Arizona, will be replaced by electricity produced by atomic energy within the foreseeable future. We are not, of course, informed about conditions respecting the particular project to which you refer.

As to your question let me say that while firm and unqualified statements about the exact rate of development of an industry which is so new should not be made, the Commission does not believe it at all likely that within the predictable future atomic power presents any serious question of replacing hydroelectricity. We have no doubt, on the basis of present knowledge, that the long-range future of atomic power is bright, but even as to long-range application the process will in general be one of supplementing rather than replacing other means of generating electric power.

Sincerely yours,

DAVID E. LILIENTHAL, *Chairman.*

[From the Republic and Gazette, Phoenix, Ariz., June 6, 1947]

URANIUM AND POWER

To the EDITOR of the GAZETTE:

The discovery of uranium in northern Arizona in such widely separated points as the northeast four State corner and Hack Canyon, a tributary of Kanab Creek, indicating large deposits, may have a greater influence on Colorado River developments than the strategy of Arizona's enemies.

Uranium-ore reduction requires immense quantities of hydropower and the cheapest, quickest and best place to get it is the upper part of the Colorado River not at Bridge Canyon.

The resource-grabbing ability of Los Angeles has advertised her widely extended city limits throughout the world, but that city is still smaller than the United States and may have to forego her program of mopping up Arizona power resources like she sponged up our water resources. The Nation should come first.

It is claimed that the State Department traded part of our water to Mexico in a grandiose gesture of goofy neighborliness to secure Latin America support for the United Nations, but I am old-fashioned enough to believe that Arizona resources converted to atom bombs will provide more security for the U. S. A. than the purchase of any nation's friendship or the increase of Los Angeles real-estate subdivisions.

Perhaps we may have to explode a bomb or two in this vicinity to awaken the people to possibilities of northern Arizona industrial developments.

There was a lot of quiet and leisure around the old Indian trading posts, brawny strength and waste products in the lumber mills and camps and glamour and dust in the cattle round-ups, but science and man are on the march and northern Arizona, for better or worse, is in the great parade of history. Lets' go, boys. We old fellows will stagger along, forward, while we may.

W. W. MIDGLEY, *Flagstaff, Ariz.*

[From the Arizona Daily Sun, June 11, 1947]

PARKER ROUTE IS NOT FEASIBLE BUT COLORADO-VERDE MAKES SENSE, SAYS
MAJ. W. W. MIDGLEY ON WATER PLANS

(By W. W. Midgley)

Bridge Canyon Dam hydroelectric power cannot pay for the central Arizona irrigation project as proposed in S. 1175. It would take 8 or 10 such dam power plants to do so.

This statement can be verified from March 1946, report of the Secretary of the Interior and Commissioner of Bureau of Reclamation, "The Colorado River." (Purple-covered book distributed in Arizona last January.)

On page 5 the cost of the Bridge Canyon Dam and power plant is given as \$234,400,000, the central Arizona project, to pump from Parker to supplement existing supply, as \$692,480,000. These total \$926,880,000.

Nontaxable war bonds, sold under patriotic pressure cost the Government less than 3 percent for interest. Operations, maintenance, depreciation, and construction time interest will amount to over 1 percent. This means 4 percent of \$926,880,000, or \$37,075,200 for the year.

With transmission lines for the lower basin power listed to cost \$288,150,000 the Bridge Canyon part should exceed \$65,000,000 which at 3 percent interest plus 3 percent operation, maintenance, etc., amounts to \$3,900,000.

This added to the \$37,075,200, gives us a total of \$40,975,200 that must be paid somehow by someone, sometime.

The Bureau estimates 805,000 acre-feet net water will be taken to central Arizona. At the very high price of \$6 per acre-foot, or \$24 per acre per year, the receipts would be \$4,830,000, leaving \$36,145,200 to be paid by power.

The Bureau estimates Bridge Canyon will produce 3,440,000,000 kilowatt-hours of power, but approximately 1,440,000 kilowatt-hours will be needed to lift all the water 975 feet to Granite Reef Dam, with some 470,000 acre-feet to be lifted 300 feet more to serve Gila Valley, leaving 2,000,000,000 kilowatt-hours for sale. This power must be sold at 18 mills per kilowatt-hour to produce \$36,000,000 per year. It cannot be done. (No X-ray needed.)

This is six times the cost of getting Boulder power to Los Angeles at present. It is far, far higher than the cost of wholesale power from small local steam or Diesel plants. Remember there is no flood control or navigation involved in this project to warrant immense Government subsidies.

Remember again this billion dollar project does not benefit all of Arizona's 700,000 people, who are but half of 1 percent of the population of the United States. Congress would have to expend \$400,000,000,000 on other projects to equalize the favors to all our citizens. Our terrific war debt, biggest in the world history, is but \$260,000,000,000.

Please just record another remember, that only 805,000 acre-feet is proposed for central Arizona which would be enough for but 200,000 new acres. At a billion dollars, 200,000 acres would cost per acre—take an anesthetic.

Here's one to smoke on and scratch that memory knob: The worker who each week has a pay-roll deduction tax would rather see his money used to buy things he wants for his home and family than expended by politicians in chimerical Government projects.

Or did they know that Bridge Canyon power, based on USBR estimated costs, could hardly be sold for enough to pay its own way with interest at 3 percent, and perhaps they never intended to construct any Arizona irrigation facilities but only for California power needs?

Say, good people, just figure this out carefully. Don't kid yourself—be sure and put the decimal point right where it belongs.

CENTRAL ARIZONA PROJECT, ARIZONA

REPLIES TO INTERROGATORIES TO V. E. LARSON BY SENATOR DOWNEY

1. Question (a): Furnish map and description showing exact boundaries of area to be served water by the project.

Answer: The potential central Arizona project would provide supplemental water for the areas and irrigation districts tabulated in table No. S-1. This table also states the maximum acreage irrigated; the average acreage irrigated during the period 1940-44; and the irrigated acreage during 1944.

The boundaries of each irrigation organization are shown on drawings titled "Irrigation Districts and Affected Areas"; Nos. 8b-4-196, 8b-4-197, and 8b-4-198. Copies of these maps are attached. The individual ownerships to receive water from the project and the amounts of water furnished irrigation organizations will need be determined by negotiation, after the project is authorized.

Question (b): Indicate on the map the parts of the area which have been developed in the last 7 years.

Answer: Information in regard to the areas which have been developed in the last 7 years has not been compiled.

Question (c): What is the total acreage developed within the last 7 years?

Answer: The desired information has not been compiled.

2. Question (a) : How is the return flow of 123,000 acre-feet calculated?

Answer: The return flow of 123,000 acre-feet represents the amount of water estimated to return to the Colorado River from the release of 210,000 acre-feet from the central Arizona area needed to carry out of the project area the salts brought to the area from the Colorado River.

Question (b) : What records substantiate this calculation?

Answer: The available scattered records of the Gila River below Gillespie Dam and at Dome were used as a guide to estimate the loss along the Gila River between the central Arizona project and the Colorado River.

Question (c) : Why will the return flow not be used on Wellton-Mohawk or other areas below Gillespie Dam?

Answer: Such return flows were considered to be too saline for suggested use.

3. Question: Give break-down of figures of 206,000 and 882,000 acre-feet of present and future requirements of projects on Colorado River below Parker Dam.

Answer: The break-down of figures 206,000 and 882,000 acre-feet of present and future depletions of Colorado River water below Parker Dam is as follows:

(a) Present depletions:	<i>Acre-feet</i>
Yuma project.....	157, 000
Colorado River Indian project.....	15, 000
North Gila Valley.....	13, 000
South Gila Valley.....	20, 000
Yuma Mesa.....	1, 000
Total.....	206, 000
 (b) Future depletions:	
Colorado River Indian project.....	285, 000
North Gila Valley.....	3, 000
South Gila Valley.....	3, 000
Yuma Mesa.....	280, 000
Wellton-Mohawk.....	311, 000
Total.....	882, 000

Since preparation of Mr. Larson's testimony, it is understood that there is a strong possibility that the Gila project (north Gila Valley, south Gila Valley, Yuma Mesa, and Wellton-Mohawk) will be limited to combined use of 600,000 acre-feet. If such a limitation is placed on the Gila project the total of the future depletions would be reduced by 31,000 acre-feet.

4. Question: Explain reason for difference between figure of 468,000 acre-feet for estimated pumping overdraft and figure of 537,000 acre-feet on page 8 of preliminary report filed with committee.

Answer: The figure shown on page 8 of the preliminary draft of report dated February 1947, Report on Feasibility of Bridge Canyon Route—Central Arizona Project, were based on incomplete studies of safe annual yield of groundwater basin and amount of pumping from the groundwater. Additional study of the available data, made between the preparation of the February 1947 draft of report and the testimony submitted by Mr. Larson, indicates the figure of 468,000 acre-feet of estimated pumping overdraft to be more nearly correct. The following table and explanatory notes present the two sets of data.

Comparison of overdraft in Maricopa and Pinal units

Item	Draft of report, February 1947	Mr. Larson's testimony, June 23, 1947
	<i>Acre-feet</i>	<i>Acre-feet</i>
Pumping 1940-44.....	¹ 1, 149, 000	¹ 1, 128, 400
Safe yield.....	² 612, 000	³ 660, 000
Overdraft.....	537, 000	468, 400

¹ In absence of specific data, many pumps assumed to discharge at full rated capacity.

² Subsequent study of individual pumps shows these not capable of discharging at full rated capacity; hence estimate of total rate of pumping reduced.

³ "Safe yield" reduced by an allowance for assumed future out-flow to maintain salt balance.

⁴ "Safe yield" without including an allowance for future outflow for salt balance. Allowance for salt balance is provided for in a separate item.

5. Question: What is the estimated safe yield of the underground basins in the project, in total and by subareas; and on what are the estimates based?

Answer: The estimated safe annual yield of the underground basin was determined from available records by measuring the discharge from the underground basin during a period of years, and computing the change in groundwater storage using data on specific yield and the average change in water level over the underground basin during the same period. The estimates of safe annual yield were made by the groundwater division of the United States Geological Survey as follows:

Maricopa unit:	<i>Acre-feet</i>
Salt River above Gillespie Dam.....	525, 000
Area below Gillespie.....	25, 000
Total Maricopa unit.....	550, 000
Pinal unit:	
Coolidge-Casa Grande-Florence area.....	100, 000
Maricopa area.....	10, 000
Total Pinal unit.....	110, 000
Total for Maricopa and Pinal units.....	660, 000

6. Question (a): Explain in detail the basis for estimated pumping overdraft.

Question (b): How much of total is in Salt River Valley area?

Question (c): How much in each of other groundwater basin areas?

Answer (a): The method used is to compare the average annual pumping during the period 1940-44 with the estimated average safe annual yield of the underground basin.

Answer (b) and (c): The break-down by groundwater units is as follows:

[Units: 1,000 acre-feet]

Unit	Average annual pumping, 1940-44	Safe annual yield of underground basin	Annual pumping overdraft
Maricopa.....	873. 7	550. 0	323. 7
Pinal.....	254. 7	110. 0	144. 7
Upper Gila.....	32. 4	32. 4	0
San Pedro.....	2. 2	2. 2	0
Total.....	1, 163. 0	694. 6	468. 4

7. Question: What are the reasons and bases for changes in figures on water supply from those in table II, page 9 of preliminary report?

Answer: See answer to question 4. Use of the more recent figures for safe annual yield, and for need of supplemental water supply resulted in modified figures shown in Mr. Larson's testimony.

The former figures and the more recent figures (which represent refinements made by the Bureau since preparation of the February 1947 draft of report) are summarized in the following table:

Feature	Figures in February 1947 draft of report	Figures in Mr. Larson's testimony
	<i>Acre-feet</i>	<i>Acre-feet</i>
New surface water available at district headgate.....	1, 082, 000	1, 082, 000
Less surface diversions required to replace reduction in pumping.....	627, 000	538, 000
Less supplemental water needed for lands now irrigated.....	143, 000	113, 000
Less requirement for municipal water supply.....	12, 000	12, 000
Water available for lands formerly irrigated, but now idle for lack of water.....	300, 000	419, 000

8. Question (a): Why are 73,500 acres of "idle" acreage to be served, instead of 52,560 acres shown on page 8 of preliminary report?

Answer: As indicated in answer to item 7, the most recent figure of water available for diversion to lands formerly irrigated, but now idle for lack of water is 419,000 acre-feet. The corresponding figure shown on page 8 of the preliminary draft of report dated February 1947 was 300,000 acre-feet. Unit rate of diversion was calculated to be 5.7 acre-feet per acre for a full water supply, which allows for a 30-percent loss between the district headgate and the farmer's headgate.

$$300,000 \div 5.7 = 52,560 \text{ acres}$$

$$419,000 \div 5.7 = 73,500 \text{ acres}$$

Question (b) : How was this acreage ascertained?

The exact location of the acreage will need be determined by future negotiations following authorization of the project. In general, however, the lands will be parts of existing farms which have a water right, but due to existing shortages an individual farmer concentrates his limited water supply on only part of his holdings. The available water supply resulting from construction of the project would be adequate for only a part of the acreage irrigated at various times in the past. The present water supply is adequate only for 414,000 acres when adequate water is released for salinity balance. Construction of the project would increase the supply and permit permanent irrigation of 640,000 acres, or an increase of 226,000 acres. However, this acreage would be 32,000 acres less than the maximum of 672,000 acres irrigated prior to 1944.

9. Question: As to irrigation distribution systems and drainage systems:

Question (a) : Have they been designed and laid out?

Question (b) : If not give basis of capital and operating costs.

Question (c) : Give description of areas to be served.

Answer (a) : No designs and lay-outs have been made.

Answer (b) : From general maps of area, there was made a rough estimate of the approximate mileage and capacities of canals, laterals, and drains needed. The construction and annual costs were estimated on a mileage basis for various capacity canals. The estimated construction cost and operating costs were based upon Bureau of Reclamation records for similar work.

Answer (c) : Data desired not available until after negotiations have been completed to ascertain exactly which lands will be served by the project. Such negotiations will not be conducted until the project has been authorized for construction.

Although this method is admittedly a rough method of estimation, it is believed that sufficient funds have been included in project cost to cover construction of such canals, laterals and drains as will be found necessary upon completion of more detail lay-outs.

10. Question: What is the estimated output of Bridge Canyon power plant by months under conditions of years 1931 to 1946, inclusive?

Answer: The attached table (S-2) shows for initial conditions, the estimated output of Bridge Canyon power plant by months for the water years, 1931 to 1940, inclusive—monthly calculations have not been extended beyond 1940.

For ultimate conditions, it has been presumed that flow at Lee Ferry would be regulated by upstream reservoirs to a practically uniform amount. Since we do not know precisely how such upstream reservoirs will be operated in the future an estimate was not made of the monthly power output at Bridge Canyon dam for such ultimate conditions. We assumed an average annual flow at Lee Ferry of 7,500,000 acre-feet.

11. Question (a) : Can Bridge Canyon, Hoover, and Parker power be "coordinated" without revising the Hoover and Parker power contracts?

Answer: No. The Hoover power contracts will require revision.

Question (b) : If not, what revisions must be sought?

Answer: Revisions must be effected in the Hoover contracts which will permit the effective coordination of that plant with Bridge Canyon. This will require arrangements permitting Bridge Canyon power at times to supply, in part at least, the Hoover contracts at various times, and the Hoover Dam at other times to supply in some part contracts which may in the future be made for Bridge Canyon power. It seems only reasonable that the maximum possible potential uses be made of the Colorado River by combining the operations of the various developments to the end that the Nation, as well as all of the people within the market area of the developments, will achieve the maximum possible benefits.

12. Question (a) : How much of the commercial power output of Bridge Canyon do you estimate would be marketed in southern California?

Question (b) : How much in southern Nevada?

Question (c) : How much in southern Utah?

Question (d) : How much in Arizona?

Answer : The estimated power load growth for these areas are 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.....	66	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

The annual net firm energy production available for commercial use under initial conditions at Bridge Canyon is equal to 3,594,000,000 kilowatt-hours as shown in the table following page 43, of Mr. Larson's statement. This compares with added requirement in 1960 over 1945 of 11,327,000,000 kilowatt-hours for southern California, 647,265,000 kilowatt-hours for southern Nevada, 24,710,000 kilowatt-hours for southern Utah, and 1,926,000,000 kilowatt-hours for Arizona.

13. Question (a) : Has the power transmission system been designed and laid out?

Question (b) : Give break-down showing location, length, capacity, and cost of each transmission line.

Question (c) : Give location, capacity, and cost of each substation.

Question (d) : Does the estimated cost of transmission of \$86,000,000 include the cost of new transmission lines and appurtenances to deliver power at or near Los Angeles?

Answer : The power-transmission system has not been designed and laid out because it is not possible at the present time to determine this. All potential customers for power to be developed at Bridge Canyon and the other power sites of the Central Arizona Project have not been determined, but it is contemplated that all power will be marketed within reasonable transmission distances of the power plants. The city of Los Angeles is considered a part of this market area.

The estimated cost of \$86,000,000 is based on the use of approximately \$112 per kilowatt for a total installation of 770,000 kilowatts. The use of such an average figure is considered reasonable for such disposal of power as based on previous experience on costs. It is believed premature to attempt to design all features of a transmission system pending authorization of the project and negotiations for sale of the power output.

14. Question (a) : Give break-down of annual costs and annual returns.

Answer : The following tabulation shows the break-down of the average annual costs and average annual returns. These are shown for two repayment provisions.

First (based upon repayment of irrigation allocations in 80 years without interest; repayment of power allocations in 50 years with 2 percent interest on the unpaid balance; repayment of allocations to municipal water in 50 years with 2 percent interest on the unpaid balance; and applying the interest component from power to aid irrigation. The costs and returns are based upon the allocations as shown in table 11 of Larson's testimony.)

Average annual costs

Irrigation	\$3, 895, 900
Power	2, 734, 762
Municipal	221, 438
Operation and maintenance	15, 115, 375
Reserve for replacement	1, 984, 612
Total	13, 952, 087

¹ Does not include operation and maintenance reserve for replacement for the Tucson aqueduct after 50 years, since this feature assumed to be paid out at end of 50 years, and thereafter, city will pay operation and maintenance costs of that feature.

Average annual returns

Power (at 4 mills per kilowatt-hour, delivered to load centers)	\$10,685,300
Irrigation (at 4.50 per acre-foot delivered to farm headgate)	3,054,400
Municipal (water at 15 cents per 1,000 gallons delivered to Tucson) ..	329,938
Total	14,069,638

Second (annual costs are based upon repayment of irrigation allocations in 50 years without interest; repayment of power allocations in 50 years with 3 percent interest on the unpaid balance; repayment of allocations to municipal water in 50 years with 3 percent interest on the unpaid balance; and applying the interest component to aid irrigation. The returns are based on rates shown under the first plan. The costs and returns are based upon the allocations as shown in table 11-A of Larson's testimony.)

Average annual costs

Irrigation	\$8,570,000
Power	4,931,000
Municipal	442,100
Operation and maintenance	5,130,600
Reserve for replacement	1,985,700
Total	19,059,400

Average annual returns

Power (at 4 mills per kilowatt-hour delivered to load centers)	\$11,420,400
Irrigation (at \$4.50 per acre-foot delivered to farm headgate)	2,882,000
Municipal (water at \$0.15 per 1,000 gallons, delivered to Tucson)	527,900
Total	14,810,300

NOTE.—It should be noted that the returns are inadequate to accomplish the full return of the irrigation allocation in the 50-year period. To do so requires a power rate of 5.5 mills per kilowatt-hour; computations have not been made on the interest component that would be applied on irrigation with this plan.

Question (b): How much of total returns over repayment period is the so-called interest component on commercial power investment?

Answer: The interest component applied on the irrigation allocation for the first condition listed under (a) would be \$129,300,000, and for the second condition listed under (a) would be \$232,621,000. It should be noted that the project would not be paid out at the end of the 50 years.

15. Question: Furnish tables showing annual costs and returns under S. 1175, under S. 433, and under existing reclamation law.

Answer: Under question No. 14 the average annual costs and returns are tabulated for two repayment conditions.

Senate bill 433 provides for repayment of irrigation allocations without interest and within a period of 80 years. It also provides for amortization of power allocations in 50 years at 2 percent interest on the unpaid balance.

Senate bill 1175 provides for repayment of the irrigation allocation without interest and within a period not to exceed the useful life of the project, and for amortization of power allocations in accordance with the Federal reclamation laws which is 50 years at 3 percent interest on the unpaid balance. Assuming the allocation to irrigation and to other uses under S. 1175 are the same as shown in table 11 (following p. 46) for S. 433, the required power rate to amortize the allocation to power in 50 years with 3 percent interest, and pay the pro rata share of the operation and maintenance costs, are estimated to be 4.1 mills per kilowatt-hour at the load center. With that power rate and assuming the interest component on power to be applied to the allocation to irrigation, the project could be repaid in 76 years under S. 1175. It appears that such a period is well within the useful life of the project.

Under these assumptions, the average annual costs and average annual returns under S. 1175 would be as shown in the following tables.

Average annual costs

Irrigation.....	\$4, 101, 000
Power.....	2, 879, 000
Municipal.....	285, 000
Operation, maintenance, and replacements.....	¹ 7, 100, 000
Total.....	14, 365, 000

¹ Does not include operation and maintenance, etc., for Tucson aqueduct after 50 years.

Average annual returns

Irrigation (\$4.50 per acre-foot delivered to farm headgates).....	\$3, 038, 000
Power (4.1 mills kilowatt-hour delivered to load centers).....	11, 019, 000
Municipal (\$0.15 per 1,000 gallons delivered to Tucson).....	347, 000
Total.....	14, 404, 000

The total amount of the interest component from power, which was applied to help pay the irrigation costs is \$206,000,000.

16. Question (a): What is the estimated cost per kilowatt-hour at the pump for aqueduct pumping?

Answer: Table 11, following page 46 of Mr. Larson's testimony shows the portion of the power features allocated to irrigation by reason of use of power for project pumping. The amount thus allocated to irrigation to furnish power for pumping at the Havasu pumping plants is \$92,109,000. (Bridge Canyon, Bluff, Coconino and \$26,000,000 of the transmission system which is allocated to irrigation.) The annual cost of these features is estimated to be as follows:

Repayment, 1/80 of \$92,109,000.....	\$1, 151, 000
Operation, maintenance, and replacement.....	1, 288, 000
Total.....	2, 419, 000

The average cost per kilowatt-hour delivered to the pumping plants would be 1.75 mills.

Question (b): Including this cost, what are the estimated total annual costs of operation, maintenance, and replacements chargeable to irrigation?

Answer: It would be \$2,419,000 + (\$3,910,000 - 1,268,000) = \$5,061,000, less such amount that would be assigned to be repaid from net power revenues.

Question (c): Same as (b), per acre-foot delivered at farm headgate?

Answer: The cost per acre-foot at the farm headgate would average \$7.45 less the amount that would be assigned to be repaid from net power revenues.

17. Question: Based on commercial power cost allocations in table 11a what would be the estimated cost per kilowatt-hour of power delivered at load centers on a 50-year, 3-percent amortization basis?

Answer: The following tabulation shows the computations of this item for two assumptions: (1) Commercial power will carry the entire annual project, expenses for operation, maintenance, and replacements, except for that portion allocated to municipal water supply; (2) commercial power will carry only its pro rata share of the annual expenses for operation, maintenance, and replacements.

Feature	Assumption ¹	Assumption ²
Interest and amortization ¹	\$9, 582, 000	\$9, 582, 000
Operation, maintenance, and replacements.....	7, 074, 000	3, 159, 000
Total annual cost.....	16, 656, 000	12, 741, 000
Salable energy:		
Million kilowatt-hours.....	2, 855	2, 855
Cost per kilowatt-hour (mills).....	5.83	4.47

¹ 3.887 percent of \$246,551,000.

² A average for 50-year period, assume 7 percent loss deducted from condition B in table 9 (following p. 43 of Mr. Larson's testimony).

Question 18. (a) : What would be the return to cost ratio under S. 1175 with a 4-mill power rate?

Question (b) : What power rate would be necessary under S. 1175 to give a ratio of 1 to 1?

Question (c) : What would be the number of years required to effect a 1 to 1 return-cost ratio with assumed power and water rates under S. 1175?

Answer : Assuming in all cases that the interest component from power would be used to help pay the irrigation costs and assuming an interest rate of 3 percent on the unpaid balance the questions would be answered as follows :

Answer (a) : If the project be assumed to have a useful life of 80 years, the ratio would be 1 to 1.

Answer (b) : Rate of 4.1 mills per kilowatt-hour if useful life of project is assumed to be 76 years.

Answer (c) : Eighty years.

Question 19: Cite authority under existing reclamation law for justifying feasibility of projects by comparison of benefits and costs.

Answer : The reclamation law does not base feasibility on the ratio of benefits to costs nor does the Bureau of Reclamation engage in "justifying feasibility" of projects on such a comparison. Reclamation law provides that if projects can meet certain criteria they are subject to authorization by the Secretary of the Interior. If they cannot meet those criteria then they can be authorized only upon action by Congress. All project planning reports prepared by the Bureau of Reclamation contain a comparison of benefits and costs. The authority to do so derives from various acts of the Congress beginning with the act of June 17, 1902, which provides for "examinations and surveys" of projects and the presentation to the Congress of "all facts relative to the practicability of each irrigation project." Similarly, for many years provision has been made in annual appropriation acts for making "engineering and economic investigations of proposed Federal reclamation projects."

The benefit cost analysis is presented for convenience in appraising the economic justification and the effectiveness of the proposed plan.

In addition, the Bureau of the Budget receives from other agencies certain related reports which, by law, include benefit-cost analyses; so for purposes of correlation and comparison, the availability of a benefit-cost analysis in reclamation reports presents opportunity for facilitating the desired review.

20. Question : Give break-down and basis of evaluating silt control benefits.

Answer : Silt control benefits for Bluff Dam, Coconino Dam, and Bridge Canyon Dam were based on the cost of preserving or replacing the reservoir storage capacity of Lake Mead. The reservoir capacity at Lake Mead is required for flood control, storage, and regulation of the river flows for irrigation and the production of power. This storage capacity is needed to store the flows during years of high run-off until needed during years of low run-off. To preserve this storage would require that upstream silt control be provided. The value of this silt retention is based upon the cost of storage at Glen Canyon and at the Coconino site to retain silt. The cost per acre-foot to retain this silt is based upon the estimated cost of these dams (\$11.75 per acre-foot). On the basis of this cost or value, Bridge Canyon Dam, Bluff Dam, and Coconino Dam were assigned a benefit in accordance with the amount of silt retained by these reservoirs.

The silt control benefit at the Buttes Dam and Hooker Dam were determined by the United States Engineer's office, Los Angeles, Calif.

The annual benefits for silt control are shown in the following tabulation :

Bluff Dam.....	\$331,000
Coconino Dam.....	317,000
Bridge Canyon Dam.....	867,000
Buttes Dam.....	331,250
Hooker Dam.....	8,750
Total.....	1,855,000
Rounded to.....	1,900,000

21. Question: Give break-down and basis of evaluating recreation benefits.

Answer: The annual recreational benefits at the various reservoirs included in the project were estimated from data furnished by the National Park Service. These annual benefits are shown in the following tabulation:

	<i>Future conditions</i>
Bluff Reservoir.....	\$3, 979
Comonino Reservoir.....	18, 032
Bridge Canyon.....	533, 905
McDowell Reservoir.....	32, 430
Horseshoe Reservoir.....	39, 399
Buttes Reservoir.....	5, 836
Charleston Reservoir.....	10, 810
Hooker Reservoir.....	8, 096
Total.....	652, 487
Rounded to.....	650, 000

22. Question: Give break-down and basis of evaluating fish and wildlife benefits.

Answer: Fish and wildlife benefits were computed from basic data supplied by the Arizona Game and Fish Commission. The benefits were based upon the estimated number of pounds of fish that each reservoir would yield. These annual values are shown in the following tabulation:

Bluff Reservoir.....	\$150, 000
Bridge Canyon Reservoir.....	150, 000
McDowell Reservoir.....	33, 750
Horseshoe Reservoir.....	27, 188
Buttes Reservoir.....	28, 125
Charleston Reservoir.....	40, 312
Hooker Reservoir.....	1, 875
Total.....	431, 250
Rounded to.....	430, 000

23. Question: Give break-down and basis of evaluating flood control benefits.

Answer: The flood control benefit at the McDowell Dam was estimated by the Bureau of Reclamation on the basis of providing the flood control storage. This was based on the estimated cost of the high dam, less the cost of the low dam. A preliminary study of the flood control benefits were made. These studies indicated that the flood control benefits were at least equal to the cost of providing the storage.

The flood control benefits for the other features were estimated by the United States Engineer's office at Los Angeles, Calif. The benefits determined by that office were adjusted by the Bureau of Reclamation to reflect the higher price levels that, it is believed, will occur during the repayment period.

These benefits are shown in the following tabulation:

McDowell Dam.....	\$94, 715
Buttes Dam.....	146, 250
Charleston Dam.....	32, 500
Safford Valley improvements.....	18, 750
Hooker Dam.....	16, 600
Total.....	308, 815
Rounded to.....	310, 000

TABLE S-1.—Central Arizona project land data

Unit	Maximum area ever irrigated	Average area irrigated, 1940-44	Area irrigated, 1944
Maricopa unit:	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Aradia area.....	1,150	970	
Arlington Canal Co.....	4,480	4,020	4,020
Buckeye water conservation and drainage district.....	19,290	15,360	15,360
Chandler Heights irrigation district.....	1,290	1,020	1,020
Gillespie area.....	20,000	14,380	14,380
Good Year Farms and Adaman Mountain Water Co.....	15,450	10,910	10,910
Indian lands.....	4,640	3,360	3,360
Maricopa County mountain water conservation district No. 1.....	27,880	20,740	20,740
Marinette farm.....	8,300	3,980	3,980
Peninsula—Horowitz and Colorado and San Jose irrigation district.....	3,730	2,510	2,510
Private pumps—			
East of reclamation water conservation district.....	2,520	1,850	1,850
North of Arizona canal.....	10,170	5,290	5,290
South of Salt River project.....	12,140	9,410	9,410
West of Aqua Fria.....	15,000	9,000	9,000
Queen Creek area.....	16,080	10,350	10,350
Roosevelt irrigation district.....	35,260	32,760	32,760
Roosevelt water conservation district.....	37,500	31,270	31,270
Salt River project and miscellaneous areas.....	229,610	217,790	217,790
Total Maricopa unit.....	462,490	394,970	406,000
Pinal unit:			
Magma area.....	3,660	2,600	2,600
San Carlos project.....	83,400	73,750	73,750
Stanfield and Maricopa districts.....	32,100		
Electrical district No. 2.....	29,490	47,380	47,380
Electrical district No. 4.....	7,250		
Total Pinal unit.....	157,300	123,730	133,000
Upper Gila unit:			
Cliff-Gila area, N. Mex.....	5,000	4,500	4,500
Duncan-Virden Valley.....	8,060	7,770	7,770
Red Rock Valley, N. Mex.....	1,500	1,300	1,300
Safford Valley.....	32,510	32,070	32,070
Total Upper Gila unit.....	47,070	45,640	45,640
San Pedro unit: St. David and Pomerene.....	4,500	1,830	1,830
Grand total.....	671,960	566,170	587,470

TABLE S-2.—Monthly power output, Bridge Canyon power plant

(Assume coordinated operation of Bluff, Bridge Canyon, Hoover, Davis, and Parker Dams with inlet conditions (diversion of 850,000 acre-feet annually from Lake Havasu) of Central Arizona project)

[Units, million kilowatt-hours]

Year ending September 30	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
October.....	481	288	258	368	142	369	370	423	507	3
November.....	348	264	281	350	166	342	383	482	540	2
December.....	391	371	384	384	187	495	405	520	558	2
January.....	345	372	360	365	306	370	378	558	378	2
February.....	369	504	341	345	285	368	396	498	380	2
March.....	380	548	432	332	303	421	476	472	499	2
April.....	352	498	422	206	294	395	420	425	410	2
May.....	300	558	515	374	395	558	558	535	511	2
June.....	332	540	540	126	540	540	540	540	442	2
July.....	305	558	518	114	558	503	558	558	262	2
August.....	269	413	262	137	420	497	484	351	292	2
September.....	323	345	226	137	405	444	405	396	455	2
Total.....	4,195	5,259	4,539	3,238	4,001	5,302	5,373	5,758	5,234	3,940



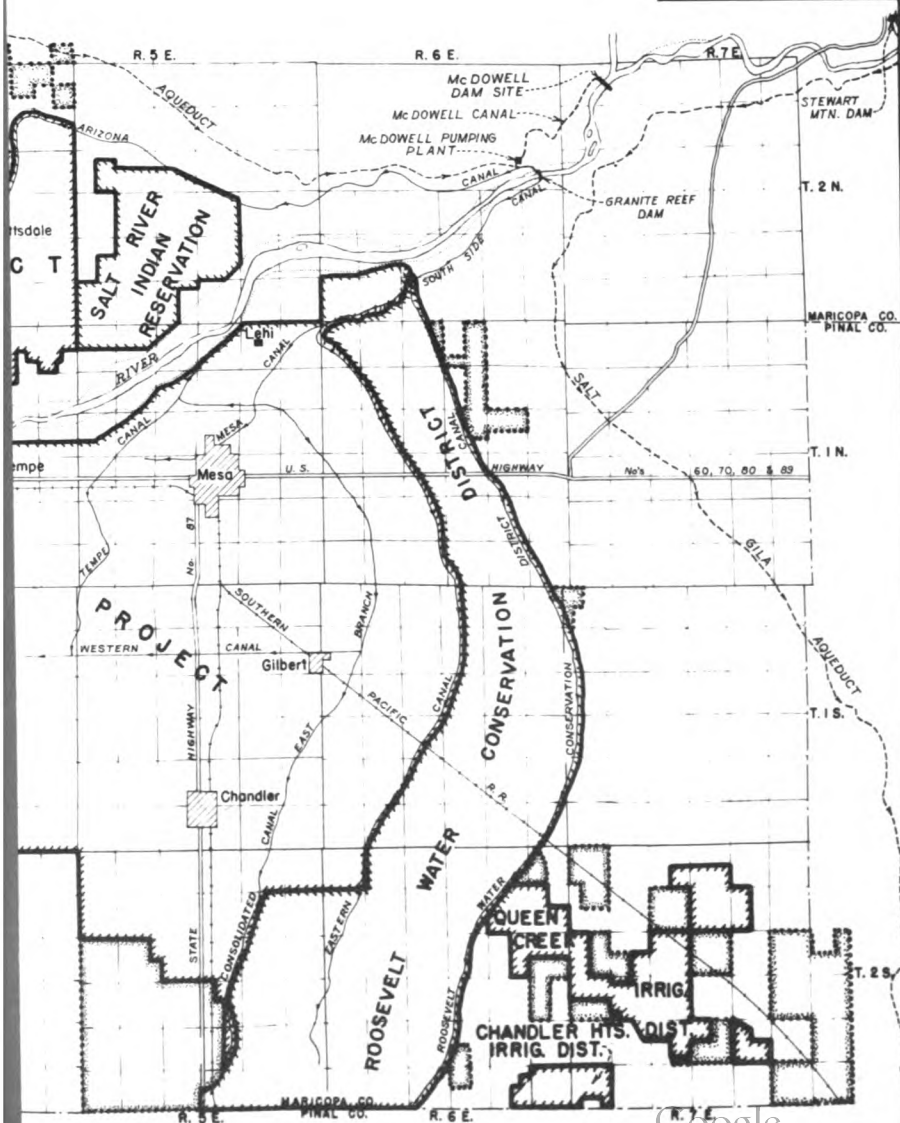
INDEX MAP

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL ARIZONA PROJECT IRRIGATION DISTRICTS AND AFFECTED AREAS

DRAWN... E.A.M. SUBMITTED
TRACED... M.H.S. RECOMMENDED
CHECKED... APPROVED

8D-4-1956
PHOENIX, ARIZONA NOV. 7, 1945
SHEET 1 OF 3





BRIDGE CANYON PROJECT

TUESDAY, JULY 1, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment at 10 a. m., in Room 224, Senate Office Building, Senator Eugene D. Millikin, presiding.

Present: Senators Millikin (presiding) and Watkins.

Also present: Senators McFarland, Downey, and Malone.

Senator MILLIKIN. The meeting will come to order.

Senator MCFARLAND. Mr. Chairman, I would like to ask Mr. Matthew one or two questions, if I may.

FURTHER STATEMENT OF RAYMOND MATTHEW

Senator MCFARLAND. Mr. Matthew, your objection to this project is chiefly that of water supply, isn't it?

Mr. MATTHEW. Yes, sir.

Senator MCFARLAND. If this wasn't water that you contended California was entitled to, you would have no objection to the project, would you?

Mr. MATTHEW. Our basic objection is that it would evade water needed in California.

Senator MCFARLAND. If that were removed, you would really have no objection?

Mr. MATTHEW. That would remove the basic objection.

Senator MCFARLAND. Mr. Chairman, to save time, I have prepared some questions; I am really just asking for a break-down of the testimony which Mr. Matthew gave, and I think that we will just submit it to Mr. Matthew and let him return it.

Senator MILLIKIN. You mean you want him to answer it now?

Senator MCFARLAND. No. I think it is something he may want to take a little time figuring out.

Senator MILLIKIN. That you will submit for the record later?

Senator MCFARLAND. Yes. I would like him to return it some time later. His written answers will be all right. And, I would like to give the same interrogatory to the Reclamation Service and we will see how nearly they give the same answers.

Senator MILLIKIN. I assume you will be available for questioning during the rest of the hearing, but in any event, will you put something in writing in answer to this interrogatory?

Mr. MATTHEW. I will be glad to, Mr. Chairman.

(Questions and answers appear as Supplemental Statement No. 4 in conclusion of Mr. Matthew's presentation.)

Mr. Chairman, with your permission, may I refer to an answer that I gave in response to Senator McFarland's question yesterday. I wish to clarify the answer to a question which Senator McFarland asked me yesterday. The question was, in substance: "Has California an underground water code?"

My answer was "No." A more clear and complete answer would be:

California has a water code, but it contains no provisions regulating the use of underground water. The law on that subject is contained in our court decisions. The Supreme Court of California about 50 years ago, in the leading case of *Kutz v. Walkinshaw*, held that owners of land overlying an underground basin have a correlative right in the underground percolating water, whereby each may use consumptively only his fair share. This right resembles the riparian right in a stream under common law.

The doctrine has been followed in numerous cases, the latest of which is *City of Pasadena v. City of Alhambra* (79 A. C. A. 512), decided about a month ago, in which pumping from an underground basin, which had created an overdraft, was enjoined and each party was limited to his share of the net safe yield of the basin.

I am informed that no law or decision in Arizona prohibits one from pumping all the water he can reach, no matter what the effect may be on his neighbors, of the basin.

Senator MILLIKIN. Does priority use affect that formula in any way?

Mr. MATTHEW. That is a matter the court or the referee, as the case comes up to the court, may decide, Senator.

Senator DOWNEY. Mr. Chairman, I would like to attempt to clarify that. I think the right is correlative in every property owner, even though one of those property owners has used the water before the other makes use of it.

If we would assume 100,000 acres over a certain underground basin, and the owners had developed 50,000 acres over a period of years, the new owner could start in and use the underground water.

Senator MILLIKIN. If that use is proportionate?

Senator DOWNEY. That is right. If for 100,000 acres there is only water enough for 80,000, each could irrigate 80 percent of his land.

Senator MILLIKIN. The different owners of the land just keep drilling. There is nothing to stop them from drilling for water underneath the land?

Senator DOWNEY. As long as they don't take more than their proportionate share of water.

Senator MILLIKIN. What correlation is there, if any, between the rights to underground water and surface water? Let me put that in terms of a case. Suppose a man with a well settled surface priority would be injured by upstream underground reservoir depletion, would he have any rights in the matter?

Senator DOWNEY. You mean by underground pumping?

Senator MILLIKIN. Yes.

Senator DOWNEY. Only to the extent that it could be proven that the pumper was tapping a well recognized underground stream. If it is natural percolating water, he could not be affected. Now, there are certain other limitations. The overlying owner cannot pump water and remove it from his own land, if he is sought to be restrained by another overlying owner. If, however, for a period of 5 years, water

is pumped out and taken to the other land, the pumper gets a prescriptive right which does have priority over other owners overlying the basin. It is a rather odd situation. One underground owner cannot gain a prior right against another. The rights remain correlative even though one has the prior use right. But a owner of remote land, who has been using on it underground water pumped in the basin if allowed to do that for 5 years, acquires an adverse right under the doctrine of prior appropriation.

Senator MILLIKIN. That goes, where a man takes water out of tract A, and transports it over to tract B off of tract A.

Senator DOWNEY. That is right. That become an appropriative right, which, unless the other overlying property owners restrain it within 5 years, becomes a prior right.

Senator WATKINS. Senator Downey, that testimony is contradictory to testimony offered in the land limitation hearing.

Senator DOWNEY. Senator Watkins, it is conceded there by everybody, including the Bureau of Reclamation's attorneys, that these overlying owners of the underground water cannot be restrained from continuing to pump. That is our whole theory and, also, they cannot be restrained from pumping, even though the Government should intermix the water in. They still have the right to pump. That is the very basis of our claim, Senator, that the overlying owner cannot be restrained from pumping.

Now, I want to say for the benefit of the committee that, of course, the condition in the Central Valley is entirely different from conditions here because in Central Valley we have enough water for all of our lands. In the Madera district with 117,000 acres, for example, there will be enough underground replenishment to take care of every owner. No question of a water code is involved. The Central Valley has around 33,000,000 acre-feet of water supply, which is almost double the total run-off of the whole Colorado River Basin, although it has only a fraction of the area of the Colorado River Basin. We contend there is 22,000,000 acre-feet of water there that is sufficient to give a totally adequate supply to all of the irrigable lands of that area. So, if we once get our project water into these different districts, we no longer have a problem, except, of course, the 160-acre limitation. That creates a problem. The reason that is a problem is because it is impossible to replenish the underground flow for nonexcess owners without also replenishing it for excess owners. And under our law the excess owner has a property right in that underground water and he cannot be restrained from pumping the intermixed water. Do I make myself clear?

Senator WATKINS. I had the impression that this particular question wasn't raised in that hearing. I thought that he could eliminate the pumping and anyone who got on the property could pump as much as he wanted.

Senator DOWNEY. If some owner having correlative rights seeks an injunction, then he can limit the rights of any other property owner to his fair proportion of the water, but that is based upon acreage and is not based on any priority of rights. You see, Senator, the difficulty in Central Valley is that you have 100,000 acres that were pumping and had an adequate water supply, and another 100,000 acres of land weren't irrigated by pumping. That second 100,000 could drain off the water from the first 100,000 to the extent it didn't take more than

one-half the water, and that would leave a totally inadequate supply for both of them. We will be bothered by that difficulty no longer in the Central Valley because, with the water we are storing, we will have ample water for all of the lands. That is the reason that, if we once successfully inaugurate our project in the Central Valley, we will have enough water for everybody—ample water.

Senator McFARLAND. No other questions at this time.

SUPPLEMENTAL STATEMENT NO. 1 BY RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA, HEARINGS OF S. 1175, CENTRAL ARIZONA PROJECT

Subject: Inadequacies of Bureau of Reclamation estimates of water requirements.

In the writer's statement presented to the committee on June 30, 1947, appears the following:

"The estimates of water requirements for the project as set forth in the Bureau's preliminary reports are approximations based upon inadequate data and studies, and the calculations therein of required supplemental water supply are questionable."

This was subsequently amplified in the section headed "Water Requirements" and further explained during cross-examination. At the conclusion of cross-examination on this subject the writer offered to submit a supplemental statement which the chairman stated would be received and placed in the record. This supplemental statement is submitted pursuant thereto.

BUREAU'S ESTIMATE OF REQUIREMENTS

The Bureau's report, Feasibility of Bridge Canyon Route (pp. 7, 8, and 9) contains statements and tabulations which set forth estimates of the water requirements of the Central Arizona project. It is stated (p. 7) that studies by the Ground Water Division of the Geological Survey indicated that the average annual inflow of the ground-water basin of the project area is about 612,000 acre-feet annually; that the 1940-44 average pumping from underground in the area was 1,149,000 acre-feet, and that, accordingly, the annual overdraft amounts to 537,000 acre-feet.

This conclusion is erroneous on its face. Gross pumping does not constitute a measure of draft on the underground waters. A substantial portion of the gross amount of water pumped from underground for irrigation returns to the ground-water reservoir and is available for reuse. In practice it is usually found that not over 40 to 60 percent of the water pumped from wells for irrigation of general field crops is consumed by crops in evaporation and transpiration. The balance returns to the underground basin. Consequently, this calculation of overdraft is evidently in error.

The analysis on pages 8 and 9 of the report referred to starts with this basic figure on overdraft and continues with a computation of the gross amount of water required as a surface irrigation supply to meet the indicated ground-water shortage on the assumption that there would be a 30-percent loss in water diverted for this purpose. No account is taken of the fact that the 30-percent loss from surface diversions would pass into the underground basin and be available for use also. Similarly, the same error is involved in estimating water supply required for lands now irrigated and lands now idle. These requirements are also estimated on the basis of gross diversion of surface water at the rate of 5.7 acre-feet per acre instead of on a basis of net consumptive use which is estimated by the Bureau as 3.3 acre-feet per acre.

As a result, the water requirements as analyzed by the Bureau exceed the amount of water that can actually be used by the difference between consumptive use requirements and the gross amount of water required for surface irrigation applications under usual practice. This means that with a water supply furnished on such a basis, there would be a large excess of water over and above the net amount consumed by evaporation and transpiration from the crops. This excess would have to be disposed of in order to prevent a rise in the water table and waterlogging of lands.

In analyzing water requirements and water supply for ground-water basins such as occur in the Central Arizona project area, the estimation of water requirements must be made on the basis of consumptive use. The Bureau's estimates as to requirements are excessive, and if a water supply were imported into central Arizona on this basis, it would provide more water than is needed, or that could be beneficially used to supplement available local sources for present developments.

Furthermore, the analysis is made on an over-all basis covering several distinct and separate ground-water basins. Accurate results can be obtained only by analyzing the supply and requirements by separate basins.

The estimated amount of water required to maintain salt balance of 378,000 acre feet is unsupported. Only the Bureau's report also contains a figure of 154,000 acre-feet for this purpose under certain assumptions. This is a complex problem involving geochemical considerations which would require exhaustive exploration and analyses which have not been carried out.

REPORTS OF GEOLOGICAL SURVEY

The most recent report of the Geological Survey covering the major area of the project, namely, the Salt River Valley, is entitled "Geology and Ground Water Resources of the Salt River Valley Area, Maricopa and Pinal Counties, Ariz.," dated February 4, 1947. This was issued in mimeograph form by the Tucson office of the Geological Survey. The following statement is quoted from that report.

"* * * The safe yield is affected by many factors that *cannot be evaluated with existing data and, therefore, no estimate of the annual safe yield is given in this report.* The average annual recharge from all sources must be determined. The total discharge, including both surface flow and underflow leaving the valley and the quantity of water used by salt cedars and other river-bottom growth, must be measured. The quantities of soluble salts entering and leaving the valley must be known. Consideration must be given to the necessity of bringing these quantities more nearly into balance, as discussed in the ensuing section on quality of water. The relation of this 'salt balance' to the annual safe yield of the ground-water reservoir must be considered. In this connection, the possibility of preventing some of the salt inflow to the upper Salt River should be thoroughly investigated." [Emphasis supplied.]

Inquiries made to the Geological Survey further confirm the fact that, in order to accurately determine the safe yield of the underground basins within the Central Arizona project area, a large amount of additional data must be obtained to supply the inadequacies in the present data available, some of the more important of which are as follows:

1. The ground-water reservoirs must be defined and relationships established between geology of the area and the occurrence of ground water.
2. Complete records of water pumped from wells must be obtained in each ground-water basin.
3. Surveys must be made of the areas irrigated and crops grown from surface and ground water separately and combined in each ground-water basin.
4. Consumptive use of water for crops and for water-consuming vegetation must be determined.
5. Measurement must be made of canal seepage losses and the loss from stream channels into the underground reservoir in each ground-water basin.
6. Additional observation wells must be established and records of ground-water level maintained in each of the ground-water basins.
7. A complete program of sampling and analysis of surface and ground waters must be carried out to study the movement and disposal of soluble salts.

COINCIDENCE OF ESTIMATES OF REQUIREMENTS AND SUPPLY

The Bureau's report states that according to Arizona's interpretation of the Colorado River compact and related statutes and documents, a diversion from the Colorado River of 1,077,000 acre-feet annually may be made for Central Arizona project, plus a return flow to the Colorado River estimated to be 123,000 acre-feet, or a total diversion of 1,200,000 acre-feet annually.

Arizona's contention in this regard has been held for some years. It was set forth in the Bureau's preliminary report of September 1945, Comparison of Diversion Routes, in which it was proposed that the Central Arizona project would irrigate a large area of new lands, 80,000 to 100,000 acres in Paradise Valley. The idea presently advanced, that the project should be limited to supplemental water supply, is a recent one, evidently designed to obtain support because of its purported rescue nature. It became necessary, therefore, for the Bureau to make estimates of supplemental water-supply requirements on short notice, and without having the necessary basic data.

The Bureau's estimate of requirements for the Central Arizona project is 1,082,000 acre-feet annually, or practically the same net amount, 1,077,000 acre-feet, that Arizona contends it is entitled to divert from the Colorado River for that project. It appears more than a coincidence that requirements for supplemental water are estimated to be substantially the same as Arizona's long-held contention as to entitlement for the project. It appears that a deliberate attempt has been made to estimate the requirements in an amount practically equal to Arizona's contention as to entitlement. This is evidenced by the fallacies and inadequacies in the estimates previously pointed out. It is further evidenced by the fact that the same total requirement of 1,082,000 acre-feet is shown in both the Bureau's preliminary report of February 1947 and in Mr. Larson's statement to the committee, although several of the important figures making up that total differ materially without adequate explanation.

Of particular significance, the requirement for land now idle but stated to have an irrigation history has been changed from 300,000 acre-feet in the preliminary report to 419,000 acre-feet in Mr. Larson's statement. Thus, it appears that this item is simply an arithmetical quantity computed to make up the same preconceived total requirement. The location of such so-called idle land is not revealed in the Bureau's report, nor in Mr. Larson's statement to the committee, nor in Mr. Larson's answers to questions submitted to him by Senator Downey. The Bureau should at least be able to identify, readily, the gross area of idle lands, out of which it proposes to irrigate 73,500 acres. It is inferred that this area does not include lands only temporarily idle by reason of the immediately current water shortage.

The Bureau's estimate of requirements for idle lands as well as other requirements in meeting overdraft and other needs are not supported, and should, therefore, be discounted in their entirety.

SUPPLEMENTAL STATEMENT NO. 2 SUBMITTED BY RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA, HEARINGS OF S. 1175, CENTRAL ARIZONA PROJECT

PRIORITIES TO USE WATER OF THE COLORADO RIVER IN CALIFORNIA

(Quoted from contract between the United States and the Metropolitan Water District of Southern California dated April 24, 1930, as amended September 28, 1931).

"The waters of the Colorado River available for use within the State of California under the Colorado River compact and the Boulder Canyon project act shall be apportioned to the respective interests below named and in amounts and with priorities therein named and set forth, as follows:

"SECTION 1. A first priority to Palo Verde Irrigation District for beneficial use exclusively upon lands in said district as it now exists and upon lands between said district and the Colorado River, aggregating (within and without said district) a gross area of 104,500 acres, such waters as may be required by said lands.

"SEC. 2. A second priority to Yuma project of United States Bureau of Reclamation for beneficial use upon not exceeding a gross area of 25,000 acres of land located in said project in California, such waters as may be required by said lands.

"SEC. 3. A third priority (a) to Imperial Irrigation District and other lands under or that will be served from the All-American Canal in Imperial and Coachella Valleys, and (b) to Palo Verde Irrigation District for use exclusively on 16,000 acres in that area known as the 'Lower Palo Verde Mesa,' adjacent to Palo Verde Irrigation District, for beneficial consumptive use, 3,850,000

acre-feet of water per annum less the beneficial consumptive use under the priorities designated in section 1 and 2 above. The rights designated (a) and (b) in this section are equal in priority. The total beneficial consumptive use under priorities stated in sections 1, 2, and 3 of this article shall not exceed 3,850,000 acre-feet of water per annum.

"Sec. 4. A fourth priority to the Metropolitan Water District of Southern California and/or the City of Los Angeles, for beneficial consumptive use, by themselves and/or others on the coastal plain of Southern California, 550,000 acre-feet of water per annum.

"Sec. 5. A fifth priority (a) to the Metropolitan Water District of Southern California and/or the City of Los Angeles, for beneficial consumptive use, by themselves and/or others, on the coastal plain of Southern California, 550,000 acre-feet of water per annum and (b) to the City of San Diego and/or County to San Diego, for beneficial consumptive use, 112,000 acre-feet of water per annum. The rights designated (a) and (b) in this section are equal in priority.

"Sec. 6. A sixth priority (a) to Imperial Irrigation District and other lands under or that will be served from the All-American Canal in Imperial and Coachella Valleys, and (b) to Palo Verde Irrigation District for use exclusively on 16,000 acres in that area known as the 'Lower Palo Verde Mesa,' adjacent to Palo Verde Irrigation District, for beneficial consumptive use, 300,000 acre-feet of water per annum. The rights designated (a) and (b) in this section are equal in priority.

"Sec. 7. A seventh priority of all remaining water available for use within California, for agricultural use in the Colorado River Basin in California, as said basin is designated on map No. 23000 of the Department of the Interior, Bureau of Reclamation.

"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 one 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 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.

"Sec. 9. In addition, so far as the rights of the allottees named above are concerned, the City of San Diego and/or County of San Diego shall have the exclusive right to withdraw and divert into an aqueduct any water in Boulder Canyon Reservoir accumulated to the individual credit of said city and/or said county (not exceeding at any one time 250,000 acre-feet in the aggregate) by reason of reduced diversions by said city and/or said county; provided, that accumulations shall be subject to such conditions as to accumulations, 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 the said city and/or said county and such users resulting therefrom.

"Sec. 10. In no event shall the amounts allotted in this agreement to the Metropolitan Water District of Southern California and/or the city of Los Angeles be increased on account of inclusion of a supply for both said district and said city, and either or both may use said apportionments as may be agreed by and between said district and said city.

"Sec. 11. In no event shall the amounts allotted in this agreement to the city of San Diego and/or to the county of San Diego be increased on account of inclusion of a supply for both said city and said county, and either or both may use said apportionments as may be agreed by and between said city and said county.

"Sec. 12. The priorities hereinbefore set forth shall be in nowise affected by the relative dates of water contracts executed by the Secretary of the Interior with the various parties."

SUPPLEMENTAL STATEMENT NO. 3, SUBMITTED BY RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA, HEARINGS ON S. 1175, CENTRAL ARIZONA PROJECT

Estimated annual beneficial consumptive use of projects in lower basin of Colorado River system at present time

	Acres-feet per annum
Net losses from reservoirs, main stream.....	750,000
State of Arizona :	
Colorado River Indian Reservation.....	50,000
Yuma project (in Arizona).....	220,000
Gila project.....	130,000
Williams River Basin.....	5,000
Little Colorado River Basin.....	60,000
Virgin River and miscellaneous.....	5,000
Gila River and tributaries.....	2,270,000
Total Arizona.....	2,740,000
State of California :	
Palo Verde project.....	150,000
Yuma project (in California).....	30,000
All-American Canal project.....	2,900,000
Metropolitan Water District of Southern California.....	150,000
Total California.....	3,230,000
State of Nevada :	
Virgin River Basin.....	25,000
Las Vegas area.....	15,000
Total Nevada.....	40,000
State of New Mexico :	
Little Colorado River Basin.....	14,000
Gila River Basin.....	16,000
Total New Mexico.....	30,000
State of Utah: Virgin and Kanab River Basins.....	50,000
Grand total of lower basin projects, present use.....	6,840,000

SUPPLEMENTAL STATEMENT NO. 4 OF RAYMOND MATTHEW, CHIEF ENGINEER, COLORADO RIVER BOARD OF CALIFORNIA, IN ANSWER TO INTERROGATORIES ADDRESSED TO HIM BY SENATOR MCFARLAND ON JULY 1, 1947, AT HEARINGS ON S. 1175 BEFORE SUBCOMMITTEE ON IRRIGATION AND RECLAMATION, SENATE PUBLIC LANDS COMMITTEE

The questions asked by Senator McFarland and answers thereto follow, in the order listed in the interrogatories.

A. The statement presented for California by Raymond Matthew on June 30, 1947, page 22, item 17, lists a requirement for the All-American Canal of 3,800,000 acre-feet. With respect to this item, the following information is desired.

Question 1: How much land is actually being irrigated at this time in the Imperial Valley area?

Answer: It is assumed that by "Imperial Valley area" is meant Imperial and Coachella Valleys or, in other words, the area under the All-American Canal project and, that "at this time" means as of the present year. On this basis, it is estimated that the land actually being irrigated at this time totals about 470,000 acres.

Question 2: How much water is being carried into this area; state each source and amount reaching the area. Also show how much of this water is being delivered to the irrigator, the amount lost in conveyance of water to the land, and the amount wasted.

Answer: It is assumed that the "area" is the same as referred to in answer to question No. 1; that annual amounts are desired; that the reference to "carried into the area" and "amount reaching the area" means diversion from the source of supply; and that "delivered to irrigator" means all deliveries as no segregation is made between water delivered for domestic, industrial, or irrigation purposes in Imperial Valley. All water required by the cities, towns, and farms in Imperial Valley must be supplied from the irrigation canal system as no other source of supply is available. On these bases: Source, (a) Colorado River. Amount carried into area totals 2,900,000 acre-feet. Of this total, 100,000 acre-feet to Coachella Valley for supplying needs for canal construction, priming completed canal (over 100 miles), and supplementing underground supply. Of remaining 2,800,000 acre-feet delivered to irrigator 1,900,000 acre-feet (68 percent); loss in canal system (1,800 miles) 700,000 acre-feet (25 percent); and canal regulation and maintenance of delivery efficiency 200,000 acre-feet (7 percent). No water is wasted. Source, (b) underground water from mountains surrounding Coachella Valley, safe yield estimated to be 50,000 acre-feet which is also used in the portion of the Coachella Valley, including Palm Springs, which lies outside of the All-American Canal area.

Question 3: Tabulate the areas on which the 3,800,000 acre-feet of All-American water is to be used, by organized districts and by areas lying outside of organized districts showing for each district area and each nondistrict area the following information:

- (a) Acres actually being irrigated.
- (b) Irrigable acres not now irrigated, with reference to report supporting such finding of irrigability, and for such irrigable acres show percent of lands publicly owned.
- (c) Reference to project reports including such lands.
- (d) Amount of water required for each such area in acre-feet per acre delivered to the farm; also amount of All-American Canal water to be used by the area and where such water will be measured.
- (e) Citation of authorization by Congress for construction of works to serve each such area.

Answer: The same general assumptions are used in answering this question as in answering questions No. 1 and No. 2:

The 3,800,000 acre-feet is to be used only on lands within organized districts; these are Imperial irrigation district in Imperial Valley and Coachella Valley County water district in Coachella Valley.

The following data are submitted in answer to the items in question 3:

All-American Canal project

	Acres	
	Imperial	Coachella
Gross areas:		
Private lands.....	700,000	133,000
Public lands.....	290,000	12,000
Indian lands.....		15,000
Total gross areas.....	990,000	160,000
Irrigable areas:		
Now irrigated.....	450,000	20,000
Not now irrigated.....	320,000	115,000
Total irrigable areas.....	770,000	135,000

(a) Acres actually being irrigated are shown in above tabulation.

(b) The irrigable acres are as shown in the above tabulation. The areas now being irrigated are private lands except for a small acreage in Coachella Valley of Indian land. Data are not now available for a segregation of the irrigable areas not now irrigated, between private, public, and Indian lands. Irrigable areas are based on soil surveys shown in the All-American Canal report of 1919, the Fall-Davis report of 1922 on problems of Imperial Valley and vicinity, studies by the Bureau of Reclamation covering the design and capacity of the All-American Canal and studies made by the two districts.

(c) For further reference as to areas included in All-American Canal project see the All-American Canal contracts between the United States and Imperial Irrigation district and Coachella Valley County water district.

(d) No specific amount of water has been assigned to each area. The 3,800,000 acre-feet is the water requirement for the project as a whole. By contract, Imperial has the first right for its requirements and Coachella, the subsidiary right.

Based on an average of about 90 percent of the irrigable area or 800,000 acres being farmed in any one year, the 3,800,000 acre-feet gives a diversion duty of 4.75 acre-feet per acre. Future losses of all kinds under full development are estimated at 30 percent resulting in a delivery at the farm of approximately 3.33 acre-feet per acre.

Under the California Limitation Act, the 3,800,000 acre-feet will be measured by and accounted for as diversions to the project at Imperial Dam less the amount of return flow from the project to the Colorado River in the United States.

(e) Authorization of works. Boulder Canyon Project Act of 1928 and various appropriation acts.

Question B: The same statement on page 21 lists "2. Net from tributaries—Lee Ferry to mouth of Gila River—300,000." Explain how this item is derived?

Answer: This figure of 300,000 acre-feet is intended to represent the amount of water available for use on the tributaries of the Colorado River between Lee Ferry and the mouth of the Gila River less main stream channel losses, under full development, for this section of the river. It should be divided into and shown as two separate amounts; i. e., water available for consumptive use by projects on tributaries in the lower basin, other than the Gila River, and main stream channel losses under full development, Lee Ferry to mouth of Gila River. However, available information is not adequate to do this although it is probable that the net result would not be substantially different from the amount shown of 300,000 acre-feet.

Based on the available information, the figure of 300,000 acre-feet was derived from data shown in the chapter on water supply in the Bureau of Reclamation's Colorado River Report of March 1946 and in Senate Document 39 (79th Cong., 1st sess.):

Tributary inflow (less main river channel losses), Lee Ferry to Hoover Dam-----	300,000
Channel losses, virgin conditions, Hoover Dam to mouth of Gila River-----	1,000,000
Salvaged losses under full development-----	400,000
Channel losses under full development-----	600,000
Tributary inflow, Hoover Dam to mouth of Gila River-----	100,000
Net loss, Hoover Dam to mouth of Gila River-----	500,000
Net from tributaries, Lee Ferry to mouth of Gila River-----	300,000

Question C: The same statement on page 21, lists "7. Main stream reservoir projects (net evaporation losses) 780,000." Advise what acreage content was assumed for Lake Mead for the 1931-40 period; also water area and evaporating rate?

Answer: As indicated, this figure represents net losses from reservoirs, existing or authorized, on the main stream of the Colorado River in the lower basin. This amount is shown in table CII of the Bureau of Reclamation's report on the Colorado River as "Reservoir losses" for "Existing or authorized projects"—"779,000 acre-feet."

Question D: The same statement on page 22, lists "15. Palo Verde irrigation district 300,000." State:

(a) Area nonirrigated and irrigable acres within irrigation district.

(b) If additional works are contemplated to irrigate these lands, who will construct such works; if they are to be constructed by the Government, cite congressional acts authorizing such construction.

(c) How quantity of 300,000 acre-feet is developed, and whether such 300,000 acre-feet includes river water consumed within the area under virgin conditions.

Answer (a): This item of 300,000 acre-feet is for the area covered by the old appropriative rights of Palo Verde irrigation district in the Palo Verde Valley and Mesa. The area is set forth in the water contract of February 7, 1933,

between the United States and the district and is in accordance with the California priority schedule.

	Acres
Gross area-----	143,000
Irrigable area-----	100,000
Now irrigated-----	50,000

(b) Additional works required will be extensions of existing works of Palo Verde irrigation district and will be constructed by the district, as have been the existing works.

(c) The 300,000 acre-feet is the total estimated consumptive use of 100,000 acres at 3 acre-feet per acre per year. It is "developed" on the basis prescribed in the California Limitations Act (sec. 4 (a) of Boulder Canyon Project Act), i. e., diversions less returns to the river.

Question E: The same statement, page 21, lists "3. Gila River and tributaries (available for consumption) 2,300,000." State:

(a) Is this figure intended to total undepleted flow to the central valley of Arizona?

(b) What part of such water would be lost by evaporation at reservoirs built or to be built for its regulation? Do you consider such evaporation chargeable to the lower basin as a whole similar to main stream reservoir losses, item 7 of your statement?

(c) What part of such 2,300,000 acre-feet would pass through the central Arizona valley area because of insufficient storage control? State reservoirs you assume built for such control?

(d) What part of such 2,300,000 acre-feet would be consumed by evaporation and transpiration along river channels, and in other areas not irrigable?

(e) What part of such 2,300,000 acre-feet do you consider necessary to pass out of the central Arizona valley for maintenance of a salt balance?

Answer: As stated in the item, the 2,300,000 acre-feet is considered to be the safe annual yield of the Gila River and its tributaries available for beneficial consumptive use. As shown under "Requirements" in the tabulation to which the question refers, it is considered that of this total, 30,000 acre-feet is required in New Mexico and 2,270,000 acre-feet in Arizona by existing (operating) and authorized projects. On this basis, answers to the divisions of this question follow:

(a) No.

(b) The amount of reservoir evaporation losses from existing reservoirs in the Gila River system, average for the period 1931-40, is indicated by estimates of the Bureau of Reclamation in House Document No. 39, Seventy-ninth Congress, first session, part 2 (p. 5), at 80,000 acre-feet per year.

The tabulation (p. 21) to which the question refers does not show and is not intended to show how such reservoir evaporation losses are or may be charged. The tabulation is an engineering analysis, independent of legal interpretations, to show the over-all deficit between available water supply and water requirements of existing (operating) and authorized projects in the lower basin. The indicated deficit is not affected by the question of how reservoir losses are or may be charged.

(c) None, with existing surface storage reservoirs in combination with the proper utilization of the available underground storage reservoir.

(d) None.

(e) None.

Senator MILLIKIN. We will call Mr. David A. Johnson. Mr. Johnson, will you give us your residence and what is your business?

STATEMENT OF DAVID A. JOHNSON, CHAIRMAN, GILA RIVER, PIMA, AND MARICOPA COMMUNITY

Mr. JOHNSON. My name is David A. Johnson. I am chairman of the Gila River, Pima, Maricopa Community on the Gila River Reservation in Arizona. I live in Bapchule, Ariz., on the upper Gila River. I have talked to the tribes, each and every one of them, and to their delegation of Indians down there, and we have never been really informed on this bill. The tribe has sent me a telegram authorizing me

to spend a little time here with you. While looking over this bill yesterday I noticed that a canal was to be built from the Salt River to the Gila, above Florence, Ariz. If you will excuse me, I will point it out on the map.

My people are concerned more about this. Here is Florence and above Florence the water flows to the west. Here is the proposed Buttes Dam over here. This is all high land up here on to Picacho where there is a railroad station on the Southern Pacific between Casa Grande and Tucson. This bill speaks of a canal to Picacho Reservoir. The Indians are down below Florence and the Santa Cruz District, which is down here. When you once get the water into the Picacho Reservoir it will not flow up here into our reservation. The proposed Buttes Dam that was talked about some time ago, I understand there was a canal to come way around to the south and go clear around us and miss all of our lands here.

Senator MILLIKIN. Mr. Larson, will you come to the map here? How do you propose to irrigate the Indian reservation? Where will they get their water?

Mr. LARSON. They have an irrigation system at present and water could be delivered in several ways. It could be released into the river.

Senator MILLIKIN. Could it be released in the regular canal?

Mr. LARSON. That paved canal goes across the Indian reservation. It could be carried in the canal, in the existing distribution system.

Mr. JOHNSON. That reservoir here, supposed to be a reservoir, is full of silt. There is no distribution that can be made out of that. It is covered up so deeply.

Senator MILLIKIN. Let's get this straight for the record. How do you propose to get water to the Indian reservation?

Mr. LARSON. In existing distribution system.

Senator MILLIKIN. The Gila lateral is part of the existing system?

Mr. LARSON. That is right.

Senator MILLIKIN. What other works will you use for that, if any?

Mr. LARSON. That existing canal would take care of that reservation.

Senator MILLIKIN. That is the Gila lateral?

Mr. LARSON. That is right.

Senator MILLIKIN. Do you agree with that?

Mr. JOHNSON. We will have to agree on that with some kind of an agreement or contract with the Department of Interior. Our land is operated under the Department of Interior, and I noticed in section 2:

The Secretary shall have the authority to acquire, by purchase * * *. *Provided*, That, anything herein contained to the contrary notwithstanding, the Secretary shall not have the authority to condemn established water rights. * * *

The Secretary of Interior will take care of our rights on that, I believe, but we must know the proposition as to how this distribution of water that is brought down from the Colorado. If it will do us good, we want it if it will take us into courts later on, we don't want it. We must have an understanding as to how we can be taken care of on the reservation. I don't want to take much of your time. I just wanted to make this brief statement in regard to our proposition. There is a good deal of litigation, I guess, that could be had on account of the Gila River decree. It would take me several days to make that statement. I just wanted to make that clear to you gentle-

men of the committee and to everybody who is interested, and my tribe has sent me to say a few words to you this morning and I am glad to make that statement.

Senator MILLIKIN. We are very glad to have you.

Senator McFARLAND. I might say, Mr. Chairman, there is no question about the irrigation of their land. They have an agreement which protects them.

Senator WATKINS. Do they have any priorities?

Senator McFARLAND. They have a decree which establishes their rights.

Senator WATKINS. Was the Indian Department consulted at all in connection with this project?

Senator McFARLAND. They have been consulted.

Senator WATKINS. They have a regular department in the Indian Bureau and I was wondering if they were cooperating on this program.

Senator McFARLAND. They haven't appeared in this hearing. They appeared in the hearing which I had in Arizona. There isn't any question about it, Senator, as far as these people are concerned. They need the water the same as the rest of the State.

Senator MILLIKIN. We will call Mr. Elder. Will you state your full name, please?

Mr. ELDER. C. C. Elder, civil engineer, Los Angeles.

Senator MILLIKIN. Your statement indicates that you are a hydraulic engineer?

Mr. ELDER. Hydraulic engineer for the Metropolitan Water District of Southern California. Civil is all-inclusive.

STATEMENT OF C. C. ELDER, HYDRAULIC ENGINEER, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Mr. ELDER. I have a statement that in effect supplements the legal memorandum of Mr. Howard's given a day or two previously, chiefly in an effort to evaluate some of the statements he made on a qualitative basis.

I am a graduate of the University of Utah and have worked as an engineer in every State of the Colorado River Basin, and was with the Bureau of Reclamation as a water-supply engineer for 7 or 8 years. In that capacity I worked on several projects but chiefly in the Denver office assisting Mr. Debler, who has testified here, chiefly on Colorado River supply studies, which were used as the basis ultimately of the Boulder Canyon project and the construction of that project.

I start out with comments on the depletion theory as applied to Gila Basin consumptive use. First, I make a comparison of quantity effect, two columns, the first being depletion at the mouth as listed in the statement of Mr. Larson at this hearing and another statement by Mr. Baker.

The present depletion at the mouth has been testified to as 1,135,000 acre-feet, and that of the future is 20,000 acre-feet, making a total of 1,155,000 acre-feet.

Now, in contrast, the beneficial consumptive use, as interpreted by me, and other Californians possibly, the present about 2,280,000 acre-feet; the future that is expected is about 20,000 acre-feet, making a

total of 2,300,000 acre-feet. The difference in charge to Arizona is 1,145,000 acre-feet.

Arizona's claimed net water available from compact, III (a) and III (b) articles is 3,670,000 acre-feet as appeared in the same statement of Mr. Larson. Certain charges are accepted. The first for main stream reservoir losses to Arizona—316,000 acre-feet. For present depletion, 1,408,000 acre-feet. Future depletion, 924,000 acre-feet. Accepted charge for total depletion is 2,648,000 acre-feet.

Now, if we apply this one correction for beneficial consumptive use, neglecting all the other factors—

Senator MILLIKIN. Just a moment, please. I am not quite clear on the relation of the present depletion figure on your page 1 with the accepted charge for present depletion on page 2.

Mr. ELDER. There is no connection except this, the first one is picked up to be added into page 2. It is simply preparation for the figure on page 2.

Applying correction for beneficial consumptive use of 1,145,000, gives us a total required for present and future uses of 3,793,000 acre-feet. Surplus over III (a) and III (b), which is the figure at the head of page 2, then becomes 123,000 acre-feet required from this surplus.

Senator MILLIKIN. That is on the theory that Arizona is charged with consumptive use on the Gila?

Mr. ELDER. That one correction is applied. I am trying to separate these factors into their respective amounts.

There is thus no III (a) or III (b) water available for the central Arizona project, correcting only for the one error in interpretation of the depletion theory. This is true even on the controversial basis of allowing Arizona its asserted right to the full 1,000,000 acre-feet of compact III (b) water.

The Arizona statements have claimed possibly available for consumption in that State, only 55,000 acre-feet, or a one-fourth share of all Colorado River water, considered as surplus over and above compact III (a) and III (b) allocations. These records thus indicate an apparent deficit of 68,000 acre-feet annually for present and planned future projects in Arizona, exclusive of the proposed central Arizona project. Therefore making the one correction for the misinterpretation of the depletion theory shows that there would then be no water of any category for the proposed new project, on the basis of the Arizona records.

But the correction for the use of the depletion theory has the further effect of increasing the unallocated surplus in the Colorado River Basin. The Arizona contract indicates that the State may possibly claim and obtain (if upper basin rights to part of the surplus are disregarded) one-half of such surplus, less one twenty-fifth part quit-claimed to Nevada. Using the data of the Arizona statements and of the United States Bureau of Reclamation, but correcting for the depletion theory, the possible share of Arizona in such surplus is computed as 484,000 acre-feet.

The net correction for the depletion theory error is then 1,145,000 acre-feet minus 484,000 acre-feet or 661,000 acre-feet annually. Allowing for the indicated requirements of other Arizona projects, both present and future, for 123,000 acre-feet of surplus water, over and above the III (a) and III (b) allocations, leaves an apparent

balance of such surplus of only 361,000 acre-feet for the proposed central Arizona project, if all other errors of interpretation are temporarily ignored. This quantity is but 30 percent of the proposed diversion for the project.

Compact III (b) claim for Arizona projects: The basis for the assertion of this claim by Arizona as well as its refutation and the historical 25-year controversy about the disposition of this 1,000,000 acre-feet allocation, have been thoroughly covered in previous statements at this hearing. The evident error involved, if the Arizona claim is not upheld in the courts, is at least 500,000 acre-feet annually. This error may be increased to 540,000 acre-feet if Nevada should assert its contract right to one twenty-fifth of the III (b) water, if the same is finally determined to be unapportioned by the compact.

Even the balance of 460,000 acre-feet might be pushed into the unallocated surplus, over and above III (a) and III (b) allocations, if lower-basin water use priorities, in the absence of a lower-basin compact, should finally be ranked in the order of actual appropriation dates. For present purposes, however, the correction for the III (b) misinterpretation is taken at the minimum of 500,000 acre-feet annually.

Allocation of reservoir losses: Colorado River main-stream reservoir losses in the lower basin, under conditions of ultimate development, are estimated at 870,000 acre-feet annually, in the statement (p. 20) of V. E. Larson at the present hearings, and in other USBR and Arizona statements and report. The same statements allot to or charge Arizona with 316,000 acre-feet of this total loss, in proportion to lower-basin main stream diversion rights, according to the special interpretations of Arizona officials. But as discussed by other witnesses, the California Limitation Act and the several California contracts for Lake Mead storage rights are specific and definite in making the California diversions net, at or near the points of diversion. These are of course all far downstream from Lake Mead, as this is located in Nevada and Arizona.

The equitable justification for these net California diversions, as is well known, is the fact that their appropriative filing date back largely from 50 to 80 years, and even the latest about 20 years or more. The chief irrigation diversions for California projects were long supplied from natural, unregulated Colorado River flow, until Lake Mead storage was substituted for such natural-flow rights, by the terms of the Colorado River compact. The vested appropriative water rights of presently constructed and operating California projects would, if not now controlled and circumscribed by the limitation act, have materially exceeded the total of the California contracts for Lake Mead storage. The margin of such surrendered water rights would be far greater on the basis of the Arizona interpretation of the compact, as previously discussed. The California contract rights to net diversion at their project intakes will therefore certainly be maintained and defended by every available legal means, and it must not be presumed that the Arizona objectives of this misinterpretation will be achieved without a serious, all-out controversy.

There is at present no basis for a determination of just how the lower-basin reservoir losses will finally be allocated, or even whether they will be charged against compact-apportioned or surplus water supplies. In any case, the error of this particular misinterpretation will

seriously affect plans for proposed Arizona diversions and most of all, the central Arizona project. The error involved is on the order of 554,000 acre-feet annually. It might be slightly less if part of such losses can be shifted to other States or other projects, or it will be somewhat increased in case these losses have been underestimated. In combination with the effect of the other mentioned errors of interpretation, this reservoir-loss item makes even more certain that after final judicial determination, no water supply will be found to be available for the proposed central Arizona project.

Other water-supply factors: In addition to the three major corrections of misinterpretations of the central Arizona project water-supply studies, other less important variations may be noted. The burden of the Mexican treaty allocations will certainly and unavoidably exceed the listed 1,500,000 acre-feet. It is concluded that this item will probably approximate 1,700,000 acre-feet annually, due to the treaty allocation of 200,000 acre-feet additional in years of so-called but undefined surplus. Regulation losses for which no treaty credit can be claimed will also be material in amount.

The present statement of Mr. Larson indicates that it is now estimated by the USBR that 376,000 acre-feet annually will have to be forced out of the central Arizona project area, under ultimate development conditions in order to maintain the project salt balance. Also, that this outflow will result in a credit of 123,000 acre-feet annually for additional return flow to the Colorado River.

In contrast, to show the uncertainty of such theoretical estimates, the statement—page 15—of Mr. E. M. Debler at this hearing shows an added return of 133,000 acre-feet, being 60 percent of a 222,000 acre-foot release from the project to remove additional salt. The assumed ratio of return at the mouth of the Gila is thus double the estimate of Mr. Larson.

The salt-balance problem is not to be minimized or discounted, in appraising the feasibility, or its lack, of the proposed project. But the necessity for some such outflow does not in the least insure or serve as a basis for such renewed optimism as to any of it running the long gantlet of Gila channel losses or (if of usable quality) of pumped diversions. It is concluded that none of such releases will dependably reach the Colorado River or at such times as credit can be claimed under the terms of the Mexican treaty.

It seems not unfair to recall that only 2 years ago, at the Senate's hearing on the Mexican treaty, the burden of this treaty allocation on Lake Mead storage was testified to, by USBR and other Federal and State witnesses of distinction, as never to exceed 600,000 acre-feet annually due to return flow and other related fallacies. In contrast, present USBR and Arizona statements, as well as 1946 and 1947 editions of the USBR Colorado Basin comprehensive report, all agree that this burden will be 1,500,000 acre-feet annually. Such sudden and unexplained variations of profound estimates and solemn, even if unsworn, testimony should at least in some degree affect the weight now given to estimates, equally important and similarly unrelated to observable factual conditions.

Depletion theory comments: Previous statements at this hearing have referred to the relative uniqueness of the Gila River, in having salvaged natural losses very large in amount, compared to the perennial streams of the upper basin and the other minor tributaries of the lower

basin. In some respects the Gila River situation is truly unique, but this is not at all the case from the water supply point of view.

In such drought years as 1940 and 1947, salvage by means of pumped wells is of chief importance and this practice of pumping happens to be not elsewhere available on a large scale in the lower basin. But historically and over longer periods, salvage of natural losses by storage of floods in reservoirs has been much more important than pumping. This is exactly parallel and similar to the result achieved at Boulder and Parker Dams, where flood waters, formerly wasted into the Gulf of California, are now salvaged and conserved for beneficial consumptive use.

There is no very obvious or apparent reason for any distinction because in one case the natural floods formerly wasted into the ocean and in the other, into the sandy desert of the lower Gila Basin. If the salvaged waters of the main Colorado River are to be charged against basin and State apportionments whenever, and to the extent applied for beneficial consumptive use—and no one has ever attempted to argue otherwise—then the similar use of salvaged natural losses along tributaries must certainly be so charged.

In the statement—page 6—of Mr. E. B. Debler at the present hearing, as an argument in support of the depletion theory, there is found the following quotation:

Congress in section 4 (a) of the Boulder Canyon Project Act * * * uses the words "annual consumptive use (diversions less returns to the river) of water of and from the Colorado River." Congress here defined consumptive use as the depletions of "the" river, meaning the Colorado River. As this definition was made only 6 years after the signing of the Colorado River compact and at a time when there was a full and frank discussion of the numerous contentions and interpretations of the compact, it must be concluded that it was intended that all apportionments were to be based on their effect on Colorado River flows. That interpretation is, therefore, hereinafter used.

With due respect for the usual acuteness of Mr. Debler's arguments, it has seemed unfair to Arizona to apply the above formula literally in determining the beneficial consumptive use of the Gila Basin. If in the phrase "diversions less returns to the river," the Colorado River is meant, as claimed, then these returns to be subtracted from the total of all diversions are really negligible.

Table I of Mr. Debler's statement shows them as having averaged only 76,500 acre-feet for the period 1930-45. The flow at the mouth of the Gila River has actually been zero since August 1941 or for the last 6 years, and for equally long prior periods. The diversions in the quoted phrase necessarily mean from the Gila River, when considering its basin, or from its several tributaries. Due to repeated reuse of return flow in the upper and central Gila Valleys, these diversions—if not adjusted for returns to the Gila River, which the argument does not permit—really add up to astronomical figures, probably much exceeding 5,000,000 acre-feet annually, including the gross pumpage from basin wells. This result is obviously absurd and it necessarily follows that the quoted argument in defense of the depletion theory is equally untenable.

Mr. Debler adds—page 6—that:

The words "one-half of any excess or surplus waters unapportioned by said compact" could refer only to such surplus waters as might become available for use by California and Arizona jointly.

The basis for this conclusion is not evident, and presumably if the compact really meant this, it would have said so in specific language. The only apparent grounds for belief in this conclusion is the oft-expressed conviction by representatives of Arizona that the compact, in defining the Colorado River Basin, should have eliminated the Gila Basin. Much sympathy may be felt for this wishful thinking, without approval, however, of such unilateral efforts to rewrite the compact by far-fetched misinterpretations at this late date. The gallant effort thus to produce the desired objective of securing a firm, first priority water right for a newly proposed and very junior irrigation diversion, however admirable under other circumstances, must in this case be judged by its effect, if successful, on other long-completed and operating projects, publicly owned, even though these may happen to be located in California.

Undisclosed by either the USBR or Arizona statements or reports, the direct result of such new Arizona water rights and diversions would be no Colorado River water right for San Diego, none for Coachella Valley, and none for the Metropolitan water district of southern California, with its resident population of over 3,000,000.

Summary: The several separate corrections for misinterpretations in the present water-supply studies for the proposed central Arizona project, as briefly outlined and evaluated in this statement, are here summarized and listed as to their net effect.

1. Depletion theory error—661,000 acre-feet annually.
2. Correction (minimum) for III (b) claim—500,000 acre-feet annually.
3. Reservoir loss allocation—554,000 acre-feet annually.
4. (a) Mexican water treaty, added burden—92,000 acre-feet annually.
4. (b) Salt-balance return-flow credit (probably imaginary)—123,000 acre-feet annually.

Total possible correction, if all controversial interpretations should be judicially or otherwise determined against Arizona—1,930,000 acre-feet annually.

This possible total correction or uncertainty in the central Arizona project water supply is 80 percent greater than the total consumptive use claimed as permissible and available for the project. This means that if only half of the controversial issues are resolved against Arizona's interpretations, there would be practically no water right available for the project, after the ultimate development of the Colorado River is approached. It means also that until at least some of the major controversies are settled, preferably by friendly litigation in order to expedite the judicial decision, Federal authorization of the proposed project must be concluded to be inconceivable, unless sound engineering and long accepted water-supply standards of feasibility are to be totally disregarded.

Senator MILLIKIN. Any questions?

Senator McFARLAND. Do you agree with the figure of approximately 1,270,000 acre-feet of virgin flow of the Gila River at the mouth where it empties into the Colorado?

Mr. ELDER. Yes; for present purposes. I might quibble slightly on the amount.

Senator McFARLAND. Approximately?

Mr. ELDER. That is right, sir.

Senator McFARLAND. And, if Arizona didn't have any dams up there, all of that water couldn't be used by Mexico, could it, even if it went down? If Arizona didn't use it, it would go down in such large quantities that only a small portion of that 1,270,000 acre-feet could be used, couldn't it?

Mr. ELDER. I would say "Yes" because it would without regulation have flood peaks, just as the main stream flow did before Boulder Canyon Dam. Any unregulated water is lost under such circumstances.

Senator McFARLAND. And so you say that should be judged by effect on other projects?

Mr. ELDER. I didn't say that. I am trying to judge this by the language of the compact.

Senator McFARLAND. Let's see what you did say.

Mr. ELDER. I am sure that wasn't it. I don't recall it being in there.

Senator McFARLAND. Here it is:

* * * however admirable under other circumstances, must in this case be judged by its effect, if successful, on other long-completed and operating projects, publicly owned, even though these may happen to be located in California.

Mr. ELDER. My admiration was to be judged by the effect on other projects—certainly.

Senator McFARLAND. And so really, when you come right down to it, Arizona if she were given credit—and were only charged with a million acre-feet, is doing California a great favor in taking that million-acre feet and using it instead of letting it go down to Mexico, isn't she?

Mr. ELDER. I have failed to detect the favor, sir.

Senator McFARLAND. Well, if they didn't use any of the Gila River at all, Mexico couldn't use as much as a million acre-feet, could they?

Mr. ELDER. I think the treaty gives Mexico 1,700,000 acre-feet.

Senator McFARLAND. They couldn't use it from the Gila River because it goes down in such big floods it wouldn't be usable?

Mr. ELDER. That is true—the same as the main river, until you regulate it.

Senator McFARLAND. So, really, insofar as equitable effect is concerned on the other projects, California benefits very much from the dams on the Gila River and its tributaries, even with our interpretation of depletion, doesn't it?

Mr. ELDER. Whether California benefits by the compact at all is a question. We certainly don't benefit from the compact with such adverse misinterpretation.

Senator McFARLAND. They couldn't use a million acre-feet by any stretch of the imagination, from the Gila River, could they?

Mr. ELDER. Certainly not.

Senator McFARLAND. And California couldn't use it, could she?

Mr. ELDER. No.

Senator McFARLAND. And so, it would just go into the Gulf of Mexico and no one would get the benefit.

Mr. ELDER. I think any water that goes into the Gulf of Mexico would be subject to regulation and California would be very glad to build a reservoir and Arizona would be glad to do the same thing to prevent any such waste. There has been no waste.

Senator McFARLAND. I grant you that California would be willing to build dams, I should say, have the Federal Government build them

any place California could get water; but she could not get water out of the Gila River?

Mr. ELDER. Not at present—no, sir. We have no desire to do so.

Senator McFARLAND. As a matter of fact—well, I believe we are agreed on this then, if this virgin flow were left to go down, California could not benefit by it in any way, even by the use of it in Mexico because it would go down in large irregular quantities. Now, I would like to pass on to the next point. Where did you get that figure 2,300,000?

Mr. ELDER. That is my personal judgment after years of study and my own conclusions on this subject and I find it checks with other engineers.

Senator McFARLAND. Where is that measured?

Mr. ELDER. That is measured at the point of inflow, I used Bureau of Reclamation and Geological Survey data which adds up to in excess of 2,300,000 acre-feet.

Senator McFARLAND. That goes in stream?

Mr. ELDER. Goes in stream. Also includes, of course, the Safford Valley which is above the Phoenix area. It includes also under the compact interpretation the valley pumping along the stream which affects the amount of water visible and measurable in surface channels.

Senator McFARLAND. Do you charge Arizona for the amount that is lost in the stream?

Mr. ELDER. No. This 2,300,000 is stated to be net.

Senator McFARLAND. Do you charge Arizona for evaporation in these reservoirs; or do you charge that to the basin?

Mr. ELDER. I think that the reservoir evaporation lost from the Gila Basin is properly chargeable, just like on the main stream. I think the compact leaves no uncertainty.

Senator McFARLAND. Where is it chargeable in this 2,300,000 acre-feet? Is it charged to Arizona or charged to the basin as a whole?

Mr. ELDER. Charged to the project getting the beneficial consumptive use of it, I would expect.

Senator McFARLAND. I am trying to find out how you are arriving at all these figures. Do you charge Arizona with the amount of water that is used by vegetation along the stream?

Mr. ELDER. Not unless it is beneficial in the form of harvested crops.

Senator McFARLAND. Do you know how much water is used along the stream?

Mr. ELDER. Approximately, within rounded figures, of an accuracy of about 2 or 3 percent.

Senator McFARLAND. Do you know how much?

Mr. ELDER. That is the 2,300,000.

Senator McFARLAND. I am talking about the amount used by vegetation along the stream.

Mr. ELDER. That is not included in the figure and therefore is not exactly determined.

Senator McFARLAND. Do you know how much water is actually diverted in the first instance by diversion dams in Arizona?

Mr. ELDER. I have access to all of the records that are available and went into the preparation of this figure. I haven't them in my mind.

Senator McFARLAND. You haven't them broken down. You have that one figure in mind?

Mr. ELDER. They were broken down and I compiled them.

Senator McFARLAND. Will you break them down for us?

Mr. ELDER. The Government has done that and I added that data.

Senator McFARLAND. The Government isn't testifying, Mr. Elder, is it?

Mr. ELDER. That is correct. I have the reports.

Senator McFARLAND. Will you break them down for us and show us how you arrived at this figure?

Mr. ELDER. I would be very glad to do so.

Senator MILLIKIN. Will you submit that for the record.

(Supplemental statement at conclusion of Mr. Elder's presentation.)

Senator DOWNEY. Mr. Elder, this figure of 2,300,000 acre-feet as beneficial consumptive use on the Gila, is in accordance with the findings of the Bureau of Reclamation?

Mr. ELDER. Exactly.

Senator DOWNEY. And your conclusion agrees with their's?

Mr. ELDER. Exactly.

Senator DOWNEY. And you used the data they developed?

Mr. ELDER. I used that data. I did not want to substitute other data for them.

Senator DOWNEY. And the figures are broken down from the Bureau of Reclamation's computations?

Mr. ELDER. Yes.

Senator McFARLAND. I realize this isn't a court of law, but that is not a proper question to say, "Do these figures agree with something?"

Senator MILLIKIN. The witness has agreed to submit the break-down.

Senator DOWNEY. No further questions.

(Supplement to statement of C. C. Elder, hydrographic engineer, the Metropolitan Water District of Southern California:)

In response to the request of Senator McFarland of Arizona for a statement of the derivation or basis of the determination of the Gila Basin's beneficial consumptive use as approximately 2,300,000 acre-feet annually, on the average, the following statement has been compiled from various official sources, reports, etc., as indicated, and from a report of the writer dated June 21, 1946, on Gila Basin consumptive use of water.

I

An interesting pronouncement, made in the name of the State of Arizona, that must be given due consideration (with proper discount) in connection with the above request, is included in the Arizona bill of complaint (U. S. Supreme Court, October term, 1930) against California, Wilbur, et al., asking for an injunction against Boulder Dam, etc.

(Bill XIV, 3:) "Said (Colorado River) 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 (in Arizona and New Mexico)."

(Bill VII:)" "Of the appropriated water (of the Colorado River and its tributaries in the United States) diverted below Lee Ferry, 3,500,000 acre-feet are annually diverted, used, and consumed in Arizona, 2,900,000 acre-feet are diverted from the Gila River and its tributaries. * * * 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 since been, nor is there now, any unappropriated water in the Gila River or any of its tributaries."

This assertion of fact as of 18 years ago is probably substantially correct as to appropriation rights in the Gila Basin (or at least no sufficient basis for questioning such an official determination is available), making reasonable allowance for extensions to projects and additional storage reservoirs and pumped wells that have since been constructed and are now operating. The claim, of course, greatly exaggerates the actual consumption of water in the Gila Basin of Arizona as of the date specified, because only in years of above-normal run-off was a full supply of water available for the lands then irrigated or included in projects. The complete use of the Gila Basin water supply, as an historical fact, has only been possible by means of a gradual increase in reservoir storage capacity and in the number of and pumpage from wells. The draft on the accumulated ground water storage of the region has been reported as determined by the United States Geological Survey to have amounted to 2,000,000 acre-feet annually for 1943 and 1944. (Testimony of Mr. Greig Scott of Phoenix, Senate Foreign Relations Committee Hearings on Water Treaty with Mexico, 79th Cong., p. 986.) There was certainly no decrease of the pumped diversions in 1945 and 1946, but probably a continued increase involving a serious overdraft as testified by several witnesses. We may accept for present purposes the data of Statement of V. E. Larson, S. 1175, Eightieth Congress, first session, page 25: "During the period of 1940 to 1944, the pumping overdraft (on the central Arizona project) is estimated to have averaged about 468,000 acre-feet a year." Also: "It is estimated that under present conditions it would be necessary to release 154,000 acre-feet of water with a salt content of $5\frac{1}{2}$ tons per acre-foot in order to maintain a salt balance within the area (to avoid abandonment of some land). Occasional flood spills at Gillespie Dam might now average about this amount, in any case.

	<i>Acre-feet</i>
Determined as "Used and consumed in Arizona" (per Arizona 1930 bill of complaint)-----	2,900,000
Pumped overdraft, average-----	-468,000
Necessary salt balance release-----	-154,000
Indicated beneficial consumptive use-----	2,278,000
Future depletions, Gila River Basin (V. E. Larson statement, p. 22)---	+20,000
Approximate total beneficial consumptive use-----	2,298,000
Which may be rounded for present purposes to-----	2,300,000

II

A sufficiently close check on the average beneficial consumptive use of the Gila Basin is given by Arizona witnesses at the S. 1175 hearings as regards regional irrigated areas and per-acre consumptive use. Mr. R. I. Meeker supplemented his written statement by testifying verbally that the average beneficial consumptive use in the region of the central Arizona project is about 3.0 acre-feet per acre. This average is not to be confused with farm or project rates of beneficial consumptive use, though these differ (if at all) only slightly by in some cases not having been fully corrected for deep percolation losses to the ground-water table. Neither is this average rate of Mr. Meeker's to be confused with basin depletion, which necessarily includes natural losses as well as beneficial uses of water. The same 3.0 acre-feet rate of beneficial use has been stated repeatedly by Attorney Charles Carson, most recently in a carefully prepared address before the national meeting of the American Society of Civil Engineers at Phoenix, Ariz., on April 23, 1947, as follows:

"In the year 1945, which is the last year for which I have figures, the gross value of our agricultural production in this (Phoenix) area exceeded \$150 per acre. In that year, I am informed that for every acre-foot of water consumptively used for irrigation, a gross crop value in excess of \$50 was produced."

This average basin or regional rate of 3.0 acre-feet per acre for beneficial consumptive use, as thus accepted and announced by Mr. Carson and Mr. Meeker, has attained wide usage in Arizona as a reasonably accurate figure. If in error, it is probably slightly too low, but may be accepted as giving due weight to the partial water shortages that have and do frequently occur in central Arizona, because of overexpansion of the irrigated area.

As regards the present irrigated area of the central Arizona project, Mr. Carson stated in the same A. S. C. E. address of April 23, 1947:

"In central Arizona on the Gila River and its tributaries * * * there are now in intensive cultivation approximately 725,000 acres of very productive land wholly dependent on irrigation water."

In hearings of July 31, 1944 on Senate Resolution 304 before the United States Senate Committee on Irrigation and Reclamation (p. 39), Arizona State Water Commissioner O. C. Williams tabulated a summary of Gila Basin "projects that must have Colorado River water" as having an irrigated area of 724,000 acres, probably as of 1943. Small scattered areas seem to have been omitted, as are the Wellton and South Gila Valley areas of 15,000 acres from both this list and the total of Mr. Carson (his list of counties involved omits Yuma County). These latter Gila Basin areas are at present supplied by pumped Gila Basin water, though completion of the planned Gila-Colorado River project will furnish them with Colorado River water.

In February 1945, Mr. Greig Scott, general counsel, Salt River Valley Water Users' Association (Mexican Water Treaty Senate hearings, p. 985) testified that the irrigated area of the Central Arizona Gila Basin was 750,000 acres probably as of 1944. He also omitted the lower Gila River areas east of Yuma. At the same water treaty hearings, on February 8, 1945, Mr. Victor Corbell, member, board of governors, Salt River Valley Water Users' Association, stated that "In the entire area of South Central Arizona, excluding the area around Yuma in the southwest part of the State, there are from 750,000 to 800,000 acres under cultivation (irrigation)." Allowing for the mentioned lower Gila areas and for 2 years' increase in new lands irrigated by pumped wells, brought in rapidly due to 1945 and 1946 high crop prices, it is concluded that the Gila Basin irrigated area in Arizona for 1946 was not less than 775,000 acres.

Combining this irrigated area with the accepted rate of beneficial consumptive use in the central Arizona region of an average of 3.0 acre-feet per acre gives, as a rounded figure, 2,300,000 acre feet per annum of beneficial consumptive use for the Gila Basin of Arizona. Due to water shortages and resulting shortages of hydro power to pump ground water from wells, the 1947 beneficial consumptive use may be as much as 500,000 acre-feet less than the above average. In each case, ground water overdrafts are corrected for and omitted as accurately as present tentative United States Geological Survey data permit.

III

Frequently quoted by witnesses at the hearings on S. 1175 are the data of table CXLVI, United States Bureau of Reclamation report of March 1946 on the Colorado River, which shows the natural inflow to the Phoenix area as averaging 2,279,000 acre-feet annually for the period 1897 to 1943, with variations from a minimum of 600,000 acre-feet in 1900 to 7,945,000 acre-feet in 1905. Accepting this table and its data, so far as it goes, as being reasonably accurate and the best available, but allowing (1) for natural losses, now conserved and salvaged, in the Safford and other irrigated regions upstream from the Phoenix-Florence region; (2) also for additional unmeasured side inflow, not fully allowed for in the United States Bureau of Reclamation estimate, both above and below Gillespie Dam, that by its percolation serves to sustain in part the present pumpage from wells; and (3) likewise for deep percolation from occasional cloudburst-type storms that is similarly important in contributing to the present ground water pumping; there is a total usable water supply, as largely regulated by surface reservoirs and ground water storage, averaging not less than 2,800,000 acre-feet in the Gila Basin of Arizona. Deducting natural losses that presently vary from 300,000 acre-feet to 400,000 acre-feet annually, according to the scarcity or abundance of the surface runoff and the consequent amounts of flood waters and return flow; also, the rare spills at Gillespie Dam which average from 150,000 acre-feet to 200,000 acre-feet, but in part contribute to and sustain irrigation pumping for the lower Gila areas amounting to about 50,000 acre-feet; there remains a net usable, beneficial consumptive use of not less than 2,300,000 acre-feet annually, in rounded figures.

Similar results have been derived from the data of a report called Arizona Stream Flow Summary, dated 1940, by Engineer Donald C. Scott for the Colorado River Commission of Arizona, as brought up to date by means of published United States Geological Survey records and other sources. A check on the results was also derived from a United States Bureau of Reclamation report of December 1934 on stream flow of the Lower Colorado River and its tributaries, the Gila Basin being discussed in exhibit D of that report, and credited to En-

gineer J. R. Riter. Likewise, little exception need be taken to the water supply data of Mr. R. Gail Baker in his statement at hearings on S. 1175, if the one major error is corrected, that irrigation pumping from wells in the central Arizona area is entirely ignored and omitted by him. This valley pumping intercepts irrigation return flow that otherwise would reach surface channels and be redirected by canals; also, other percolating ground waters. In the Phoenix area, no valid distinction can be made between surface diversions and ground water pumpage from wells, in any serious study of beneficial consumptive use. This pumpage has been reported variously from 1,700,000 acre-feet annually in statement of Dr. George W. Barr, S. 1175, hearings, to 1,800,000 acre-feet as an average (report entitled "The Case for Water in Central Arizona," published and widely distributed by the Central Arizona Project Association), and even as high as 2,000,000 acre-feet annually as mentioned previously. Allowing for Mr. Larson's estimated pumped overdraft of about 468,000 acre-feet and possibly as much more deep percolation and reuse involved in the pumpage, the value of less than 1,497,000 acre-feet of Mr. Baker's statement, from surface sources only, is easily increased to a net beneficial consumptive use of not less than 2,300,000 acre-feet annually by the addition of net use from pumped wells.

IV

In Mr. Tipton's statement on S. 1175, concern is expressed that the beneficial consumptive use interpretation of California would result in charging the upper basin States with some salvage of natural losses. Though the case is similar to that of the Gila, the amounts involved are negligible in comparison, and certainly would be much less than the reasonable interest of the upper basin in the additional surplus resulting from upholding the California interpretation in the Gila Basin case. Mr. Tipton continues:

"On the other hand, during periods of protracted droughts, should it become necessary for the upper basin to curtail the use of water in order to deliver the 75,000,000 acre-feet (at Lee Ferry) in a 10-year period in accordance with article III (d) of the compact, the curtailment must be in sufficient amount to make up the deficiency at Lee Ferry. The increments of consumptive use which are curtailed will in the aggregate exceed the deficiencies at Lee Ferry by the amount of channel loss required to get the water to Lee Ferry, Calif., therefore in the one instance would not permit the upper basin to enjoy the use of the river losses it salvages, but in the other instance would require that the upper basin make up the river losses by curtailing the increments of consumptive use an amount sufficient to supply such losses."

This is an exceedingly far-fetched comparison, as losses on added or incremental flows in the canyon sections above Lee Ferry will be too slight to allow for or consider, since the flow of the Colorado River there can be doubled without appreciably increasing the water surface area or its evaporation loss. But in any case, the comparison is irrelevant, as the III (d) guarantee in no way involves considerations of beneficial consumptive use, but is definitely a fixed minimum delivery to be measured at a fixed point (Lee Ferry). The lower basin obviously stands channel losses on such III (d) deliveries below Lee Ferry, even as the upper basin must stand such losses, if any, above Lee Ferry. This simple case cannot possibly be confused with the depletion versus beneficial consumptive use controversy, as Mr. Tipton attempts to do.

V

In the statement of Mr. E. B. Debler on S. 1175, at the hearings before the Senate Subcommittee, Irrigation and Reclamation, in his tables 1 and 4 for the flow of the Gila River at Dome for the years 1943 to 1945, Mr. Debler lists a material runoff as occurring, ascribing the data to the annual United States Geological Survey water supply papers by a footnote. In this case, Mr. Debler seems to contradict a conclusion in my own statement (p. 10) that—

"The flow at the mouth of the Gila has actually been 0.00 since August 1941, or for the last 6 years, and for equally long prior periods."

This conclusion and observed fact is of considerable importance in determining either the depletion or the beneficial consumptive use of the Gila Basin with present conditions of irrigation development. It therefore seems necessary to point out that Mr. Debler, in his tables 1 and 4, has erroneously (and doubtless

inadvertently) copied from the respective United States Geological Survey Water Supply Papers Nos. 979, 1009, and 1039, for the years 1943, 1944, and 1945, not the discharge of the Gila River near Dome (12 miles above the mouth of the Gila) as the tables indicate, but instead the annual discharges of the Sunset Canal near Virden, N. Mex., which is some 400 miles eastward by highway distance. Making this needed correction, the Gila River at its mouth continues to be absolutely dry, as stated.

VI

The present controversy or issue involving depletion versus beneficial consumptive use may possibly be clarified to some degree in spite of the confusion imparted by the explanations offered by the four Colorado witnesses (Debler, Meeker, Tipton, and Stone). None of these experts seemed aware that the hydrographic characteristics, the physical conditions underlying return flow and channel loss estimates, etc., are radically different and in many respects wholly reversed in the extreme desert of the lower Gila River, as compared with the South Platte Valley with which they all are long and thoroughly familiar. Its mile-high elevation, long winter season and mild summers, snow-fed mountain tributaries, and relatively heavy rainfall (five times that of southern Arizona, on the average) are in complete contrast to the Gila's near-sea-level elevation, 12 months' growing season and intense summer heat, side inflow only from rare cloudburst storms, and occasional year-long periods without measurable rainfall.

These Colorado witnesses support the Arizona representatives in starting their computations of Gila beneficial consumptive use at the mouth of the stream, 200 miles from the main area of irrigation use. The California method of computation starts, instead, at the main river gaging stations just above the chief diversion points for the main irrigation project. This avoids the necessity for extreme accuracy in the estimates of river channel losses, though lack of such accuracy does not seem to be a matter of concern to the Arizona computers. However, the direction of approach, from upstream or down, cannot greatly affect the results if the several items of the computation are reasonably determined.

Neglecting several minor factors of relatively slight or no importance, the Gila beneficial consumptive use equals (1) the total available run-off of the watershed, minus (2) natural losses, and minus (3) the flow at the mouth. There is little uncertainty or variation in estimates of the total run-off, and in fact the United States Bureau of Reclamation estimates have been accepted by California engineers with only minor factors suggested for added consideration. There is no uncertainty at all as to the flow at the mouth of the Gila (correcting for Mr. Debler's slight error, as discussed above). The whole point at issue is then whether estimated prehistoric, preirrigation, channel losses should be subtracted, in the simple formula as stated, now and forever into the future, as the Arizona and Colorado witnesses insist; or whether present (but likewise natural) channel losses should be so subtracted to determine present beneficial consumptive use; similarly, 1960 losses subtracted to determine 1960 beneficial consumptive use, etc., as proposed by California representatives. That prehistoric channel losses, no matter how great they may have been, cannot be a proper factor in determining present beneficial consumptive use, seems a wholly reasonable and obvious conclusion. The difference, as stated by numerous witnesses, is on the order of 1,000,000 acre-feet annually, the reduction in present natural losses being due to salvage of former losses by storage of flood flows and ground water pumpage from wells.

The same issue may be presented in a slightly different form, based on the definition of Mr. Meeker's statement that aggregate beneficial consumptive use (in the upper basin at least, under the terms of the Colorado River compact) is depletion by irrigation uses. But in considering the Gila Basin, Mr. Meeker and the other Colorado witnesses, in particular, insist subconsciously at least on revising this acceptable definition to "increased depletion since irrigation began." The latter form of definition is a legalistic fiction, justified neither by the language of the compact nor by well-established engineering usage. The best proof of this fact is that every Arizona representative, from 1922 to 1944, knew exactly what the compact means as to Gila Basin beneficial consumptive use, and accordingly kept Arizona from ratifying the compact.

STATEMENT OF WILLIAM S. PETERSON, ASSISTANT CHIEF ELECTRICAL ENGINEER, DEPARTMENT OF WATER AND POWER, CITY OF LOS ANGELES, LOS ANGELES, CALIF.

Senator MILLIKIN. Please be seated, Mr. Peterson, and give your full name, residence, and business for the record.

Mr. PETERSON. 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.

Do you wish me to go on with my personal identification or qualifications?

Senator MILLIKIN. You might put some qualifications in the record.

Mr. PETERSON. I have been employed with the department of water and power for very nearly 25 years.

Senator DOWNEY. How long, Mr. Peterson?

Mr. PETERSON. Nearly 25 years.

In that department, one of our principal pieces of work that would be of interest to the committee would be that I worked for many years on engineering and ultimate designs of the department transmission lines between Hoover Dam and Los Angeles.

In more recent years, my status within the department has been raised so that at the present time I am assistant chief electrical engineer, which is the second man in authority in the power system.

Senator MILLIKIN. What is your professional training?

Mr. PETERSON. My professional training was as electrical engineer. I graduated from the University of California in 1917 with the degree of bachelor of science.

Senator MILLIKIN. Go ahead, Mr. Peterson.

Mr. PETERSON. 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.

Integration: On the basis of figures presented in testimony before this committee by Mr. V. E. Larson, assistant regional planning engineer for region III of the Bureau of Reclamation, over three-quarters of the revenue upon which the central Arizona project—Parker Route—depends, as proposed in S. 1175, is to be derived from the sale of electric energy made available to a large degree by coordinated or integrated operation of the power plants at Hoover Dam, Davis Dam, Parker Dam, and at Bridge Canyon.

Senator MILLIKIN. Mr. Peterson, before you finish your statement will you tell us what are the sources of power in the Los Angeles area? Will that be in here?

Mr. PETERSON. That will not be, but I will be glad to supply it later.

Senator MILLIKIN. Tell us now, at the present time.

Mr. PETERSON. The Department receives its major source of power from the Hoover Dam project. We have three 287,500-volt transmission lines, and there is transmitted over these lines, a maximum of approximately 500,000 kilowatts of which 40,000 kilowatts maximum is delivered for other municipalities, Glendale, Pasadena, and Burbank.

The net is 500,000 less 40,000 as measured at Boulder. There can be slight variations from that amount.

The next important source of power is from our aqueduct power plants. Those are plants taking advantage of the drop in water in our Owens River aqueduct.

Senator DOWNEY. That is located in California?

Mr. PETERSON. That is located in California.

The plants are between 40 and 50 miles from Los Angeles. The total from that source is broken up into three plants. The total output as we record it for our availability from those plants is about 100,000 kilowatts, but the sum total of individual plant capacities would be a little bit higher than that.

The remaining power comes from steam plants. Two of those steam plants were acquired from the Los Angeles Gas & Electric Co. One is the Seal Beach plant with two steam units in which we have an approximate capacity of 75,000 kilowatts.

Another plant was a very old plant acquired from the same company, which has a rated capacity, or had a few years ago of about 70,000 kilowatts, but which in recent years we have had to discount due to boiler conditions becoming poorer and the rating has dropped to about as low as 52,000 kilowatts, but through a process of rehabilitation we expect to raise it possibly to 60,000 or a little bit more for this coming winter.

Senator MILLIKIN. What do you burn, oil or coal?

Mr. PETERSON. We burn oil in this plant. Now we have, in addition to that, a unit of 60,000 kilowatts capacity which we lease from the Southern California Edison Co. That power is received through a frequency changer, 50 to 60 cycles, and comes into our system very much as if it were one of our own plants.

We have in operation one unit of 65,000 kilowatts in our Harbor steam plant. It was initiated before the war and completed during the war.

Senator MILLIKIN. That is at San Pedro.

Mr. PETERSON. At Wilmington, near San Pedro. That plant has an additional unit of 65,000 kilowatts being installed and it is presumably to be ready by the winter peak to be experienced this year in 1947. It will be ready in the fall.

In addition, we have under construction and installation three 75,000 kilowatt steam units for the same Harbor steam plant which are aimed to be in operation the latter part of 1948.

It does not appear that all three units will be ready at that time. I presume one of them may be later, such as in the spring of 1949. We cannot know such things too accurately under present conditions of manufacture.

With only other minor capacity, such as a small plant on the aqueduct water system of our Department, that is the total capacity available.

Senator MILLIKIN. To recapitulate in terms of present use, what percentage is water generated power from Boulder and what percentage is generated from the Owens River, and what percentage steam?

Mr. PETERSON. If we speak in terms of capacity and not in terms of energy for the moment, we might say that Boulder represents to the city system something on the order of 460,000 kilowatts plus 100,000

more through hydro, which is then around 560,000 kilowatts for the system. If you total the steam capacity up on the basis of 75,000 for Seal Beach, plus 60,000 for Alameda, which is 135,000, plus 60,000 more from Edison, which is approximately 195,000, plus 65,000 from Harbor, we get 260,000 kilowatts.

I had better stop there because that is about all we will have for this fall, because, although we gain the 65,000 kilowatt new unit we lose the unit presently being leased from the Edison Co.

So, that we have therefore about 260,000 in steam against about 560,000 in hydro. It is a one-third—two-thirds relationship, roughly.

Now, in energy, our system takes under the present circumstances nearly one billion and a half kilowatt-hours firm energy from Hoover, plus about 700,000,000 kilowatt-hours of metropolitan water district unused energy and we get about 300,000,000 firm kilowatt-hours from our aqueduct system. This makes a total of nearly two and one-half billion kilowatt-hours.

The remainder of our system is carried on steam and I am not sure I can remember the total load figure at the present time. It is probably 3,200,000,000, but that is from memory and there is a slight inaccuracy probable. In addition nearly 400,000,000 kilowatt hours is supplied from steam generation to the basic magnesium plant, to Arizona and to the California Electric Power Co.

From that, you can see that there is a very very considerable amount of 1,100,000,000 kilowatt-hours that might have to be generated by steam.

Now in years of liberal water supply up to maybe 700,000,000 to 800,000,000 kilowatt-hours might be supplied from secondary energy, cutting the steam production to 300,000,000 or 400,000,000 kilowatt-hours. In the immediate future all growth will be carried on steam generation.

At the present time I am told that we are operating to obtain about a third of our energy from steam.

Senator MILLIKIN. What is the relative cost of your steam power as contrasted with water power electricity?

Mr. PETERSON. You mean in terms—

Senator MILLIKIN. What does your city pay for it?

Mr. PETERSON. For the amount we get?

Senator MILLIKIN. Yes.

Mr. PETERSON. Per kilowatt-hour, is that the point you mean?

Senator MILLIKIN. Yes.

Mr. PETERSON. Boulder energy, which costs about $1\frac{3}{4}$ mills at the high tension bus, has to have added to it the transmission cost which runs something of the order of about $1\frac{1}{4}$ mills which is largely investment cost.

Senator MILLIKIN. That is all the cost?

Mr. PETERSON. Yes. That cost varies, depending upon how much we transmit each year because there is a total fixed annual charge that is divided by the variable amount of energy.

That means that Boulder energy at the city system, not counting expenses being charged for steam that is used to stand by against Boulder, is of the order of 3 mills.

Senator MILLIKIN. 3 mills?

Mr. PETERSON. When we add steam stand-by, that cost is increased, and I hesitate to say exactly how much that costs. I have not had the figure or looked at it lately.

I would presume it might be said it would bring the cost, when added to $3\frac{1}{2}$ or $3\frac{2}{3}$ mills, or something of that order for Boulder energy, and the figures will vary from year to year.

Now steam costs, at the time the Boulder project came into being, were competitive with Boulder and very closely equal to that same amount; but in recent years, particularly in recent weeks, with the present flurry in the price of oil, the price of steam power has increased.

The basic cost of steam plants is in a violent flux. We do not know whether it is going to be more or less as time goes on, but the figure for the cost of steam power depends on how we use it in our system, how we integrate it, whether used at high or low load factor and would probably develop costs which would range from around 4 mills up to something over 5.

I would have to review figures to come closer to that at this time.

Senator MILLIKIN. What is your oil supply?

Mr. PETERSON. Our oil supply is by purchase of oil from oil companies.

Senator MILLIKIN. California production?

Mr. PETERSON. California production and it has been California production up to date.

Senator MILLIKIN. Have you had any imports, imported production at all during the history of your steam plants?

Mr. PETERSON. Not up to the moment.

Senator McFARLAND. I understand California will become an import State in the near future.

Mr. PETERSON. I am not an expert on the availability of oil, but there have been discussions along this line; yes, Senator.

Senator MILLIKIN. Has there been any estimate of the life of your oil supply, your domestic oil supply in relation to your steam plants?

Mr. PETERSON. There have been estimates made by the oil people and I have even occasionally read some of the papers that have been issued on that subject.

I do not believe that I should try to interpret those things at this moment because when you begin estimating how many years the oil reserves will last, it is not the problem of taking somebody's estimate of how much oil is in the ground and then taking your estimate of how much more is going to be used, and divide one into another and come out with the value for years, because the thing that limits it is the rate of flow by which oil can be brought out.

I do not know that and I just do not believe I should try to answer on a problem in a field in which I am not an expert.

Senator MILLIKIN. Do you use bottoms or do you use the oil as it comes from the ground?

Mr. PETERSON. We do not use it as it comes from the ground. We use oil sold under specification 400 which is an oil produced for fuel.

Senator MILLIKIN. For fuel?

Mr. PETERSON. Fuel oil.

Senator MILLIKIN. Do you know whether California oil is increasing in production or decreasing?

Mr. PETERSON. I am not sure on that because I do not know whether they over-produced during the war and have set it at a different level or not. I am not quite sure on that.

Senator MILLIKIN. I assume in connection with the construction of steam plants there must have been some estimates as to the source of fuel.

Mr. PETERSON. We did use estimates as to the fact that oil supplies might be depleted within the life of our plants.

Senator MILLIKIN. Yes.

Mr. PETERSON. We did not have to come to an accurate conclusion that in any particular number of years it would not be available. We did have to make preparation to use other fuel.

Senator MILLIKIN. What are the alternative fuels?

Mr. PETERSON. The alternative fuels are probably, the principal one that comes to mind, of course, which is coal and the other possibilities are oil from such things as shale deposits or oil deposits in diatomaceous earth. Those are in process of investigation.

I have no basis for reporting on this at the present time. We are very intensively studying the fuel situation.

Senator MILLIKIN. Where are your coal supplies?

Mr. PETERSON. That is under study.

Senator MILLIKIN. I say where are your coal supplies?

Mr. PETERSON. The determination of that point is under study. I do not know.

Senator MILLIKIN. Do you have coal deposits in California?

Mr. PETERSON. Not appreciably.

Senator MILLIKIN. In Utah?

Mr. PETERSON. There are coal deposits in Utah and they would be considered?

Senator MILLIKIN. Are there any closer coal deposits to California than Utah?

Mr. PETERSON. That, I do not know. The problem is being studied. I would prefer not to answer that.

Senator MILLIKIN. I do not want you to answer if you cannot answer.

Mr. PETERSON. We are investigating coal in whatever localities might be suitable for us, but this is in process, not a finished thing.

We do not know there is coal in Utah, in Washington and Alaska, probably, but those are things we are studying and have not come to a conclusion on.

Senator MILLIKIN. I suggest the matter has pertinency in this hearing. I am not saying you are responsible for testifying as to that, but it has pertinency in this hearing.

Mr. PETERSON. It does have pertinency.

Senator MILLIKIN. All right, proceed.

Senator McFARLAND. May I ask just a few questions while we are on the subject?

Senator MILLIKIN. Yes, Senator.

Senator McFARLAND. What is the present cost of the oil in Los Angeles?

Mr. PETERSON. Without wanting to appear facetious, I would hate to answer without looking at the newspaper, but I will say this, that about the last cost before I left Los Angeles was on the order of \$1.80 per barrel.

Senator McFARLAND. And what is the present cost of coal?

Mr. PETERSON. I do not know.

Senator McFARLAND. If it becomes necessary to import oil how much more will it cost you than the present oil?

Mr. PETERSON. That, I do not know.

Senator McFARLAND. It would cost you the price of freight anyway, would it not?

Mr. PETERSON. It would not necessarily be freight. It might be a pipe line or some other means of transportation.

Senator MILLIKIN. It might cost duty also?

Senator McFARLAND. Yes. Is not a pipe line now being built for gas from Texas to Los Angeles?

Mr. PETERSON. For gas.

Senator McFARLAND. You really do then have a power problem in southern California, do you not?

Mr. PETERSON. We have a power problem for two reasons. The principal one is growth, and the other is cost.

I would like to volunteer one thing, if you will permit me.

To understand the cost situation there, the cost of oil, at the time the Boulder project was first instituted, I think was of the order of 58 cents a barrel. Later, for a period it was of the order of 80 cents per barrel, and during the war I think something of the order of \$1.25 per barrel covered the situation.

More recently, as you see, the prices have gone up rather sharply. We are not necessarily planning that such price levels will be the level at which we will stabilize, but I do not know that I can offer proof of that point.

Senator MALONE. Has the export of oil to various foreign countries had any bearing on the cost of oil in that area?

Mr. PETERSON. I do not know whether it has a bearing on the cost of oil or not, Senator.

Senator MALONE. There is still some oil being exported to Russia?

Mr. PETERSON. I have heard, principally from what I have read in the papers, to which all of you have access, there has been oil exported to Russia in particular, but I do not know the quantities and cannot offer much testimony.

Senator MALONE. One more question in that connection on oil supply. Has there not been period before on the west coast when predictions were made that oil was running out, there would be no future oil supply; say 25 years ago, was it not predicted that oil would be exhausted in 5 or 6 or 7 years?

I think you will find that to be true.

Mr. PETERSON. I have a tendency to agree with you, but I could not state from memory where I may have gotten the idea.

Senator MALONE. And then the deep wells brought in new fields, an exploration has been halted during the war due to lack of steel and lack of facilities. Is that not true?

Mr. PETERSON. I would think it was. I have not had an opportunity to examine the figures.

Senator MILLIKIN. Senator Downey and Senator McFarland, I assume both sides of this controversy will submit some kind of data on the power sources for the southern California area?

Senator McFARLAND. Well, the Reclamation Service, I believe, has been called upon to prepare some data.

There was one other question, since Mr. Peterson appeared here as an expert on this subject and is supposed to be probably as familiar with it as anyone, I would like to ask him if he knows the cost of coal he uses?

Mr. PETERSON. I have people checking in on that, but I have not had their report as yet.

Senator MCFARLAND. It would increase the cost of your power if you had to go to coal, would it not?

Mr. PETERSON. We would go to coal, depending on the cost of other forms of energy. If coal were cheaper, then at some future time we would go to coal. If it is not cheaper we would go to something else.

Senator MCFARLAND. Could you tell us at the present time whether it is cheaper to use coal in Los Angeles or oil?

Mr. PETERSON. I told you that I have not received a report on the present prices of coal. It is being investigated and I do not think I should give you old data on a subject of that kind, and I do not know, but I suspect that at the present moment that oil is probably selling cheaper than coal, because we have not developed any system of purchase. There is no logical distribution of any coal in Los Angeles. The only coal I know being used is being used at the Fontana steel plant, other than for some small industrial purposes.

Senator MCFARLAND. Do you know what they pay for it?

Mr. PETERSON. No, sir.

Senator MCFARLAND. Does your cost of 4 or 5 mills include fixed charges, and if so, at what rate?

Mr. PETERSON. Yes; they include fixed charges. They include charges at the interest rates on money that we borrow, together with all other normal fixed charges.

Senator MCFARLAND. I think that is all the questions I want to ask.

Senator MILLIKIN. Are you using any gas for the production of power in southern California?

Mr. PETERSON. Some gas is being used, but not in our system, during the summer months when there is some gas available.

Senator MILLIKIN. Can you give us any data on your gas supply in California?

Mr. PETERSON. No; I have not investigated that except to know that they have had to bring in a pipe line because the other supplies were about used up by present use.

Senator MILLIKIN. I wanted to ask you about that. When will that pipe line be completed?

Mr. PETERSON. I am not sure about that.

Senator MILLIKIN. It is under construction at the present time?

Mr. PETERSON. I believe it is. It is definitely a project. The financing and everything is complete. I do not know whether physical construction is in progress. If it is not, it surely will be soon. It is shortly to come.

Senator MILLIKIN. Does the supply come from Texas?

Mr. PETERSON. I think so.

Senator MILLIKIN. All right, go ahead, Mr. Peterson.

Mr. PETERSON. Despite the fact that the Bridge Canyon plant, by itself or even augmented by the storage afforded by the silt-control reservoir at Bluff, is a project with very limited capabilities for the generation of firm energy, 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 287,500 kilowatts of generating equipment at Hoover Dam yet to be installed for this purpose plus the 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 the contractors or allottees that have guaranteed and are returning to the Government the cost of that project with interest.

Several months 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. It became evident in this meeting that under the present contracts, and regulations, there was not an obligation to integrate 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. The following quotations from sections 20 (a) and 20 (b) (i) of the "agency contract" express this idea as follows.

Senator MILLIKIN. What is this agency?

Mr. PETERSON. The agency contract is the contract which the Government has with the city of Los Angeles and with the Southern California Edison Co. whereby those two groups act as agencies for the operation of the power plant at Hoover Dam.

Now I am quoting from that contract, and have underlined for emphasis a few points. [Reading:]

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 in so far 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 in so far as practicable*, as 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) (i) 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*"—

I may interject there that the sentence is long. I want to indicate by the emphasis that it was to be reasonably integrated with other projects on the Colorado River and the respective systems, including all energy.

Senator DOWNEY. Mr. Chairman, may I intervene there?

Senator MILLIKIN. Yes.

Senator DOWNEY. Does the Southern California Edison have their power plants dependent upon oil?

Mr. PETERSON. Yes, the Southern California Edison Co. has a large steam plant installation which is primarily dependent on oil but uses some gas in the summertime.

Senator DOWNEY. Of the total amount of electrical power disbursed in the southern California area, how much is disbursed by Southern California Edison Co.?

Mr. PETERSON. The easiest figure I can remember is to say this, that the department of water and power disburses something less than a third of the total energy disbursed in areas in the Southwest which were controlled by an interchange group and which includes Arizona, a portion of Nevada and southern California.

Now to determine what the Southern California Edison would have, I would take away three areas, including the City, and the supply to Arizona and Nevada. The point I would probably lead up to on the basis of that adjustment is that about half the power must probably be supplied by the Edison Co., but I do not have the figures available. I believe the figures are available to the Bureau of Reclamation. The Federal Power Commission has been conducting a survey on that point, and I believe the information will be made available to your committee through that source.

Senator DOWNEY. The power developed by the Southern California Edison, about what percentage is produced by steam and what percentage by hydro?

Mr. PETERSON. My rough estimate of theirs is about like ours, probably one-third produced by steam.

Senator DOWNEY. Then—

Mr. PETERSON. I can give you one other point in answer to your question, the capacity of the Southern California Edison Co. is approximately $1\frac{1}{2}$ times the department system.

Senator DOWNEY. Thank you.

Mr. PETERSON. Picking up the quotation:

Provided, That the time and rate of delivery of energy to allottees and contractors other than the city and Edison Company (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.

That refers to such groups as Burbank, Pasadena, Glendale, California Electric Power, and other small contractors.

Senator DOWNEY. Does that in any way refer to the metropolitan water district?

Mr. PETERSON. The metropolitan water district occupies a special place in this situation due to the paragraph which I previously read which indicates the interchange, first with the energy allocated to the metropolitan water district, so they are involved here.

Senator DOWNEY. As I understand the metropolitan water district was allotted about 36 percent of the total power developed at Hoover?

Mr. PETERSON. That is correct.

Now picking up the quotation:

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 man-

ner 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.

In that comparison I have again supplied the emphasis, which I think I have given orally in the reading of the above paragraph.

It appears that Mr. Larson's figures are derived from a study approximately parallel to the one given in appendix D of Project Planning Report No. 3-8b, 4-0, entitled, "Comparison of Diversion Routes, Central Arizona Project." In this case, interchange is largely between Hoover Dam plant and the Bridge plant, that is, during high run-off Bridge is operated and Hoover plant is held back and then during low run-off Hoover is operated. 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 confined to 36 percent of the energy, presumably the energy allocated to the metropolitan water district, but the remaining energy is included through the device of saying that "64 percent of the firm output would be produced in a manner suitable for integration with power produced at hydroelectric and steam plants in southern California."

Senator MILLIKIN. Is it your point in brief there is no legal right to count on integration with the Boulder power?

Mr. PETERSON. There is a limited legal right.

Since I have made the statement I have just written Mr. Raymond Matthew—

Senator MILLIKIN (interposing). Before you finish, will you define that? If you cannot define the limitation will you have someone define the legal limitations as you see them?

Mr. PETERSON. This will define them. Since preparing this, Mr. Raymond Matthew has shown me a letter and some figures obtained, I believe, from Mr. Larson, which indicates in the final integration study the entire plant was thrown into integration purposes.

Senator DOWNEY. What entire plant?

Mr. PETERSON. Hoover Dam, rather than 36 percent of it. The difference in the argument of that is minor.

Although such a 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 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.

In short, this had the effect that all credits for operation of all Hoover Dam facilities, even those which might result from the operation to meet utilities' own integration, are given to the central Arizona project.

Furthermore, no display is made of the performance of the projects on a generator-capacity basis as well as the energy basis. 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 the operations proposed by the Bureau of Reclamation, it is not clear that the demands on Hoover Dam plant equipment will not directly interfere with the use contemplated by the power contractors on their own systems.

Senator MILLIKIN. It is clear that there will be an interference.

Mr. PETERSON. I believe so.

Senator MILLIKIN. Will you make that clear?

Mr. PETERSON. That will be developed, I think, here.

Senator MILLIKIN. All right.

Mr. PETERSON. Since no estimate of cost is included 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.

Senator MILLIKIN. Let me ask you, you contend that the proportionate part of the cost of power generation at Hoover Dam should be attributable to this proposed project?

Mr. PETERSON. Yes; I think that where the Hoover Dam project gives service of a valuable nature to the project above in this case, it should receive some credit for that service.

The principle is not new. It has been used and applied in the case of the Grand Coulee power plant when there is a lower power plant coming in and profiting by its storage. It comes in and passes credits to the Grand Coulee project.

Senator McFARLAND. Likewise, do you think the Hoover Dam ought to help pay for the benefits that accrue to it by the building of this project?

Mr. PETERSON. In this proposed integration no benefits accrue to the Hoover Dam.

Senator McFARLAND. No? What about silt control? Is that not a benefit?

Mr. PETERSON. I will have to back up on silt control, yes; but I had in mind when I answered your question the matter of power benefits.

As a matter of fact, power benefits are slightly reduced. That will be developed.

Senator MILLIKIN. Let me clear myself up again. You contend from a legal standpoint there is no right, only a partial right?

Mr. PETERSON. A limited right.

Senator MILLIKIN. To make an integration of the kind proposed?

Mr. PETERSON. That is right.

Senator MILLIKIN. You said that to the extent that an integration would be made. I assume that legally under your theory that there should be an assumption of the prorating part of the capital costs of the Hoover project.

Mr. PETERSON. That would be one method. I have not thought through the best way of allocation of that cost and distributing its benefits, but the general theory is what I would speak about.

For example, it appears that each year, as the Bridge Canyon Reservoir is drawn down, outputs of energy are contemplated that may not be within the capability of the 750,000 kilowatts of generators due to the fact that at low head the water turbines would be unable to produce full kilowatt output. Proposed generation during March, April, and May frequently typifies this condition.

Senator MILLIKIN. Let me ask you this, Mr. Peterson:

Will the water in Lake Mead be firmed up with the completion of Davis Dam? Will you be able to preserve more stable levels in Mead Reservoir after the completion of Davis?

Mr. PETERSON. The completion of the Davis Dam will have the following effect: From the power viewpoint, at the present time, due to Davis not being present, it is sometimes necessary to modify the generation of power in the summer from what we would like to do, from our own viewpoint, to accommodate irrigation demands. We shift our taking of energy to accommodate that situation.

Davis, as I understand it, from the statements that were in the congressional documents at the time the project was under consideration, has the duty of reregulating the Boulder flow for irrigation, and presumably thereby removes that obligation from Boulder.

Senator McFARLAND. Yet the Boulder people do have that benefit?

Mr. PETERSON. The benefit from Davis?

Senator McFARLAND. Yes.

Mr. PETERSON. No; neither did we charge for incurring the obligation temporarily. At the time of the Hoover Dam contracts reregulation by Davis was contemplated, I believe. I am subject to error on this point, but I believe I am correct. Some of the original Davis studies indicated that.

Senator McFARLAND. You do not think the same rule should apply to the Davis and Boulder as you would apply to Boulder and Bridge?

Mr. PETERSON. I think the points there were covered in advance of the contracts.

Senator McFARLAND. That is all.

Senator DOWNEY. Are there any private allottees or agencies that would have any right in Davis at the present time?

Mr. PETERSON. I am not competent to answer on that.

Senator DOWNEY. You know none of the southern California agencies have acquired any power rights in Davis?

Mr. PETERSON. We have requested power rights in Davis and have not received any favorable answer of any being granted. I know of no rights being granted to California agencies, but cannot speak with full competency on that point.

I have noticed in the integration scheme 93 percent of the power from Davis and Parker, that is being integrated, is stated by them to have Arizona characteristics. I assume, that most of it is probably not designed to come to California.

Senator McFARLAND. I hope that is true.

Senator DOWNEY. I think it is true, Senator, but in the case of Hoover Dam we have a case in which the equities and the contractual rights of agencies and private allottees have already attached.

Mr. PETERSON. Yes, sir.

Senator DOWNEY. Thank you.

Mr. PETERSON. Also to be emphasized is the period of low generation at Bridge Canyon in operations for 1934-35 water conditions when Bridge is developing outputs of approximately 100,000,000 kilowatt-hours per month. Those are the extreme low values.

At such times Hoover is being called on for outputs of over 500,000,000 kilowatt-hours per month with storage levels down to less than 15,000,000 acre-feet. Under present operations, while the storage has ranged near 19,000,000 acre-feet, only firm energy of a little over 350,000,000 kilowatt-hours per month has been permitted to be taken out. The reduced capability of the Hoover Dam generating units under such low heads will create a pinch in capacity on the system.

On a kilowatt-capacity basis each of the two main plants faces alternate periods of operation under low head. The net total kilowatts available from the entire system are less than the total simple summation of individual capacities of the entire system. For those periods where the output at Bridge is very low, there is thrown onto the Hoover Dam plant the need to generate nearly all the contemplated firm energy for both plants with only about a 28-percent increase in its equipment. This calls for the use of capacity factors in the use of equipment that make it impracticable to include such generation within the shape of the load curves experienced by the systems involved. This is particularly true since the war, when system-load factors have become lower.

I believe this statement would be clarified if I added that this statement is made with due regard to the right of the utility system to integrate the Boulder equipment with their own system.

Senator MILLIKIN. Has your demand for power decreased since the war in the Los Angeles area?

Mr. PETERSON. No. Do you want me to amplify that a little bit?

Senator MILLIKIN. Yes.

Mr. PETERSON. In the early part of 1945 we had estimated that there would be a decrease in load at the end of the war. It happened, however, that back in December 1945, the load was within about 15,000 kilowatts of the highest war peak. At the time of this 1945 peak, we were not carrying the aluminum plant, which took about 120,000 kilowatts.

The 1944 war peak did have that plant included in its load, so you see there was a tremendous jump in demand when you allow for the aluminum plant operation change that happened. That equality with the war load is really representative of the jump of over 100,000 kilowatts from the previous year's load, excluding the aluminum plant, and the growth has been maintained since, year after year.

The results to be obtained from integration as presented by the Bureau of Reclamation seem unduly optimistic. At least they are incomplete in not showing the generator kilowatt capacity considerations. Furthermore, the details of water control under which the studies are given are not set forth in sufficient detail to show that they are based on foresight rather than hindsight. The Colorado River is a most difficult river to predict and it would be most instructive to know the methods of water control used to achieve almost unbelievable results.

The concepts adhered to in the studies, which Mr. Larson mentions in his statement to this committee, for control require some clarification.

The statement—

(1) All reservoirs were full or at required flood-control levels at start and finish of all reservoir operation studies—

should be augmented by rule curves or descriptions of operation from year to year depending on variable river conditions.

The statement—

(2) Irrigation demands governed the amount of water available for power—
should be augmented to indicate that in early years during incomplete upper basin development the power releases might exceed the irrigation and are so used in the study. The method of determining these releases, should be stated.

The statement—

(3) Under coordinated operation the firm power production was equal to the amount which that plant could produce under independent operation.

It should be indicated that this happened only as an average of a period of years, and not each year. It also appears that the obtaining of this average was regarded as one of the controls. It should have appeared as an approximate result. This statement lends weight to the belief that operation may have been predicated on what kind of a result can be achieved when you know what the water availability is.

The statement—

(4) Minimum reservoir content of Lake Mead was held to the same level whether Hoover power plant was operated independently or integrated—

should be interpreted in the light of part of the flood-control responsibility being shifted to Bridge Canyon and Bluff projects, with the result that Lake Mead had to be operated at different levels.

The statement—

(5) All power plants under coordinated operation produced their average yearly credited amounts of firm power over the 10-year critical period—

requires the same comment as given above for item (3).

The statement—

(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—

should be augmented to say that some secondary energy available under separate operation was not available to the contractors under integrated operation.

The city constructed a third transmission circuit and assumed the obligation of two generators to make use of secondary energy and unused Metropolitan water district energy, all of which are involved in this integration process. The adverse effects of the integration program on the value of this investment are not given consideration in the report.

Due to existing contracts, the problem of integration is much more complex than is evident from the report now guiding your judgment. Action should not be taken on the basis of such limited information, on a matter with such far-reaching consequences.

TRANSMISSION

In such a system of integration, as is proposed by the proponents of S. 1175, there is not always opportunity for complete combining of all the generation into one system. Circuit breaker duties, parallel line operation and necessities for isolating systems and the need to carry heavy loads alternately from each of the two main plants all add to the transmission complexity.

These problems have not all been worked out. This becomes evident from a letter dated May 21, 1947, from Mr. H. F. McPhail, Director, Branch of Power Utilization of the Bureau of Reclamation, to Mr. Raymond Matthew, chief engineer of the Colorado River Board of California, wherein Mr. McPhail states:

The transmission system cost estimates appearing in this report are based on a cost of \$125 per kilowatt of total installed generating capacity. This cost has been determined by the Bureau, to be reasonably satisfactory for preliminary estimates of an entire transmission system including main transformers and switchyards of power plants, transmission lines, and substations. Since the switchyard at the power plants were included in the central Arizona project power plant estimates, these costs were deducted from the unit cost of \$125 per kilowatt and a cost of approximately \$112 per kilowatt of installed capacity was used to arrive at the estimate of \$81,674,000 for the Bridge Canyon route and \$86,113,000 for the Parker route in the above report. The total installed system capacity for these two routes is 731,000 and 770,100 kilowatts, respectively.

Inasmuch as the present study is preliminary and has not reached the stage of definite detailed preconstruction planning, the study is not based on a fully developed transmission system plan with definite transmission lines and terminal points. It is, however, anticipated that power will be delivered to the load centers in southern California and Arizona, though the power transmission will undoubtedly be coordinated with the transmission systems associated with the existing and future plants on the lower Colorado River.

We believe that such an estimate of transmission cost is not as accurate as should be available to your committee to decide on this project.

The value of the power at the load center depends on the adequacy and reliability of such transmission and if extensive stand-by is necessary because of lack of transmission reliability, the power is to be discounted accordingly. The city developed and constructed a transmission system that makes Hoover Dam power reliable, but all systems of transmission that might be proposed from Bridge Canyon would not necessarily do that. For this reason, we are interested in making sure that the transmission costs would cover adequate reliable lines to the market. We believe the Bureau of Reclamation should do further work on this problem.

SILT PROBLEMS

The silt problem on the Colorado River must be viewed from its long-term effects and in general no sacrifice must be made to expediences. Under the proposed project the Bluff Reservoir of 3,000,000 acre-feet is receiving silt at the rate of 28,200 acre-feet per year. The Coconino Reservoir with a capacity of 1,600,000 acre-feet is receiving silt at the rate of 27,000 acre-feet per year. With such dams in place, the Bridge Canyon Reservoir of 3,700,000 acre-feet is receiving silt at the rate of 73,000 acre-feet per year.

In this matter, it is not the all-important consideration to say that in 100 years Bluff will be filled or that in 50 years Coconino and Bridge 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. In the course of a few years, the flood control assumed for these reservoirs could no longer be obtained.

An analysis of the operation study by the Bureau of Reclamation will show that even if the proposed integrated plan of operation

could be effected, Bluff Reservoir would not be adequate to maintain the firm power output of Bridge Canyon.

Furthermore, if these projects are built as proposed, the effect of the silt will be to reduce the effective life of the projects to considerably less than the period assumed for repayment.

CONCLUSIONS

In conclusion, it is submitted for your earnest consideration that the bill S. 1175, under which the central Arizona project would be authorized, should either be not acted on or should be disapproved for the following reasons:

1. No costs have been charged to the central Arizona project for the benefits derived from the Hoover Dam power plan and Lake Mead which enhance the value of the Bridge Canyon power output and thereby provide revenue to subsidize irrigation in Arizona.

2. No appropriate arrangements under which the proposed integration operations could be carried out have been made.

3. Operations on the scale proposed for integration cannot be presumably conducted on the basis of present contracts.

4. The data provided to judge the results of integration and, therefore, to judge the revenue is inadequate, as no information is given on a system capacity basis and no adequate relationship with respect to integration with the utility systems is displayed.

5. The concepts under which the integrated control is to be developed are inadequate and incomplete.

6. No details of transmission system and costs are given, despite the fact that inadequate transmission could adversely affect the market value of the power sufficiently to cause the project to fail.

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 integrated operation. These effects become noticeable within a few years.

8. The effect of silt will be to reduce the economic life of the projects to less than the periods specified for the financial operations proposed in the bill.

Senator MILLIKIN. Entirely aside from the project we are considering, what is the answer to the silt problem on the Colorado?

Mr. PETERSON. We have given consideration to that problem largely from a power viewpoint and it is our conception that a large reservoir should be built probably in the vicinity of Glen Canyon. At that point we have talked in terms of tentative and not final recommendations yet of as much as 25,000,000 acre-feet.

The reservoir has a multiplicity of purposes which could be expanded on, but at any rate it could assume that silt burden for a long time.

The Coconino and the Bluff Reservoirs also perform the duty that is similar to the one here and I think should be continued. Everything that is possible should be done to prolong the life of all the projects along the river.

Senator MILLIKIN. Is that another way of saying, and I am not speaking in reference to this project at all, we have just got to continue building new reservoirs to take up the silt?

Mr. PETERSON. Yes; but we should not have a development whereby we get one project silting up and have to reject that one for its original purpose entirely, and it seems to me a very comprehensive plan should be worked out and adequate reservoirs planned so that the silt problem is controlled for hundreds of years. The Colorado is too valuable a possession to both California and Arizona and all the upper basin States as well to have it destroyed by silt due to lack of planning.

Senator MILLIKIN. The answer to that is more reservoirs to gather the silt. Is that correct?

Mr. PETERSON. Yes; that is correct, and in connection with the question of whether it is logical to develop it or not, the department of water and power has made studies which indicate that an integrated operation between Glen Reservoir and the power development at Bridge Canyon, without interfering with the present contracts for power generated at Hoover, but integrated with Hoover to the extent necessary, would produce a lower-cost energy than would Bridge Canyon alone, except as it leans on Hoover in the manner proposed in this bill and furthermore guarantees that you have all you need for silt control and have capacity for power development all properly encompassed in one bill that will take care of conditions for a long time.

We feel the initial project should be Bridge Canyon with power plus Glen Canyon storage. In due course power would be developed at Glen Canyon. Later on, as time goes on, if costs are feasible, and we have not studied that, the Kanab project might be developed and at that point we have probably completed the development of the Colorado River in the lower basin. Glen Canyon is in the upper basin, but close to the lower basin, but its development includes all the projects in reasonable transmission distance. Glen Canyon approaches 500 miles from Los Angeles in transmission-line length, and it takes a little stretch of the transmission art to accommodate that, but we believe it can be reached economically. Our figures show such a development is feasible.

Senator MILLIKIN. I think you have already answered the next question in part.

The question I am going to ask is what is southern California's plan for getting the power it needs over the long term?

Mr. PETERSON. I had better speak only for the department because I am not familiar with what the southern California Edison Co. would like to do, but for the department we would like to have developed the Colorado River development which I have outlined, Bridge, plus Glen and later possibly Kanab.

We believe that this development should be made very similar to the Boulder project wherein the power output is contracted for in a firm sort of way, with the contractors definitely paying the Government back the money it has invested over a reasonable period of amortization, and that interest be charged and paid into the Government Treasury for that work.

We believe that the money the Government advances to those projects costs the Government money in interest, and the Government should get that interest return. Otherwise, it is losing its money, and nothing in the way of the true cost is returned to the Government.

Senator MILLIKIN. Are you prepared to say or give your opinion that the power of this project could not be sold, assuming the projects were put into effect, in southern California, or a considerable part of it?

Mr. PETERSON. Do I have a feeling it could not be sold?

Senator MILLIKIN. Yes.

Mr. PETERSON. I have this feeling, Senator, in respect of the development such as has been proposed.

Senator MILLIKIN. Let us assume, without conceding that this project were put into effect and it could legally be put into effect, and that the integration plans of the department could be effectuated.

Under this assumption, which I hope I have made very clear, and which I am not asking you to concede, could the power be sold in southern California?

Mr. PETERSON. Are you asking that question on the assumption that the power rate of such a project is at 4 mills, or are you assuming that the rate may have been adjusted to meet the burden it must carry?

Senator MILLIKIN. Assuming it is a rate that competes fairly with your present rates in southern California.

Mr. PETERSON. I think that if we were to think of this bill and the contracts under it with the long terms involved that we face a difficult decision on the problem you propose because of other sources of energy that might be involved in the period of time we are speaking of.

I refer at least in one instance to atomic energy. With atomic energy being on the horizon one can not jump at a project which is closely competitive with steam, for example.

Long-term hydro projects at reasonable costs, where hydro does not have to bear the brunt of other things, yes, we can take a little courage and go into them, because there is a better margin, but one set up on this basis to us seems dangerous.

Senator MILLIKIN. Would you say that it would be a mistake to repeat the existing power contract on Boulder if we were confronted with that as a fresh situation?

Mr. PETERSON. Boulder contracts were made on the basis of close competition with steam, it is true, and we had no knowledge at that time of any other potential source of power that might compete with it, and we did not go into that.

We have one more obligation we should couple up with my discussion, and I think it is an obligation that rests more highly on the public agencies than others; and that is, we should not burn fuel if we could possibly get the water-power development that is reasonable, practicable, and economical, and we share that obligation; but here we are also subject to obligations to protect the public funds in our case, and we would be hard put to a decision on a project of this nature when we have such long-term contracts at a rate for power which, at best, will probably be comparatively close to steam.

Now that is as near as I can answer that.

On that problem I have here a letter which our general manager, Mr. Morris, has directed to you, which he has requested me to read before this meeting. If it is proper, I will be glad to read it. Here is the signed copy, and mimeographed copies have been made available.

It has some bearing on your question. This letter is from Samuel B. Morris, general manager and chief engineer, department of water and power of the city of Los Angeles [reading]:

Re S. 1175.

MY DEAR SENATOR: [Downey] It is imperative that the United States carry to fulfillment a vigorous program for the development of the hydroelectric resources

of this country and for the marketing of the power so developed "in such a manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with the sound business principles." In the words of Secretary Krug, "this is good business and good government."

It should be emphasized that the investment of the United States in power facilities is repaid in full with interest. Under these circumstances, these facilities should be constructed by the United States whenever justified by demand. They should be constructed in time to meet the demand as it rises in the service area; that is, their construction must be treated as a matter of business and not as a political question. If the potential demand in a particular area justifies the immediate construction of a project, then the authorization and the funds for the construction of that project should be promptly forthcoming as a matter of "good business and good government."

But in order to achieve this statute, it is indispensable that the projects actually constructed be economically sound, for only an economically sound public power program will command the confidence of the public and the Congress to the necessary degree. If in some instances projects having no economic justification are authorized by the Congress and constructed, then inevitably every project will be viewed by the Congress with doubt, and their authorization will be treated as a political question.

We are very proud—and I think justly so—of the part this department has had in the development of the Hoover Dam project and in the distribution, under public ownership, of our share of the power generated. The unquestionable soundness of that project has, we believe, inspired confidence in public power throughout the country.

There are other sound projects awaiting development on the Colorado River. Irrigation projects and hydroelectric projects, singly and in combination. This area—not only Los Angeles but the Southwest generally—is in need of the power which can be developed in the lower Colorado. The industrial development, which alone can assure employment to the millions of people who live in this area, depends upon an adequate supply of electric power at reasonable rates. We are eager to participate, to the extent of our proper share, in any sound hydroelectric development and to participate on such terms as to make the project a sound investment for the United States.

But S. 1175 obviously does not propose such a project. The irrigation scheme which is coupled with the hydroelectric development at Bridge Canyon fails utterly to meet the standards which have governed the construction of reclamation projects for a generation. If, as proposed, this irrigation scheme be regarded as part and parcel of the Bridge Canyon project, then that project is not economically feasible.

Nothing could be better calculated to destroy public confidence in the reclamation program—irrigation as well as public power—than the construction of a project so lacking in every element of economic justification.

In conclusion, another point must be emphasized. Under the proposed project, water is to be diverted to Arizona, while the great bulk of the power revenues must come, if they come at all, from California. As this committee is doubtless well aware, the water proposed so to be diverted to Arizona is claimed in its entirety, and needed, by public agencies of California. These claims are vigorously disputed by Arizona and must some day be settled by agreement or judicial decision. Pending a settlement, it is manifestly unjust and unreasonable to expect the people of southern California to participate in any program of purchasing power to help finance a project to divert to Arizona the water upon which their own future is staked.

The Board of Water and Power Commissioners of the city of Los Angeles has, by resolution, approved this communication and authorized its transmission to you.

For the reasons above stated, we are opposed to S. 1175 and respectfully urge your committee to act adversely upon this bill.

Senator MILLIKIN. Does the letter mean this: That Los Angeles is eager to purchase power from sound hydroelectric developments; that it does not consider this to be a sound one; but, in addition, because of the water controversy on the Colorado River, it would not purchase the power if by doing so, in the viewpoint of the writer of the letter, it would injure California?

Mr. PETERSON. I think it comes down very close to that. I did not have any part in the wording of that letter. The letter must stand on its own feet.

I have a few comments I might add, prompted somewhat by the letter.

There has been no distribution of this statement, and I trust the recorder will take it down.

The department of water and power has the responsibility to provide for the people of Los Angeles both water and power, with an equal responsibility for both. It is our duty to see that within all that is humanly possible these necessities are provided. Lack of either of these necessities will alter the growth of our community.

In viewing this bill S. 1175, we must keep in mind both of our responsibilities. It offers power development which we need, but it takes away our water. Looking at the matter in cold dollars and cents, if our anticipated supply of water from the Colorado River is taken away, at what price do we replace it in southern California? In the Southwest water is limited. No amount of money can pay for what is not there. To accept this bill would be selling our soul—water—for a mess of pottage, the immediate development of power.

It is not reasonable to expect the department to take so short-sighted a view as to support this bill because of power potentialities.

If we measure the Colorado River in terms of the needs of the Southwest, it is not adequate. If we measure it by those needs that we are willing to pay for in order to be supplied, it will be adequate.

By "willing to pay for," I mean through using projects that meet the standards of the reclamation law on the basis of its original interpretation. With this in mind, and with confidence that contracts with the Government would not be jeopardized by future acts of Congress, two and one-half or three million people in the Los Angeles area constructed the metropolitan water district aqueduct to give insurance that water would be available for possibly 8,000,000 people to reside there.

That aqueduct and the Parker power cost \$274,000,000. Gentlemen, that cost is almost exactly equal to \$288,000,000, which represents the value in 1945 of all of the farms, ranches, and buildings on those farms in the entire State of Arizona. To augment that economy in Arizona by not more than one-third, a project is being proposed, costing more than twice the farm values in Arizona, or in which even the irrigation features alone exceed the total farm values in the entire State. For this the Government will get back part of its money in 80 years and lose interest on all of it.

You are, in this bill S. 1175, being asked to do this. I ask that you rather preserve a water supply for 4,000,000 people yet to come to southern California.

Gentlemen, the destinies of these two great communities are in your hands.

That concludes my statement.

Senator MILLIKIN. If the proper authority were to determine that Arizona has the water to support this proposed project, would southern California then buy the electric power from it, assuming the rates were comparable to its other power cost?

Mr. PETERSON. California is a high advocate of settling this problem by proper authority. Whatever the proper authority is that settles it will certainly be abided by, by California.

Our quarrel is only that proper authority has not been appealed to. We would act with our best business judgment on any project that would come forth. Whatever appropriate authority said was the correct thing in this allocation of water, we would of necessity abide by and govern our actions by the economics of the situation.

Senator MILLIKIN. Any questions?

Senator McFARLAND. Mr. Peterson, you talk about the water supply for Los Angeles and the relative benefits to the people there and to the State of Arizona, rather disavowing any rights in the water. Would you take this water away from the State of Arizona if she has the legal right to it?

Mr. PETERSON. Not if you have the legal right to it, and established by any one of the three methods under the compact.

Senator McFARLAND. And you could solve your problem in California by failing to put in cultivation that new land in the Imperial Valley which is owned almost entirely by the Federal Government, could you not?

Mr. PETERSON. I do not know whether a type of move like that is a fair deal to the people who are looking to California. If we were turning back our agriculture, cutting back our industry and disregarding those things which we regard as our normal right, due to the original development of these projects many years ago before any of this storage was involved and which were contracted for at the time, we are not only being traitors to the people of California but to the people who look to California as their future place of industry and living. We cannot countenance that method of getting water.

Senator McFARLAND. On the other hand you cannot countenance the "method of getting water" by passing legislation which would give another State benefits it is lawfully entitled to.

Mr. PETERSON. We do not recognize Arizona is legally entitled to it.

Senator McFARLAND. Your position goes further than water. You use every club you can get hold of to try to keep Arizona from making any development.

Mr. PETERSON. I think our club has been very weak compared with the one Arizona has been using against California.

Senator McFARLAND. If Arizona has been using a strong club against California, it has not been strong enough, because you have developed many, many things.

Mr. PETERSON. Not on the basis you are asking for water.

Senator McFARLAND. On whatever basis, you get the development.

Mr. PETERSON. Yes; and we are paying it back.

Senator McFARLAND. You have not hesitated to ask for developments over there before anything was settled in Congress, have you?

Mr. PETERSON. Have we not always taken the financial responsibility?

Senator MILLIKIN. I do not think this is moving the boat, gentlemen.

Mr. PETERSON. I do not think so either, Mr. Chairman.

Senator McFARLAND. There have been some rather serious charges.

Senator MILLIKIN. The Chair is completely uninfluenced by the charges on either side of the table.

Senator McFARLAND. Then I want to make one point clear, and then I will not burden the chairman with any further cross-examination.

The contracts which you spoke of are only for power, aren't they?

Mr. PETERSON. No.

Senator McFARLAND. From Hoover Dam, I am talking about.

Mr. PETERSON. By contract.

Senator McFARLAND. Pardon me. I shall attempt to rephrase that.

Mr. PETERSON. O. K.

Senator McFARLAND. You spoke here of the development of Bridge Canyon and Glen Canyon and the Coconino Dam, and I believe the Bluff Dam, but you said that contracts similar to those of the Boulder Dam should be entered into.

Mr. PETERSON. That is for power.

Senator McFARLAND. Solely for power?

Mr. PETERSON. I think so.

Senator McFARLAND. And those only repay if the power is available for sale?

Mr. PETERSON. Yes; but I think the department and the southern California power utilities would be willing to enter into firm contracts for that power if it is not burdened with other things that make the cost run up.

Senator McFARLAND. But you would not be willing to contract for the power except on the same terms when, as, and if available.

Mr. PETERSON. I would not want to go that far.

Senator McFARLAND. That is, the way Hoover is?

Mr. PETERSON. Yes, the way Hoover is.

Senator McFARLAND. And you do not have to pay, except for the power delivered to you?

Mr. PETERSON. Yes. It does perform the other irrigation service almost gratis; but, for this reason, that the people had some rights in the river by reason of prior appropriation.

Senator McFARLAND (interposing). I would like for the witness to give us a break-down of his estimate of what it will cost to generate power by steam, or oil fuel, showing the cost of fuel, the cost of supervision and engineering and labor, and cost of water and supplies, and so forth, the cost of maintenance, the cost of fixed charges; I would like to see the basis of his calculation.

Mr. PETERSON. Mr. Chairman obviously I am not equipped to give you that information at this time. If I may be given the question in written form I will be glad to furnish the committee with the information.

Senator MILLIKIN. I suggest it is not necessary to give it in written form. It must be apparent to the witness that the committee would like to have some kind of data on the cost of generating power in this area, of delivering it in the Los Angeles area from power sources other than water.

Mr. PETERSON. Yes.

Senator MILLIKIN. Give us some idea on it, if you wish to, I mean.

Mr. PETERSON. I think the costs of such forms of energy are a pertinent thing for your committee to have.

Senator MILLIKIN. Then would you supply them?

Mr. PETERSON. We will do our best to supply the information that you desire.

(Supplemental statement at conclusion of Mr. Peterson's presentation.)

Senator DOWNEY. Mr. Chairman, I have only one very brief issue I would like to discuss.

Senator MILLIKIN. Very well.

Senator DOWNEY. Mr. Peterson, are there figures showing how long it would take the Bridge Reservoir to silt up completely without more development further up on the river?

Mr. PETERSON. Well, the figures I gave in the report indicated that Bridge with a reservoir capacity of 3,700,000, is receiving silt—

Senator DOWNEY (interposing). Just a conclusion.

Mr. PETERSON. That takes about 50 years.

Senator DOWNEY. At that time do I understand you to mean that the project would be totally valueless for power purposes?

Mr. PETERSON. That probably works out this way. You have a higher-level of silt in the back of the dam. You have the water coming to the power plants below. Obviously the inlet works are destroyed by the silt. You might have to correct something around them. I do not know about that. One difficulty is you are then taking the run of stream water full of silt and trying to run it through turbines. I fear there would be a high degree of wear and there would be difficulties. I think the project would lose practically all of its value. I do not want to say it becomes inoperative. It is a problem for engineers.

Senator DOWNEY. You expect it to be half silted up in 25 years!

Mr. PETERSON. Yes, sir.

Senator DOWNEY. What would be the results in 25 years?

Mr. PETERSON. The result in 25 years is that the storage capacity you are depending on for the integrated control is not there. You only have half of that capacity. Therefore, the water cannot be held to the same extent. The flow becomes more variable and throws more and more duty on Hoover in trying to reregulate and develop power of a secondary nature, of power to firm up Bridge Canyon secondary, and it would not carry that burden or firm-up.

Senator DOWNEY. To the degree that Bridge Canyon Reservoir did silt up there would be a tendency to substantially reduce its value for hydroelectric purposes?

Mr. PETERSON. Yes, sir.

Senator DOWNEY. Do I understand you to say the Bureau of Reclamation in its figures does not give any consideration to that problem?

Mr. PETERSON. I find no mention where that is given consideration. The only thing that seems to be considered is the upper basin depletion.

Senator DOWNEY. As I understand it, that is a difficulty that could be cleared for a long period of years—centuries, perhaps—by the construction of Glen and other reservoirs in the upper basin.

Mr. PETERSON. Yes; of liberal capacity.

Senator DOWNEY. Do I understand it is your opinion Glen Dam should be constructed before Bridge Dam?

Mr. PETERSON. Glen Dam should be constructed either at the same time or closely thereafter, or at least should be guaranteed by the same bill.

Senator DOWNEY. What would be the total cost?

Mr. PETERSON. I cannot tell you from memory. I would refer to the Bureau of Reclamation figures.

Senator DOWNEY. I think that is all, Mr. Chairman, I have.

Senator MILLIKIN. Any other questions?

Senator MCFARLAND. In the question that Senator Downey asked you, were you assuming there would not be other dams built above?

Mr. PETERSON. No, sir; I am not.

Senator DOWNEY. My question assumed that, Senator.

Senator MCFARLAND. It was not clear.

Mr. PETERSON. Let me make this clear, when I say Glen Canyon, I suggest it because you can have a large reservoir there, but the thing I would really like to see is substantial upper basin storage, if you will, so located and so chosen as to assist in the silt problem, and my reason for having something at Glen Canyon is that it represents about the most northern development that can be made on the river from which power could be sent to Los Angeles.

Senator MCFARLAND. You are anxious to get power in Los Angeles?

Mr. PETERSON. Yes; I think so; yes. Mr. Morris' letter indicated that very clearly.

Senator MCFARLAND. But on this particular project, regardless of the difficulties which you talk about, you would have no objection, if the price were such that you did not want it, to its being built and sold other places?

Mr. PETERSON. We have a new problem with this project. If this project goes through the growth of Los Angeles is essentially stopped. When a city does not grow it does not want to contract for power, particularly for a city for which it does not know the future.

Senator MCFARLAND. Will you kindly answer the question?

Mr. PETERSON. The answer is "No" under that condition.

Senator MCFARLAND. In other words, unless you can get the full benefit of the whole dam which is a natural resource in Arizona, entirely within our borders, you do not want it to be built.

Mr. PETERSON. I do not want to see it under circumstances offered in bill S. 1175.

Senator MCFARLAND. Would you oppose it being built even if it did not have the water features? Is that right?

Mr. PETERSON. I will oppose it until the water features of the project are settled by any one of the three methods provided for in the compact, that is interstate agreement, arbitration, or by a Supreme Court decision.

After a settlement is made on that basis and whatever part Bridge Canyon, Glen Canyon, or any place on the river plays in supplying the water coming from that decision, economically, we will be for it and help you.

Senator MCFARLAND. Are you opposed to the project on the basis of water or on the basis of power?

Mr. PETERSON. We are opposing the project because it is an uneconomical development in the manner of its proposal, the way the money is advanced, the way it is repaid, and the way the interest components are handled, the tremendous allocation to silt control. All of those features of the bill, in our mind, are such that Congress should not even pass the bill, and as long as that is the situation, the project is being—

Senator McFARLAND (interposing). I do not believe you are answering my question.

You heard the question I asked Mr. Matthew. If the water situation were removed would you oppose the bill?

Mr. PETERSON. You mean if Arizona got no water from this bill?

Senator McFARLAND. I realize you would be willing to take all the water and the power. I assume that. But I say if that condition were removed.

Mr. PETERSON. I cannot understand the question.

Senator MILLIKIN. Senator McFarland, I think the witness stated if the water problem were settled in one of the three ways he mentioned, then the State of California would be in the power market. Is that correct?

Mr. PETERSON. Yes, sir.

Senator McFARLAND. Would you oppose this particular bill?

Mr. PETERSON. I think that I would oppose this bill inherently for other reasons. This would have nothing to do with Arizona. We would help write a bill to help get what you want, but we believe the economic set-ups in this bill are faulty. Frankly we do not like the bill for that reason.

Senator McFARLAND. Mr. Chairman, I do not want to take the time, but I would like to tell the chairman what I was trying to point out when the chairman interrupted me, and that is this: California, regardless of whether we have the right to the water or not, will, if she can, prevent development of the river for Arizona. She will still get the water and use it, and in 1963 she can claim the definite right to it.

That is the point I was going to make.

Mr. PETERSON. I would like to reply to that. We do not have that type of attitude, to the best of my knowledge, from talking to the people of southern California, frankly and honestly, as you believe in your State we believe in our State. On the contrary we are only pleading that the controversy be settled before we try to draft things of this nature and make Congress make the decision instead of relying on interstate agreement, arbitration or the Supreme Court.

Senator DOWNEY. It is the intention of several Senators from the lower basin States to jointly introduce a bill in a week or two by which we will seek to have the Federal Government give its consent to be made a party to a suit. No attempt has been made to grab this water from Arizona, or say how it may be utilized. We believe she should have it, if she is entitled to it under the law. We believe the legal issue can be settled by the Supreme Court in a year or 18 months, and if Arizona is allotted this water which is in dispute, Congress can go forward from that point.

Senator McFARLAND. If I may make a statement, I believe such action would be solely for the purpose of delaying this legislation; this has been California's tactics all the way through, and if a suit of this nature, as the chairman well knows, were settled in the suggested time, it would be a record. We contend these matters have already been settled as we will show by our rebuttal. I think the evidence will substantiate our charge that California is not acting in good faith when at the last moment she appears and wants to introduce a bill for this purpose after she has received millions of dollars and reaped the benefit from the waters of Colorado River and the power of our own natural resources, which she desires.

(Mr. Peterson subsequently submitted the following letter.)

DEPARTMENT OF WATER AND POWER,
THE CITY OF LOS ANGELES,
July 18, 1947.

Via air mail.

HON. EUGENE D. MILLIKIN,
*Chairman, Irrigation and Reclamation Subcommittee,
Committee on Public Lands, United States Senate,
Washington, D. C.*

MY DEAR SENATOR MILLIKIN: In fulfillment of the request made by Senator Ernest W. McFarland and you at the time of my testifying before your committee on July 1, 1947, on S. 1175, I am sending you a statement showing costs of steam-electric generation for a 360,000-kilowatt plant.

In general, these costs pertain to the plant being constructed presently by this department at Wilmington and known as the harbor steam plant. The costs are typical of a modern, high-efficiency steam plant.

The capital investment shown of \$118 per kilowatt is that which will be obtained for this plant upon its completion for operation in the spring of 1949.

The load factor for which fuel costs are determined is approximately that which would be contemplated for operation in comparison with distant hydro plants with corresponding heavy transmission expense. The proper load factor for such comparisons could not well be taken lower than shown but could easily be taken higher with corresponding reduction in unit costs.

The fuel price used—\$1.32 per barrel—is based on the actual cost of fuel burned for steam-electric generation by the department of water and power for the 11 months ending May 31, 1947. These are as near complete data as can be given for the fiscal year 1946-47. We are not sure the recent quick rise in oil prices reflects a stable or permanent condition. Recent testimony given in oil hearings before a Senate committee—on July 14 and 15—indicated that there is no basic shortage of crude petroleum but that there exist spot shortages of fuel oil due to lack of transportation facilities and lack of steel for pipe lines, etc. It is for this reason that our costs are based on our actual experience during the past year.

You will note that the cost for fuel-generated energy as presented above is 3.99 mills per kilowatt-hour delivered in Los Angeles.

I anticipate that the detail given in this statement will be adequate for the purposes of the committee. We shall be pleased to answer any questions your committee may have with respect to these data.

Very truly yours,

WM. S. PETERSON,
Assistant Chief Electrical Engineer.

Costs of steam-electric generation (360,000-kilowatt plant)

Production:

Capital investment, 360,000 kilowatts at \$118 per kilowatt-----	\$42, 500, 000
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Annual expense:

Interest at 2 percent per year-----	850, 000
Depreciation (sinking fund basis on 32-year composite life factor of .0226 for 2-percent interest)-----	960, 500
Operation and maintenance-----	1, 320, 000
Administration and overhead-----	132, 000

Total-----	3, 262, 500
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Transmission from steam plant to receiving point:

Capital investment:

Two double circuits (2 miles at \$50,000 per mile, double circuit)-----	200, 000
Switching and related equipment at R. P.-----	380, 000

Total-----	580, 000
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Costs of steam-electric generation (360,000-kilowatt plant)—Continued

Transmission from steam plant to receiving point—Continued

Annual expense:	
Interest at 2-percent per year.....	\$11,600
Depreciation (sinking fund basis on 41 year composite life, factor of .016 for 2-percent interest).....	9,300
Operation and maintenance.....	34,000
Administration and overhead.....	3,400
Total.....	58,300
Totals:	
Capital investment:	
Amount.....	43,080,000
Amount per kilowatt of capacity.....	120
Annual expense (exclusive of oil requirements:	
Amount.....	3,320,800
Amount per kilowatt of capacity.....	9.22
Load factor of operation (percent).....	65
Hours of generation per year.....	5,694
Energy generated (full load, in millions of kilowatt-hours).....	2,050
Oil requirements in barrels.....	3,687,000
Total costs (annual):	
Oil at \$1.32 per barrel ¹	4,853,800
Fixed costs.....	3,320,800
Total.....	8,174,600
Cost per kilowatt-hour in mills.....	\$3.99

¹ The actual cost of oil burned for steam-electric generation by the department of water and power for the fiscal year 1946-47 (11 months to May 30, 1947) averaged \$1.32 per barrel.

Senator DOWNEY. Mr. Chairman, may I state that many months ago the Governor of the State of California suggested to the governors of the other States in the lower basin that this matter be arbitrated. That discussion has been taking place over the last few months.

Arizona has refused to arbitrate. Arbitration could take place in less than a year. There are three methods as the witness set up by which this dispute could be settled under the compact.

It is my opinion, and the Chairman is a much abler lawyer than I am, that no decision by Congress on this matter, by which it would authorize a project allocating that amount of water to Arizona, would ever become final until the Supreme Court of the United States has spoken on it or until there has been an arbitration.

I say that, having in mind that we cannot have this suit without consent of Congress or without the consent of the Chief Executive.

Senator McFARLAND. I concede if this legislation is passed and should prove in any way injurious to California the issue may be resolved in court. They do not need any legislation to prevent us from injuring them, but that is not what they want. They could go into court if we were building public works which would in any way harm them.

Senator DOWNEY. There are no further questions of importance or argument.

Senator MILLIKIN. Has California concluded its case?

Senator DOWNEY. Except my statement which will not consume over 30 minutes, and I will try to keep it down to 20.

Senator MILLIKIN. We will meet at 10 o'clock tomorrow morning. (Whereupon, at 12:55 p. m., the subcommittee adjourned until 10 o'clock a. m., Wednesday, July 2, 1947.)

BRIDGE CANYON PROJECT

WEDNESDAY, JULY 2, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10:10 a. m., in room 224, Senate Office Building, Senator Eugene D. Millikin (presiding).

Present: Senators Millikin (presiding), Ecton, and McFarland.

Also present: Senator Sheridan Downey and Congressman Murdock.

Senator MILLIKIN. The committee will be in order.

Senator DOWNEY. Before we proceed, Mr. Chairman, may I say that I have had a telegram from Mr. W. C. Mullendore, president of the Southern California Edison Co., stating his opposition and reasons for his opposition to this bill.

Senator MILLIKIN. Do you mind reading the wire?

Senator DOWNEY. Do you want it read?

Senator MILLIKIN. Yes.

Senator DOWNEY. Yes. Very well [reading]:

As a public utility the Edison Co. distributes electricity to citizens of southern California at costs largely determined by factors beyond the company's control such as taxes, wages, and capital costs of generating and distributing mechanisms. If additional projects are developed on the Colorado which reduce the amount of water and power available from existing projects and which thus increase the average cost of all Colorado River water and power, the customers of our company, present and future citizens of southern California, are injured thereby.

We understand that projects proposed under Senate bills 483 and 1175 would be given much more favorable terms as to amortization and allocation of costs than was granted under the Boulder Canyon project and in these respects and otherwise subsidized at the expense of the taxpayers and the users of present Hoover Dam water and power. Since our customers, both as taxpayers and power users, would be required to pay a large share of the costs of these subsidized projects, we respectfully suggest in their behalf that the proposed projects, if authorized, be given no more favorable terms than those granted to our customers under Boulder Canyon Project Act.

Further, we submit that those institutions and their customers who have underwritten the Boulder Canyon project and thus made it possible should have opportunity on at least equally favorable terms with others to the benefits from further projects on the lower Colorado River.

In view of the foregoing and as agents charged with the responsibility of providing this public service to our customers we could not recommend or support a project which would take away from these customers a portion of water supply which they have already provided for themselves by an underwriting of the Boulder Canyon project.

(The quoted telegram was dated July 2, 1947.)

Senator DOWNEY. Mr. Chairman, if it is agreeable to the chairman, I would request permission to have Mr. Elton and Mr. Dowd sit at my right so that if I should desire to secure certain technical information from them I may do it conveniently.

Senator MILLIKIN. Fine.

Senator DOWNEY. And before beginning my very brief statement here, Mr. Chairman, I wish to say in advance that if I do use the expression "Boulder Dam" it will be entirely inadvertently; I am not recalcitrant at all. I have acquiesced in naming the project in honor of our great President, and I would ask the reporter to change "Boulder Dam" wherever used to "Hoover Dam."

Mr. Chairman, there has been, it seems to me, rather incoherent and fragmentary testimony concerning the comparisons or contrasts between the Hoover Dam project and the proposed central Arizona project as contemplated in the bill pending before the committee. I should like very briefly to run through the comparative features of the two projects, to show a conclusion drawn by myself that the Boulder Canyon project was on an essentially safe, conservative financial basis while the contemplated project, if it were ever accepted, would be one of extraordinary costs and governmental improvidence.

The Hoover Dam, with the power facilities at the dam, cost \$150,000,000. The contemplated project at Bridge Canyon, the dam with its necessary reservoirs at Bluff and Coconino, and the power plant at Bridge Canyon, would presently cost \$250,000,000. It would be admitted by any of the technical witnesses that Bridge Canyon would seriously be impaired because of the accumulation of silt at Bridge if Glen Canyon Dam is not constructed almost contemporaneously therewith.

The construction of Glen would, to a limited extent, help the silt problem all down the river but it should be noted that Lake Mead stores about 32,000,000 acre-feet and Bridge Canyon can only store 10 percent of that amount, or 3,500,000 acre-feet. I think any technical expert would admit that the overwhelming part of the cost of Glen Canyon should be charged to Bridge Canyon, because it would keep it free from silt so that its power functions may continue unimpaired.

In both of these projects, the existing one and the contemplated one, we have long aqueducts, I think each of them approaching the magnitude of 300 miles, one from the Parker Reservoir over to the Phoenix area, and one from the Hoover Dam down to Los Angeles.

First, as to the great Metropolitan Aqueduct, costing, I believe, about \$175,000,000.

Mr. Dowd. \$200,000,000.

Senator DOWNEY. \$200,000,000.

That was constructed wholly by the metropolitan water district. The Government advanced no money for its construction. The metropolitan water district borrowed the money from the RFC, I believe, at an interest rate of 4 percent.

Mr. Dowd. Five percent originally; cut to four later.

Senator DOWNEY. The RFC later disposed of those bonds at a profit to the RFC of \$13,000,000. And, incidentally, those bonds are now selling on a 2-percent basis, so they have become quite a valuable investment.

It is proposed in this bill that the Government construct the aqueduct to Phoenix. That aqueduct will have to be paid for either out of

direct governmental subsidy or out of added cost to the power users—I think almost wholly within the southern California area.

The metropolitan water district has to lift its water 1,600 feet in order to get it over the divide into the Los Angeles area. The Bridge Canyon project calls for a pumping lift of about 1,000 feet from the Parker Dam over into the Phoenix area.

The metropolitan power district, which was allocated 36 percent of the power generated at Hoover Dam for its pumping has constructed all its own transmission lines, constructed the pumping plants along the aqueduct, and is charged the full commercial rate for power. That commercial rate included a 4-percent power interest charge that went into the Treasury of the United States. Under the Adjustment Act of 1940 that was reduced to 3 percent.

Again let me repeat, the metropolitan water district of California pays the full power rate, including as one of the items making it up, a 3-percent interest charge going into the Treasury of the United States.

One-third of the power generated at Bridge will be allocated to the central Arizona irrigation system for pumping purposes. While in one way, as a matter of fictitious bookkeeping, a charge is made for that pumping, it should first be noted that it is only being made at 2.7 mills per kilowatt-hour against a commercial charge of perhaps 4 or 5 mills. The interest differential of 3 percent is included in the charge against the commercial users of Los Angeles for Bridge Canyon power but is not included in the charge for the pumping of this water.

As I say, that is not very important because in no event will the farmers over in Phoenix pay any part of that pumping charge. That will all be paid under the contemplated plan by the power users, I suppose 90 percent of whom will necessarily be found in the southern California area.

I reach that conclusion in this way. The Bureau of Reclamation has told us that they have fixed an operation and maintenance charge on the lands in the Phoenix area to the full extent those lands will bear, that is \$1.50 an acre-foot. The Bureau of Reclamation has likewise told us those operation charges will be \$6.50 an acre—that operation and maintenance charges will be \$6.50 an acre-foot, so they fall by 50 percent to include enough in that figure even to pay the operation and maintenance expense; and in reaching the \$6.50 an acre-foot the Bureau has totally left out any charge for pumping the water to the Phoenix area—any power charge.

If that is added, it would increase that cost per acre-foot by about \$3 for operation and maintenance charges, so that the operation and maintenance charges, including an allowance for the cost of the portion of the power used by Arizona, would run to something over \$9, I am informed—\$9.50.

So, in reality, the Arizona project pays not 1 cent for any pumping charge in its project, while, as I have said, the metropolitan pays the full commercial rate including an allowance of 3 percent on power capitalization that goes into the Treasury of the United States.

When the Hoover Dam power was allocated, 36 percent was set over to the metropolitan, 36 percent was set over to Arizona and Nevada, and the balance was allocated to the city of Los Angeles, to the Southern California Edison Co., some small allotments to smaller cities in southern California and private contractees. While 36 percent was set

over to Arizona and Nevada, the Government compelled these governmental agencies in California and the private corporations to guarantee that if and whenever Arizona and Nevada do not want that 36 percent, the California agencies and corporations must pay for it even though they are unable to use it.

More than that, Mr. Chairman, both Arizona and Nevada are entitled to move in and out on that power. The guaranty is by California that if they can't use it, they have to pay for it. To the extent Arizona and Nevada do not want to use it, they have to pay for it. And I am informed that Arizona so far has never used one particle of that 18 percent that was set over to it.

In the contracts that were made in California for power and for water from the Hoover Dam, the rate was fixed at an amount that would pay \$600,000 a year for a period of 50 years to Arizona and Nevada, to be divided equally, virtually for rent of the Hoover Dam site. Another \$500,000 a year has to be paid in that same way, for a period of 50 years, for exploration expenses in the upper basin. And California makes no objection to any of those items.

Senator MILLIKIN. That is the water investigation?

Senator DOWNEY. Yes, sir.

And, also, I may say that money can be used for construction throughout the basin.

Under this proposed bill and under the proposed plan presented here by the Bureau of Reclamation, the Government assumes an amount of the magnitude of \$75,000,000 for its share of capital cost, allocated against flood control, navigation, silt control, and recreation. No such allowance was made in our project—no such allowance.

It is true that an item of \$25,000,000 of the cost of the Hoover Dam was allocated for flood control and the repayment of that item was delayed for the period of 50 years, but we ultimately have to pay it. Consequently, over a long period of time, the Government assumes no obligations on those items, while they assume a substantial part of the total cost of bridge by that method.

In the figures used by the Bureau of Reclamation no allowance is made for any interest on the capital cost of the project under contemplation during the construction period. The California interests were charged interest on Hoover Dam during the construction period of 5 years. That was added to the principal and we have been paying compound interest on that, through our various payments from the State of California on the project.

As far as I know, this project, in relation to its contemplated cost, is absolutely unique in anything that I have ever heard discussed. As all of the evidence shows here, the Bureau of Reclamation says there will be 636,000 acre-feet of water delivered to the Phoenix area over a 50-year period—an average of that amount. The costs allocated to irrigation are something over \$300,000,000, or a total capitalization charge per acre-foot of \$500. On any acre of land that will be fully irrigated with 4 acre-feet of this water, and there will be substantial areas of that kind, the total cost will be \$2,000 an acre. The project would bail out land that has gone into irrigation almost wholly in the last 5 years, that is worth 100, 150, 200, 250, 300, or 400 dollars an acre. Almost all of it is used for what we term general farming purposes.

Mr. Chairman, I cannot conceive how any responsible body of this Government could even consider bailing out an area of insufficient water, that is worth two or three hundred dollars an acre on an average, at a cost of \$2,000 an acre. All over the United States there are general farming lands of approximately equal value whose fertility has been exhausted, that have been subjected to erosion or that are too rough to cultivate. All over the United States there are hundreds of millions of acres of that kind that could be made just as productive as this Phoenix land at the expenditure of two or three or four hundred dollars an acre. And how we can justify bailing out general farming land 300 miles from the Colorado River at this titanic cost, I am unable to say.

Contrasting with that, Mr. Chairman, let me say that the cost per acre-foot down in the Imperial Valley is only \$10 an acre-foot. I might digress for a moment to say that we considered our Central Valley one of the most expensive irrigation projects that should be countenanced. The cost for Central Valley was only \$100 an acre-foot, the Imperial Valley cost is \$10 an acre-foot, and it is \$500 here. And I might say that in our Central Valley we have a far greater percentage of lands in high-priced specialty crops and a much smaller percentage in general farming land of less valuable nature.

Mr. Chairman, these lands in this area in Arizona that it is sought to protect have principally come into irrigation in the last 5 years. I want now to contrast that with the situation with which we are dealing in California.

Our first water was appropriated there on the Colorado River, I think, in the Palo Verde district in 1877 and the water put to beneficial use. Appropriations followed that. The total amount of water allocated to California for irrigation purposes is all under valid existing water rights, most of which had ripened into actual use dating back prior to 1900.

The chairman will recall perhaps something of the titanic struggle of the Southern Pacific Co. in the Imperial Valley district in California against the flood waters of the Colorado River when they broke loose in the first decade after 1900 and formed the Salton Sea. That history is a spectacular and dramatic part of the utilization of this water. California is entitled, in acre-feet, according to priorities that we believe are supported under the Boulder Canyon Project Act and certainly are supported in California, to first right water in the amount of 3,850,000 acre-feet. Of that 3,850,000 acre-feet, 3,000,000 acre-feet are now being utilized and have been utilized for more or less than a half century. There are 850,000 acre-feet of that first irrigation water right that are not yet being utilized but, Mr. Chairman, the All-American Canal was built in good faith by the people of the Imperial irrigation district of sufficient capacity to take care of that water. Hoover Dam, as far as the California water users are concerned, did nothing more than regulate and store and make more usable the water to which they were entitled. As I have said, before Hoover Dam was ever in existence, we were using 3,000,000 acre-feet. We had full rights to more than that amount, which rest on filings on the river that had been diligently followed up.

I, of course, understand Senator McFarland's viewpoint, and I suppose if I were the Senator from Arizona I would perhaps be saying the same thing. He continuously stresses that California watersheds do not turn any water into the Colorado River. True, we do not. But, Mr. Chairman, we cannot make specific rules; we cannot make fish and flesh out of the same thing. Under a century of development of irrigation law in the United States, we have developed the theory of prior appropriation and application to beneficial use within a reasonable time thereafter. That is the inexorable law on which we bottom our rights here.

As I have already said, we were using this lower Colorado River water back in 1877. The law of appropriative right applies between different States as well as within a State, and the State of Colorado itself has been on both sides of that argument. But the Supreme Court of the United States in the Wyoming-Colorado case and the Colorado-Kansas case, and other cases, has said that that doctrine of prior appropriation applies between States. So while the able Senator from Arizona may regret the law it is a well-formulated law.

Mr. Chairman, in addition to these irrigation rights I refer to which went back 75 years, there were new rights created in California, and it was only because those new rights were created that the Hoover Dam was ever built. I don't think it would be built to this day unless power could pay for Hoover Dam. There was no prospect of building it; nobody would even consider it. California had a dreadful struggle in Congress and against Arizona to get it built under any conditions, and it was only because of the firm guaranties of California interests made possible by power use that we were able to build that great project, and it was only because we needed the power there that we could do it. And we wouldn't need the power if we couldn't have sufficient domestic water supply to pursue a course of development.

Consequently, there was under the Boulder Canyon Project Act a sufficient amount of water guaranteed California, as we believe—I don't want to enter into any argument about the legal rights, but we so believe—to take care of these water rights of the metropolitan district, 1,100,000 acre-feet, and 112,000 to the city of San Diego.

Mr. Chairman, those rights are subordinate to our irrigation rights. We are here struggling with Arizona, unhappily and unfortunately—I wish we didn't have to—over the right to use a million acre-feet of water.

When I was a young man in business I got myself in many difficulties by being too optimistic. Perhaps I have become too pessimistic in my view of the operations of nature and the fallibility of man's judgment. I am astounded when I see Bureau of Reclamation engineers, having repeatedly made mistakes on the flow of the Colorado River in the past, having markedly departed from their figures even in the thirties, now attempting to allocate this river with an average flow of somewhere around 18,000,000 acre-feet down to a residue of 200,000 acre-feet, about 1 percent of the total flow, of the river, an amount that no engineer could even measure, if it were flowing in the stream. That is all of the amount of water that will physically be available under the Bureau of Reclamation figures in a period of low runoff if this million acre-feet is allocated.

That brings me up to this point. I do know that we in California have about 850,000 acre-feet of water set aside for the irrigation of about 250,000 acres and that the cost to put that water on the land will only be 40 or 50 dollars an acre. I do know that we have already constructed the All-American Canal to distribute that water over those lands. Those lands are public lands. Those lands are lands in which veterans have the prior right of settlement. That was one of the arguments that carried this bill through, that 250,000 acres of public land would receive the water through the All-American Canal, with preferential rights to the veterans.

The point I am endeavoring to stress now is that, in my opinion, the southern California area is on very dubious ground. Right now if it should happen that we are now in a more extended drought than we have anticipated, that million acre-feet of water could easily be wiped out. We are in an extended drought period. Let that continue a few years longer and this million acre-feet of water about which we are quarreling will not be present.

Mr. Chairman, I have no disposition or desire to resurrect any quarrels that are past and gone. What I have to say is not said for that purpose, but the chairman and the distinguished Senator from Arizona and I, all bear in mind the language and the possible effect of the Mexican Treaty.

When these contracts were made with California back in the thirties, it was then believed that the flow of the Colorado River that we do rely on was a million acre-feet more than engineers now believe. It was believed and assumed, Mr. Chairman, that the final allocation to Mexico would be limited to her then beneficial use of 750,000 acre-feet. Now we have increased that by 750,000 acre-feet. In my opinion, common prudence would require that we contemplate the possibility of the loss, by less precipitation, of another million acre-feet.

I am firmly convinced of this, that the treaty left the door open for Mexico—not certainly, but perhaps—to claim another half million or a million acre-feet. Why do I say that? There is no description in the treaty of the quality of water that Mexico is obligated to take. As the chairman will recall, the State Department very categorically, dogmatically and solemnly assured us that they had memoranda from the Mexican Government by which the Mexican Government had agreed to take from us water however saline it might be, even though it were saline to the point of being unusable. One of the fights I made on the Senate floor was to clarify that point. The Foreign Relations Committee accepted the treaty as it was and it went through the Senate upon the solemn assurances of the State Department. We put in no qualification as to the kind of water Mexico would take, leaving that question open for a future court of international arbitration, as to which we would be obligated whenever the issue was presented between Mexico and the United States.

When the Mexican Senate considered this question, while it did not, like the United States, attach any reservations to the treaty, in the committee discussions, of which I have copies, that committee took the position that Mexico was entitled to a high quality of water and at least to the best quality of water that would be used on the lower Colorado River.

As the chairman will recall, the salinity content of Lake Mead is about 500 parts per million, at Imperial Dam presently about 725.

It is believed to be a strong possibility that looking ahead 20 or 30 years the salinity in the water supplied to Mexico may be 1,500, 2,000, 2,500 parts per million. If that is so, it will require maybe 50 percent more water to give the same irrigation value as water with lesser saline content.

Whether that question will ever arise, whether Mexico would be successful in the interpretation I have suggested, I don't know, but certainly I would say that common prudence might suggest that we might lose another 500,000 or million feet to Mexico. This could happen if the water becomes so saline as to justify an international court in saying that the salinity must be balanced by an additional flow of water.

I say that I am alarmed to see the United States going into great projects, upon which populations and civilizations will be dependent for irrigation and for domestic water supply, on the basis of allocating out 18,000,000 acre-feet, within 1½ percent of the amount that is going to be physically present. I have felt this, Mr. Chairman, that California did have a certain amount of fat that she might be able to cut out and utilize, in the event the flow of the river should fall off another million acre-feet, or Mexico should claim and receive additional water, or something else that is now totally unforeseeable to any of us might happen.

I would like to say this, Mr. Chairman, I do not want to bind California—the subject is complicated and technical and I am not able even to discuss it intelligently—but I think it is the belief of most of the California lawyers that if another million acre-feet of water should be lost in the Colorado River, eight or nine hundred thousand acre-feet of that loss would fall on the lower basin States and not the upper basin States. I don't want that to be a damaging admission against California but I think it is the belief of our people that half a million acre-feet might be lost and prorated against all land without too much difficulty, but the difficulty is we have priority between the upper basin and the lower basin, we have priority between the States, and then in California we have priority solemnly established and existing by operation of law.

If we should lose this million acre-feet of water to Arizona which is in contest, that totally wipes out all of our future increase in domestic water supply and some that is being presently used both for the metropolitan water district of southern California and for San Diego.

The distinguished Senator from Arizona has suggested that we have 800,000 acre-feet of water we are not presently using. There would exist in the metropolitan water district the right to condemn irrigation water for domestic purposes but I think, Mr. Chairman, the metropolitan water district would find itself in this pretty dreadful position, under a rule in California that a municipal agency does not have the right to condemn water outside its boundaries if there is water of a similar class within its own boundaries. By that I mean the metropolitan water district could not legally condemn water over in the Imperial Valley without first condemning its own agricultural water supply. The lands in Los Angeles County are the most valuable agricultural lands in the world. Los Angeles County is the first county in the United States in agricultural production. Our average acreage in citrus fruits is 10 acres. We have tremendous-

ly valuable truck farms—avocados, walnuts, and other specialty crops of very great value.

Due to the huge concentration of population there, those lands are of great value—I suppose you could easily say two to three thousand dollars per acre for agricultural purposes. To aggravate that condition, we have a rainfall in southern California of 15 or 20 inches. Down near the coast it may be substantially more than that.

Senator MILLIKIN. Senator, don't you want to take that off the record?

Senator DOWNEY. No, sir; maybe in the next hearing but not in this one.

Due to that fact, and the fact that we carefully conserve every drop—

Senator MILLIKIN. Off the record.

Senator DOWNEY. Due to that fact and the fact that we concrete line our ditches and carefully guard every drop of water.

Senator MILLIKIN. Let me get the fact in the record. What is your rainfall in Los Angeles County?

Senator DOWNEY. Well, I think over the whole area it probably runs from 15 to 20 inches, a small part of it being much higher.

Senator MILLIKIN. Inches?

Senator DOWNEY. Inches. Down on the coast and up in the—

Senator MILLIKIN. Is that a fairly sustainable average, or does it fluctuate?

Senator DOWNEY. It fluctuates. We secure sufficient precipitation from heaven that we can use much less water in irrigation than in the Imperial Valley where there is only an average of 3 or 4 inches of rainfall a year. They never count on it and they don't like to see any rain because it interferes with their pattern of irrigation. Over closer to the coast the rainfall is sufficient to very much reduce the duty per acre of water so that we probably only use there on an average—of course, it varies greatly—maybe an acre-foot or an acre-foot and a half per acre. That means that if we would have to condemn in the metropolitan water district, say, a million acre-feet of water, it would take almost all of the local agricultural lands. Let me put it this way: We would have to abandon back to the desert almost all of the agricultural lands of Los Angeles County.

Now, we could strike a bargain with the Imperial district. It couldn't be in pseudo condemnation because we wouldn't have the legal right to go over there. What price Imperial Valley would want for its water, I don't know, but the point I am trying to make is—and I don't want anybody from the Imperial Valley to shoot me—that in the event of a falling off of the Colorado River, we have a certain amount of fat there. It would be a tremendous cost, a tremendous worry, but we might be able to work out. But if this million feet of water upon which we have relied is taken away from us, of course, that is gone, too.

Mr. Chairman, in addition to contrasting the Hoover Dam project with this proposed project, the Senator from Arizona has very reasonably made the argument that we are pursuing certain of the governmental methods up in the Central Valley that he wants to pursue here. In the Central Valley project there is an allocation of about

\$75,000,000 for navigation, flood control, salinity repulsion, and recreation. The total cost of the Central Valley project as presently authorized is about \$400,000,000. About \$200,000,000 of that is allocated against irrigation as against \$300,000,000 in the central Arizona project.

Senator MCFARLAND. According to my figures it is \$221,055,600.

Senator DOWNEY. Allocated against irrigation?

Senator MCFARLAND. Yes.

Senator DOWNEY. Well, I have been using the figure of \$220,000,000 but I would be very happy to use this figure.

Senator MCFARLAND. I thought you said \$200,000,000.

Senator DOWNEY. What do you say it is?

Senator MCFARLAND. \$221,055,600.

Senator DOWNEY. Well, I am willing to accept that figure.

Senator MCFARLAND. That is all right. I just wanted to know. There is no point.

Senator DOWNEY. The amount allocated against the Central Arizona project for irrigation purposes is \$300,000,000.

Let us consider this a moment. At a cost of \$221,000,000 as allocated in the Central Valley project, we conserve about 2,100,000 acre-feet of water. That is the amount that we will be using as soon as this project is complete. At a cost of \$221,000,000, we will have within the next year or two 2,100,000 acre-feet, which is three times the amount of water that would be available to central Arizona, as a result of the proposed investment by the Government of \$300,000,000—three times as much. Now, it is true that Arizona has a benefit beyond that of about 300,000 acre-feet to maintain the salt balance in the Gila River.

As I understand Mr. Larson's statement, and he will correct me if I am wrong, during the first 50 years of the project there will be something in the order of between 900,000 or a million acre-feet of water come down to central Arizona. Three hundred and seventy-six thousand acre-feet will never be delivered at the farmers' canal side but will seep down into the Gila and will there assist in maintaining the salt balance, taking the salt out. After pumping it, they will need to use that much water to maintain the salt balance.

The Bureau has stated that it sees no way of charging the farmers for that; that in fixing the charge of \$4.50 an acre-foot it does not include any charge for it. In other words, the farmers are not charged for the extra 376,000 acre-feet of water.

We have almost identically the same condition in the Sacramento Valley. We there will utilize probably double that amount of water, in the neighborhood of 600,000 acre-feet, to repulse the salt tides that come up through the Golden Gate to our delta lands. There are three or four hundred thousand acres of very fertile and very valuable truck gardens and other lands in the delta region. The water around them that they have been using for irrigation, pumped out of the streams such as the Sacramento and San Joaquin, have been so heavily impregnated with salt that the lands are being injured.

Senator MILLIKIN. Just by way of a complete aside, how far are the tidal effects felt on your California rivers there?

Senator DOWNEY. We have felt them to a certain degree as far as the Sacramento is concerned for about a hundred miles. But this particular area in which the salt infestation became so serious was about half that distance. It was very serious. This three or four

hundred thousand acres of land is very important, fertile land which was being ruined by salt encroachment. A sufficient amount of water has been allocated out of Shasta to have a fresh flow going down the river in times of low run-off to repulse the salt tides.

One of the things I have been pointing out, and the Senator is probably cringing as he hears me talk about it, is that there is no way of compelling the farmers to pay for that water, just as there is no practicable way of forcing the farmers in the Phoenix area to pay for it. The farmers could afford to do so. It is a very wealthy district. One reason it was never worked out, is that the Bureau is insisting upon applying in the Central Valley the 160-acre limitation. It admits that it cannot be done in the delta region and neither, under the way the Bureau has pursued, can that very wealthy owner of land be made to pay any expense for this salt-repulsion water. So we allocate to salt balance about double the amount of water that is allocated in the Phoenix area, with neither the lands in the Phoenix area nor in the Central Valley being compelled to pay for it.

Mr. Dowd states to me that in figuring the allocation against irrigation in the Central Valley, the item for salt repulsion is calculated as one of the items. That is undoubtedly true, but at least the farmers who get the benefit of it don't have to pay for it.

Now, consequently, we have in Central Valley about 2,100,000 acre-feet, underground and surface, that will be available for use. This comes to a cost of about \$100 an acre-foot, as against \$500, or five times that amount, in the Phoenix area.

That isn't all the story. Only 15 percent of the total power generated at Shasta Dam in the Central Valley has to be set aside for pumping project water, as against one-third that has to be used in the Phoenix area.

Now we come to something that is even more startling. I was very glad to see that the Bureau officials, in fixing the ability of the farmers of the Central Valley to pay their water charges, fixed them on a fair, conservative basis. They didn't consider all together your high-priced and low-priced lands; they didn't consider any era of great agricultural prosperity like 1939 to 1944. They took other figures tending to evaluate how much not the best lands but the poorest lands could pay, and over a long period of time. And they reached the conclusion that in the Central Valley, one of the most wealthy farm economies in the United States, we could only afford to pay a weighted average for both ground water and the surface water around \$2.75 an acre-foot. I think I am safe in saying that the Bureau of Reclamation properly fixed the ability to pay of the farmers of the Central Valley at one-half of what they are here fixed. Of course, the reason for the amount fixed for central Arizona is apparent, because they took a period of years that I wouldn't think that any expert could be so improvident as to take, and that is the period of 1939 to 1944.

Let us see one conclusion that comes from this. We charge only one-half the rate in the Central Valley that is contemplated in the Phoenix area but our charge will not only pay all the operation and maintenance but will likewise provide an amortized fund for a substantial part of the irrigation cost. It, of course, depends upon the length of years used to figure it out but something from an average of fifty to a hundred million dollars could be used out of our annual water charges to amortize out our capital charge against agriculture.

On the other hand, as I have already said, and I know the chairman does not like to have repetition, because his penetrating mind takes these matters in rapidly, the Phoenix charge would never pay any capital costs, because it is only approximately one-half of an amount sufficient to pay the operation and maintenance charges.

Mr. Chairman, while I am on that point I think that any of the farmers who are here from Phoenix area who went through the rather desperate days of the thirties, when nearly all their municipal agencies went into municipal bankruptcy, probably know that in a period of 5, 10, 15, or 20 years the farmers of Phoenix will never be able to pay that water charge. I don't believe it can be done on general farming. On citrus lands it becomes a comparatively small item one way or the other. They may go broke on citrus lands in Arizona as well as in California and Florida; but the item of water is a comparatively small item. In general farming, of course, a charge of 20 or 30 dollars an acre may be the margin between disaster and continuing to own your farm. I am confident that if this rate is fixed, with conditions in the Phoenix area the same as what unhappily may happen to all the farming portions of the United States, the United States would have to assume another 100 or 150 million dollars to bail this project out.

Mr. Chairman, I only want to develop one or two points more. The Southwest, including Colorado, Utah, New Mexico, and Arizona, is one of the grandest regions in the world. Arizona is a State of beauty and interest and unique wonders. For some reason all of us, and I know it applies to my own city of Los Angeles, I regret to say, have a desire to get bigger. I don't know why we in California do. It means crime, blackmailing, and race suicide, alcoholism, insanity. All those things follow the concentration of population. And why we aren't content to live as people live where they are happy, in small towns, without the struggle to get bigger, I don't know. But, of course, that is a problem for Arizona to decide. Her people evidently want to have the business and the population that will flow from this greater acreage.

Of course we will continue to object to this bill until the Supreme Court of the United States or arbitration or interstate compact settles the issue of water right between California and Arizona. I personally, as a Senator, would continue, liberal as my ideas are in financing to object strongly to any project designed to bail out \$200 land by an expenditure of \$2,000 by the Federal Government. I think we could do nothing to bring the whole reclamation system into greater disrepute than to throw open the Treasury of the United States on a proposition to bail Arizona lands out, at a tremendous cost, several times the values involved.

In relation to that, I want to tell this incident. I was at least partially instrumental in selling President Roosevelt and the Navy on a plan to help out the city of San Diego by the construction of the aqueduct from the metropolitan system over to San Diego that I spoke about the other day, to carry 112,000 acre-feet of water to San Diego.

My justification was this: San Diego in 1940—the county—had a population of about a quarter of a million. It had ample stored water, that had cost it very little, with which it could survive for two or three decades. The war came on and the population of San Diego County about doubled. Our military installations came in there, and

war industries. The governmental agencies took about half of that water, and the cheap water that San Diego had accumulated was used up during the war years, leaving her with reservoirs that were almost down to the mud.

We saw that a great disaster might impend there if we didn't get in this Colorado River water. Under the instructions of the President a commission was formed of the heads of the Army, Navy, Bureau of Reclamation, and Federal Public Works Administration, and a plan was worked out under which the Navy agreed to construct that aqueduct. It was contemplated to cost \$15,000,000. And San Diego made firm commitments to pay back that \$15,000,000 at \$500,000 a year, which would take 30 years, without any interest charge. That remission of interest was fixed on the theory that the governmental agencies would have one-half of the water that would come in.

The Navy apparently failed to report to the Naval Committees of the House and Senate the nature of this contract. The contract was investigated by the Senate Committee To Investigate Executive Expenditures. The personnel on that committee is startlingly different from the personnel on this committee, being composed almost wholly of southern and Atlantic and middle western Senators. I might say that Senator Knowland and I had a very serious time maintaining that contract. I saw there the attitude of Senators when their attention is aroused to this question of interest-free money on reclamation projects and interest-free money on power.

It is my own opinion that we will give a serious blow to reclamation development in the West if we attempt to get interest-free money for our power investment. I am opposed to it.

It is true that the Bureau of Reclamation is attempting to inaugurate that sort of program up in the Central Valley by which we undoubtedly benefit. They never consulted with me about it. Apparently, lawyers differ as to whether the Bureau of Reclamation has the right to make that kind of an allocation or not. At least, we have all assumed up to the present time that whenever there was a power investment and the Government advanced the money, the Government was entitled to receive 3-percent interest on the outstanding balances.

What I would favor in the Central Valley would be the reduction, by a general law that ought to be applicable to all States of the interest rate from 3 to 2 percent and as liberal a period of amortization as could be worked out.

In this bill the interest isn't reduced to 2 percent; it is wholly wiped out. The whole benefit of it is given to irrigation, and an extraordinary long period of amortization is set up on the irrigation end of the project.

I am firmly of this opinion, Mr. Chairman, that that would not be fair to say of the State and it would result in controversy and chaos among the reclamation States that would be most unhappy, if we should endeavor to give such benefits to certain projects, not to all projects and to all States.

I do think that the Rockwell bill, that I think has had the interest and attention of the Chairman—I do not know his attitude on it—is the right legislation. I believe it has been favorably reported by the subcommittee of the Public Lands Committee of the House.

I want to close now with this one remark: It seems to me that the

expenditure by the Federal Government at the rate of \$500 an acre-foot for partial irrigation, or \$2,000 an acre for full irrigation, to bail out land worth \$250 an acre cannot be justified, especially when you add to that the fact that no one can possibly know in advance how the complicated controversies relating to the law of the Colorado River will be settled before the Supreme Court speaks.

It seems to me there is no justification for this kind of bill, and I urge the subcommittee for the present to entirely defer it until we have further data and until the Supreme Court has spoken or, if the committee acts now, I urge it to act adversely.

Mr. Chairman, I should like to have placed in the record certain figures here in a letter from the Acting Secretary of the Interior transmitting a report to Congress dated February 24, 1947.

Senator McFarland, this does show that my figure is correct, that the total reimbursable cost of irrigation in Central Valley project, including the salinity regulation, is \$199,661,100.

Senator McFARLAND. There is some cost that wasn't reimbursable, though, was there not?

Senator DOWNEY. No.

Senator MILLIKIN. Have you marked the part of the table that you wish to go in, Senator Downey?

Senator DOWNEY. I will do that and give it to the reporter. I still may be in error, but I think that does substantiate my statement. (The matter referred to is as follows:)

37. It is found that the proper allocation of the estimated capital costs of the project discussed in this report, and the amount of such costs which can probably be repaid by net revenues, by the year 2009, is as set forth below:

	Cost allocation	Probable repayment
Nonreimbursable:		
Navigation.....	\$18,083,000	
Flood control.....	31,444,000	
Total nonreimbursable.....	49,527,000	
Reimbursable:		
Irrigation, including salinity repulsion.....	199,661,100	\$55,470,875
Contra Costa distribution system.....	3,074,600	3,074,600
Municipal and industrial water.....	9,091,800	29,067,932
Commercial power.....	104,143,600	227,757,693
Total reimbursable.....	315,971,100	315,971,100
Canal capacity for future use.....	18,815,900	¹ 18,815,900
Total reimbursable cost of project.....	334,787,000	334,787,000
Total cost of project.....	384,314,000	

¹ To be repaid by water users using this capacity when additional storage is provided; otherwise by surplus revenues from other features by the year 2012.

Senator MILLIKIN. Thank you, Senator.

You have not closed your case, Senator Downey?

Senator DOWNEY. We have closed our case except—we will try not even to make any rebuttal. We have not anywhere near consumed our time.

Senator McFARLAND. Yes, according to the secretary, you have.

Senator DOWNEY. Very well.

Senator McFARLAND. That is all right. I am not trying to cut them off, Mr. Chairman.

Senator MILLIKIN. If there is anything more on either side it can be covered by supplemental statements that will be put in the record.

Senator MCFARLAND. Mr. Chairman, we will try to confine our rebuttal entirely to rebutting evidence which has been introduced here by the opposition to this bill. We will not rehash the evidence.

Regarding these power contracts which have been referred to here many times, the chairman is familiar with those as are the other members of the committee; they know that all that California has done is contract to pay for a certain amount of power, which is a very profitable contract for the State of California. This is very well demonstrated by the fact that they are now seeking and wanting other contracts for Glen Canyon Dam, and other dams on our project with contracts similar to that of Boulder Canyon, according to the testimony presented yesterday. So that proposition answers itself; they fared very, very well in their contracts.

And that is the only guaranty that they give, to pay for the power that is delivered to them. They would be under no responsibility if the dam would go out for any unknown reason and they would not have to pay a dime for it.

Now, I wish at this time to place in the record, Mr. Chairman, some data prepared by the Bureau of Reclamation, a statement on power assistance to repayment of irrigation investments. I will not take the time to read it, but I would like to have it appear at this place. I will give copies to the chairman and the members of the committee and to Senator Downey a little bit later.

(The statement of the Bureau of Reclamation on Power Assistance to Repayment of Irrigation Investments follows:)

The estimated total cost of the Columbia Basin project, Washington, is \$581,021,000, of which \$425,878,608 has been allocated as being for the benefit of irrigation. The portion of the irrigation cost to be repaid by the application of power revenues amounts to \$287,913,608, leaving \$137,965,000 to be repaid by the water users. Power revenues will also repay \$118,622,815 which has been allocated as the construction cost of power features of the project.

The Colorado-Big Thompson project will be paid for largely from power revenues. On the basis of an estimated total construction cost of \$128,110,120, a division is made of \$79,356,521 for irrigation and \$48,753,599 for power features. Under present repayment contract arrangements, the water users will be required to pay \$25,000,000 and the balance of \$54,356,521 for irrigation, in addition to the portion allocated to power, will be repaid by power revenues.

On the Central Valley project, California, the estimated total construction cost is \$384,314,000 and \$221,551,600 of this is allocated to irrigation. A total of \$108,822,876 of the irrigation portion will be repaid from power revenues, in addition to the \$104,143,600 which has been allocated for power features.

The total cost of Hoover Dam and power plant, Boulder Canyon project, Arizona-Nevada, is \$152,000,000. Of this amount \$127,000,000 will be repaid by power revenues, and \$25,000,000 now allocated for flood control will become reimbursable after other costs have been paid. The water users of the Imperial, Yuma, and Coachella Valleys, who are benefited by storage of water in Lake Mead, are not required to pay any part of the cost of Hoover Dam and appurtenant works.

The total cost of the Kendrick project, Wyoming, which is allocable for repayment by the project, is \$20,383,000. The irrigation cost of \$13,458,000 will be repaid to the extent of \$11,858,000 by power revenues, leaving \$1,600,000 to be repaid by the water users. An additional \$6,925,000 allocated to power features will, of course, be repaid also from power revenues.

Attached is a tabulated summary of the tentative allocation of costs for Bureau power projects, which includes the material outlined above.

Summary—tentative allocation of costs for Bureau of Reclamation power projects

Project	Estimated total cost of project	Irrigation	Power	Navigation	Flood control	Municipal water	Other	Portion of irrigation investment repaid by power
1. Boise-Anderson Ranch.....	26,738,818	15,722,878	3,296,480	-----	10,769,450	-----	-----	9,916,396
2. Columbia Basin (Coulee).....	1,581,021,000	425,878,698	118,622,815	-----	1,000,000	-----	\$ 35,519,577	287,913,608
3. Minidoka.....	34,486,901	32,901,056	1,585,845	-----	-----	-----	-----	489,329
4. Yakima.....	47,991,622	47,817,170	174,452	-----	-----	-----	-----	622,391
5. Central Valley.....	384,314,000	221,551,600	104,143,600	18,083,000	31,444,000	9,091,800	-----	108,822,876
6. Boulder Canyon.....	152,000,000	-----	127,000,000	-----	\$ 25,000,000	-----	-----	-----
7. (a) Parker.....	23,883,562	3,429,428	7,981,572	-----	-----	-----	\$ 12,472,562	\$ 3,429,428
(b) Davis.....	76,661,900	-----	76,661,900	-----	-----	-----	-----	-----
8. Yuma.....	10,351,873	9,929,497	422,376	-----	-----	-----	-----	131,646
9. Grand Valley.....	5,980,211	5,769,711	210,500	-----	-----	-----	-----	609,113
10. Rio Grande.....	23,613,458	13,052,229	8,062,989	-----	1,498,240	-----	\$ 1,000,000	2,513,365
11. Riverton.....	11,658,000	11,277,713	380,287	-----	-----	-----	-----	269,905
12. Shoshone and Heart Mountain.....	20,953,700	17,756,837	3,196,863	-----	-----	-----	-----	1,254,800
13. Fort Peck.....	\$ 23,776,000	12,125,760	11,650,240	-----	-----	-----	-----	\$ 12,125,760
14. Colorado-Big Thompson.....	128,110,120	79,356,521	48,753,599	-----	-----	-----	-----	54,356,521
15. Kendrick.....	720,383,000	13,458,000	6,925,000	-----	-----	-----	-----	11,858,000
16. Kortes.....	13,411,700	-----	13,411,700	-----	-----	-----	-----	-----
17. North Platte.....	22,068,915	19,849,046	2,219,869	-----	-----	-----	-----	3,317,432
Total.....	1,610,454,780	929,876,054	534,700,097	18,083,000	89,711,690	9,091,800	48,992,139	497,630,630
Total cost, nonreimbursable.....		\$63,794,690		Total cost to be repaid by power:				
Total cost to be repaid without interest.....		1,002,868,183		With interest.....				
Total cost to be repaid with interest.....		543,791,897		Without interest.....				
Total project costs.....		1,610,454,780		Total.....				

1 Installation and removal costs for Shasta units amounting to \$1,818,000 will be paid from power revenues as operation and maintenance during fiscal years 1944, 1945, and 1946.
 2 Reimbursable, allocated to downstream river regulation.
 3 Reimbursable after other costs have been paid.
 4 Funds furnished by the metropolitan water district.
 5 Nonreimbursable, appropriated to State Department by 59th Cong.
 6 Under this allocation Federal Power Commission has determined that the entire cost of the power plant shall be allocated to power development and reserve the right to allocate the cost of facilities for power development and other facilities.
 7 Total cost \$21,445,000. \$1,692,700 allocated to downstream beneficiaries; included in reimbursable cost of Kortes.
 8 Power facilities required for irrigation-pumping requirements.

Senator McFARLAND. The statement shows that what we are asking in this project in the way of power helping pay for reclamation is similar to other projects in the West and, I might say, in line with the Central Valley of California.

Then, we will have some more rebuttal testimony in regard to power a little later on, but at this time we want to move on to that of water.

The evidence has shown here that California is now using 3,000,000 feet of water and, of course, all of that amount doesn't go back to 1877. But I think the evidence is clear about how it is distributed, and in the way it is administered, for the reason that 3,000,000 acre-feet does not reach the 4,400,000 acre-feet provided for in the California Limitation Act.

As far as Arizona and her use of the water is concerned, it was shown here by our testimony that our rights date back to 1867, and that it is part of these rights which we are trying to protect by giving a sufficient supplemental water supply.

I only want to say this in regard to my friends who are opposing us here in our effort to relieve the situation: We are not trying to get bigger as suggested by Senator Downey as our testimony has shown. We are not trying to grow one bit. As a matter of fact, the water we seek will not be adequate to irrigate all of the irrigable lands; but we are trying to maintain the present economy in our State, permitting the people who are there to stay there, preventing them from having to move, and saving our farmers from being forced to leave their lands.

In rebuttal to the testimony given, I am going to call as our next witness Mr. Meeker.

Senator MILLIKIN. Let us take a 5-minute recess, please.

AFTER RECESS

STATEMENT OF RALPH I. MEEKER, IRRIGATION ENGINEER

Senator McFARLAND. Mr. Meeker, will you come forward?

Senator MILLIKIN. Mr. Meeker, will you state your full name, your residence, and your business.

Mr. MEEKER. My name is Ralph I. Meeker, irrigation engineer, Phoenix, Ariz.

Employment by the State of Arizona on cooperative investigations with the United States Bureau of Reclamation water resources of Arizona, Phoenix office, 1945 to 1947.

Senator McFARLAND. Mr. Meeker, would you mind stating your qualifications? I mean as an engineer, in particular your experience as an engineer. I believe you have that in your statement, though.

Mr. MEEKER. Yes. That follows immediately.

Prior to the Arizona work, was located in Denver, 1903 to 1945. Specialty, interstate river problems. Scope of work, engineering investigations of the Laramie, Rio Grande, La Plata, Colorado, North Platte, and Arkansas Rivers. Employed by the State of Colorado on interstate river compacts, 1919 to 1929. In private practice as consulting engineer in Denver, 1930 to 1942. Served as chairman of the irrigation division of the American Society of Civil Engineers in 1926.

Colorado River compact: During the negotiations of the Colorado River compact at Santa Fe in November 1922, was engineering adviser for the State of Colorado; participated in the compact sessions and familiar with the background of the compact. At the request of Chairman Hoover, I assisted Mr. A. P. Davis—that was Arthur P. Davis, the director of the Reclamation Service and adviser to the Federal representative—in “reconstructing” the Colorado River flow at Lee Ferry to natural or virgin run-off conditions. It was necessary to know the total water fund to be divided.

Senator DOWNEY. Mr. Chairman, could I secure one bit of information from Mr. Meeker?

Senator MILLIKIN. Yes.

Senator DOWNEY. At that time that these figures were issued, was it expected that there would be 22,000,000 acre-feet of water available in the Colorado River?

Mr. MEEKER. No. About 20,000,000.

Senator DOWNEY. And that figure has presently been reduced to about 17,000,000?

Mr. MEEKER. Yes; nearer 18,000,000; 17,700,000.

“Consumptive use” is an engineering term, first used in the Laramie River interstate suit, 1912–14, to deplete and “reconstruct” river flows. I served as engineer to Wyoming in the Laramie River controversy. During 1918–19 I acted as engineer for Wyoming in a cooperative investigation and report with the Bureau of Reclamation on the North Platte River, where extensive use was made of “consumptive use” to deplete and “reconstruct” the flows of the North Platte River in Colorado, Wyoming, and Nebraska. The “consumptive use” values for irrigated land were based on “valley consumptive use” (inflow minus outflow) of the Little Laramie and the Cache La Poudre Rivers in Wyoming and Colorado, respectively; also other engineering data.

During the negotiations of the Colorado River compact, the above engineering terms were used and applied to Colorado River water. The river flow at Lee Ferry was “reconstructed” to virgin conditions and depleted to 1920 conditions of irrigation development in the upper basin.

Senator MILLIKIN. Just a moment. Give me a little more enlightenment on that phrase “valley consumptive use.”

Mr. MEEKER. Well, we have “farm consumptive use,” “project consumptive use,” and “valley consumptive use.” The method whereby “consumptive use” was determined, “valley consumptive use,” taking the valley, the inflow up at the canyon where the river emerges from the mountain and the outflow discharging into the river, and the difference between the two representing the consumptive use.

Senator MILLIKIN. The valley consumptive use does not contemplate the separate evaluation of all the contributing streams?

Mr. MEEKER. Those occur automatically.

Senator MILLIKIN. Those occur automatically.

Mr. MEEKER. Any tributaries that come in below.

Senator MILLIKIN. In other words, you look to the end result in the main stream.

Mr. MEEKER. Yes. There are practically no tributaries in here. They are very minor.

Senator MILLIKIN. But, if there were tributaries in a stream basin or stream valley, in the use of the term which you have mentioned you would look to the net result on the main stream. Is that the point?

Mr. MEEKER. Yes. But they would be accounted for. There would be an allowance for those tributaries if there were such.

Senator MILLIKIN. Yes.

Proceed.

Mr. MEEKER. The Compact Commission had in mind a depletion by the upper basin of 7,500,000 acre-feet, and a depletion of 8,500,000 acre-feet by the lower basin of the flow of the Colorado River.

I took to the Colorado River compact meeting 10 years of knowledge on "consumptive use" values and experience on river depletion by irrigated lands.

Delivery of upper basin water to lower basin:

Under the terms of the compact, the point of delivery for upper basin water is set at Lee Ferry, 1 mile below the mouth of the Paria River (art. II (e)). Lee Ferry is therefore the point on the Colorado River where the aggregate beneficial consumptive use or depletion by irrigation uses of the upper basin is applied to river flow.

In a similar manner the depletion of the lower basin is properly measured at the United States-Mexican boundary, where delivery is made to the Republic of Mexico. Likewise, the depletion of the Gila River is properly measured at its mouth where its contribution reaches the Colorado River.

By the above procedure, the natural channel losses along the main stream of the Colorado and along the Gila are eliminated from river flow in arriving at the usable water fund of the lower basin. Such channel losses—large in volume—were common to the two designated river channels prior to man-made depletion by irrigation uses.

Lower basin apportionment of 1,000,000 acre-feet per annum: Under the terms of the compact, 1,000,000 acre-feet of additional water (from the lower basin run-off) is apportioned to the lower basin, designated III (b) water. Of my own knowledge this apportionment was made as the result of demands by Arizona for water to cover irrigation consumption in the Gila River Basin, estimated as rapidly approaching 1,000,000 acre-feet per annum in 1922. This allotment for Arizona was well understood by those present during the compact negotiations. In support thereof, the following citations are offered.

I am now reading from the report and supplemental report of Delph E. Carpenter, commissioner for Colorado in Colorado River matters to the Governor of Colorado, page 4:

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 of the surplus waters of the river.

I shall now read from the report of Frank C. Emerson, commissioner for the State of Wyoming in re Colorado River compact, to William B. Ross, Governor of Wyoming, January 18, 1923, page 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 possible developments upon the Gila River, and the probable rapid develop-

ment 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.

Senator MILLIKIN. Now, the words "and the probable rapid development generally upon the lower river," does that refer to the Colorado River or the Gila River?

Mr. MEEKER. The Colorado River, the lower basin.

I am going to read from a citation from the Colorado River compact by Reuel Leslie Olson, September 1926, (see footnote 73, p. 39). Now, I have that here in the building but I do not have it with me, so I will read from the text:

Mr. Bannister erroneously asserts that this paragraph was inserted because the Commissioner from Arizona "was so persistently obstinate."

You may wonder why the three Southern States have received in this compact a million more acre-feet of water than has been received by the Northern States. I have wondered about it myself but the explanation is that the Commissioner of Arizona was so persistently obstinate, and, in the opinion of the upper States, so unreasonably obstinate, that he would not sign the compact unless he obtained an extra pound of flesh. Hence, the bonus of 1,000,000 acre-feet to the three States of the south.

I might say that L. Ward Bannister was a special representative for Colorado at compact negotiations.

The 1,000,000 acre-feet apportionment is reflected in the Boulder Canyon Project Act of December 21, 1928 (sec. 4), where the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, undiminished (except for return flow) by any treaty that may hereafter be made with Mexico.

Senator MILLIKIN. Any questions?

Senator MCFARLAND. Mr. Meeker, was there quite a bit of discussion about this 1,000,000 acre-feet at the compact negotiations?

Mr. MEEKER. Yes. The draft compact was made without that originally and then later, after objection by Mr. Norveil, the Arizona Commissioner, it was inserted.

His position first was that the Gila River should be omitted from the compact, but that was denied on the grounds that it was a part of the Colorado River system. And then, after he felt that he couldn't get it cut out, he demanded a million acre-feet for the Gila.

Senator MCFARLAND. Well, during this discussion was the discussion to the effect that this water was to be allotted to Arizona? Was that the effect of the discussion?

Mr. MEEKER. Absolutely; to cover the water that was then being consumed in the Gila River Basin.

Senator MCFARLAND. Was that understood by all of those present?

Mr. MEEKER. Yes, sir.

Senator MCFARLAND. Now, in your discussions what water were you talking about? Was it the surface water which reached the streams?

Mr. MEEKER. Surface water only.

Senator MCFARLAND. Surface water only.

I believe that is all, Mr. Chairman.

Senator DOWNEY. I have a few questions, Mr. Chairman.

Mr. Meeker, you read in this statement the paragraph about which the chairman inquired:

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.

That is a quotation from Mr. Carpenter?

Mr. MEEKER. That is correct.

Senator DOWNEY. Did you read this short paragraph that appears in his report before that paragraph, which follows:

7,500,000 acre-feet, exclusive annual beneficial consumptive use in perpetuity to the upper basin and a like amount to the lower basin.

Mr. MEEKER. I know there is much more material that I didn't read. I only read that which is pertinent to the Gila River.

Senator DOWNEY. This last paragraph is in the Carpenter report antedating the part you read?

Mr. MEEKER. Certainly.

Senator DOWNEY. Do I understand that in these two paragraphs you interpret "annual beneficial consumptive use" as not to mean the amount of beneficial use that the landowners actually have in acre-feet but the amount they deplete the river?

Mr. MEEKER. Yes. It is the aggregate beneficial consumptive use or water that is "burned up", as Mr. Carpenter used to use the term, at the point on the river where the delivery is to be made. And in that sense "consumptive use" is stream depletion. You have to determine your consumptive use and apply it to the irrigated areas in the upper basin and arrive at the total and apply that as depletion.

Senator DOWNEY. Well, as I understand you, you say it is measured at the point where the water is taken from and then when it returns to the stream.

Mr. MEEKER. No. In this sense, the consumptive use values have been derived that way but the consumptive use so derived are then applied to the irrigated lands in the basin and from that the depletion fund built up and then applied at the point of delivery.

Senator DOWNEY. Again, Mr. Meeker, I am somewhat at a loss. I have known you for a number of years by reputation. I originally came from Wyoming.

Mr. MEEKER. So I understand.

Senator DOWNEY. I still don't clearly understand you. You gave your method of determining consumptive use in a prior answer to me which, as I understand it, I agree with. But, apparently, you would not apply that measure to diversions and returns on the Gila River.

Mr. MEEKER. No; for the reason that you have got a million acre-feet of lost water that never reached the river.

Senator DOWNEY. Then, you don't apply that definition of consumptive use that you gave me to the Gila water.

Mr. MEEKER. Oh, yes, absolutely. No preferential treatment for any stream. They are all on the same basis.

Senator DOWNEY. Well, Mr. Meeker, you said you would measure the water at the point of diversion and then take the amount where the water returned to the stream and deducting one from the other you would have the beneficial consumptive use.

Mr. MEEKER. Yes. That is the engineering procedure for determining consumptive use in various areas, say 1 acre-foot per annum or 3 acre-feet per annum, or whatever it may be.

Then, having determined that—maybe not from the area in question, maybe some nearby area, some adjacent area, then the consumptive use values are applied to the irrigated land so much water per acre-foot.

Senator DOWNEY. Do you agree with the definition of "consumptive use" as used in the treaty with Mexico?

Mr. MEEKER. Why, yes. There is no discrepancy there. There is a good deal of confusion that has gone out on this because perhaps everybody does not understand the engineering procedure in arriving at these results.

Senator DOWNEY. Let me read the definition of "consumptive use".

Mr. MEEKER. I know what it is.

Senator DOWNEY. May I read it, please?

"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.

Do you accept that definition given in the treaty with Mexico as applicable to the lands in the Colorado River Basin in the United States?

Mr. MEEKER. Certainly, when you are applying that to the river flow by irrigation uses.

Senator DOWNEY. This definition isn't applied to the main stream of the Colorado River, is it?

Mr. MEEKER. Why, the definition is applied to all over the basin.

Senator DOWNEY. Are you familiar with Mr. Tipton's explanation of the expression "consumptive use"?

Mr. MEEKER. I have read it.

Senator DOWNEY. Do you agree with that? [Reading:]

The extraordinary drought provisions of this treaty will be invoked, as I say, when these areas up in here begin to suffer deficiencies. We indicated to the Mexican negotiators that the entire basin must be considered—

I emphasize "the entire basin must be considered"—

and we put the words "consumptive use" in because it would be more practical to use it as a measure than the thousands of diversions. It is very practical to use as a measure the consumptive use, because many gaging stations are installed throughout the irrigated areas, and many more will be installed, for the purpose of determining for compact administration what the various States are consuming.

And later Mr. Tipton says it is consumptive uses, the plural—

because we have a consumptive use on this little tributary, a consumptive use on this tributary, a consumptive use on this stream, and so forth. So we have a series of consumptive uses, and that is what we are talking about in the treaty. The amount of these consumptive uses is readily ascertainable by measuring the inflow to the areas and the outflow from the areas; and when those begin to reduce, this provision can be invoked, and that is long before there can be any material depletion of storage in these various main-stream reservoirs.

Do you agree with that statement, Mr. Meeker?

Mr. MEEKER. I concur with that, absolutely.

Senator DOWNEY. That is all I have to ask.

Mr. MEEKER. Just a moment.

Senator DOWNEY. First, you would apply that same language and that same rule set up by Mr. Tipton in his explanation of the definition of "consumptive use" in the treaty to the lands in the United States?

Mr. MEEKER. Yes. And that is the reason Mr. Carpenter had selected Lee Ferry, where all the depletions would accumulate and could be measured at the point of delivery.

But I think the point that you haven't clearly in mind is that it isn't practical to measure every tributary and find out the consumptive use on every one, or every small tract of land. Therefore, the engineers have evolved the procedure of determining the consumptive use for selected areas, for thereon the inflow and outflow can be measured and a valid result secured. And that's for different climates, that is, for meadowlands—the meadowlands of Wyoming, for instance.

In the meadowlands the consumptive use is around nine-tenths to 1 acre-foot per acre per annum. That is in high altitudes where you have a short growing season and low temperatures.

You come down into the western part of Colorado, and your consumptive use may be around $1\frac{1}{2}$ or 1.6 acre-feet.

You come down here into—or, rather, come down into Arizona; your consumptive use is over 3, and when you get down to Imperial Valley, it is almost 4 acre-feet per acre per annum.

So, in applying your consumptive-use values to the irrigated lands, all the irrigated lands being used, different variations in acres with the different climatic conditions, you arrive at a total fund of depletion, which is then applied at the point of delivery on the river.

Senator DOWNEY. Mr. Meeker, you use the expression "consumptive use" as being applicable to the amount of water delivered at Lees Ferry by the upper basin for the benefit of the lower basin. That is the 75,000,000 acre-feet delivered over a 10-year consecutive period?

Mr. MEEKER. That's right. That is the water burned up, instead of using the headgate diversion and then finding out what the return—

Senator DOWNEY. Mr. Meeker, haven't we an entirely different measure there? Doesn't the compact recognize it in this language—the obligation of the upper basin is to deliver physically in the river at Lees Ferry, not any amount of consumptive use or depletion or anything else, but 75,000,000 acre-feet of water physically in the river?

Mr. MEEKER. Yes. But that is beneficial consumptive use. You have the beneficial consumptive use of $7\frac{1}{2}$ million acre-feet.

Senator DOWNEY. Oh, I am not talking about that, Mr. Meeker. The compact calls for the delivery of 75,000,000 acre-feet of water physically in the river?

Mr. MEEKER. Oh, yes. Certainly.

Senator DOWNEY. That has nothing to do with consumptive use.

Mr. MEEKER. Well, pardon me; I think I was in error there in that particular statement.

Senator DOWNEY. Well, Mr. Meeker, that was your principal reason for your interpretation. You said that Lees Ferry had been set aside because it was in the main stream to measure this 75,000,000 acre-feet in terms of consumptive use.

Mr. MEEKER. That is where the depletion of the upper basin is measured, your one-half acre-feet depletion of the upper basin.

Senator DOWNEY. Well, so far as the obligation of the upper basin is concerned, there isn't any question of depletion or of consumptive use involved. Theirs is the obligation to deliver physically in the river at Lees Ferry a physical volume of 75,000,000 acre-feet.

Mr. MEEKER. Oh, yes. I assented to that. I was wrong.

Senator DOWNEY. All right. That is all.

Senator MILLIKIN. Mr. Meeker, let us consider an abstract problem. Let us pass the rights of States to water of the main stream. Let us pass basic questions. Let us assume that the sole engineering problem were to determine the consumptive use occurring on a main stream—any main stream.

Am I correct in this—that under your theory of the proper use of the words “consumptive use” you would measure the virgin outflow of that stream at its mouth, and you would put that against the actual outflow, and the difference would represent the consumptive use on that main stream? Is that correct?

Mr. MEEKER. Well, that is, in substance, what it amounts to. Yes.

Senator MILLIKIN. With that problem.

Now, if the problem were to measure the consumptive use of a tributary to that main stream, would not the procedure be exactly the same as to that tributary?

Mr. MEEKER. Yes; and at the point of delivery to the parent stream.

Senator MILLIKIN. Now, then, if you take that main stream and chop it up into upper- and lower-basin obligations in terms of consumptive use, is it your theory that you apply exactly the same formula under that particular problem?

Mr. MEEKER. Yes, sir.

Senator MILLIKIN. And if the problem cut itself down further into figuring out the allocations to States of consumptive use, you would allocate the results achieved in that way to the States according to whatever contract obligations might be. Is that correct?

Mr. MEEKER. Yes, sir; the same procedure.

Senator MILLIKIN. Thank you.

Senator McFARLAND. As I understand it, then, Mr. Meeker, what would be charged, for instance, on the Green River in Wyoming, would be what Wyoming actually depletes the Green River at the point it empties into the Colorado River?

Mr. MEEKER. Yes; if you are now speaking of the beneficial consumptive use of the upper basin at Lee Ferry.

Senator McFARLAND. Yes. Would that be true with the tributaries in New Mexico, the Gunnison in Colorado, and the San Juan in New Mexico?

Mr. MEEKER. That is correct.

Senator McFARLAND. And, of course, that same rule would apply in the lower basin?

Mr. MEEKER. Yes, sir.

Senator McFARLAND. That is all.

Senator DOWNEY. That is all.

Senator MILLIKIN. Thank you very much, Mr. Meeker.

Senator McFARLAND. Mr. Carson.

**STATEMENT OF CHARLES A. CARSON, SPECIAL ATTORNEY FOR THE
STATE OF ARIZONA ON COLORADO RIVER MATTERS**

Senator MILLIKIN. Mr. Carson, will you state your full name, your residence, and your business.

Mr. CARSON. My name is Charles A. Carson. I live in Phoenix, Ariz. I am a practicing attorney and am special attorney for the State of Arizona on Colorado River matters.

The original statement that I made before the House committee last year, I understand, is incorporated in the record and will be printed as a part of the record.

Senator MILLIKIN. That is correct.

Mr. CARSON. So I want now to rebut some arguments here made by spokesmen for California interests.

The spokesmen for California interests argue three questions which I desire to briefly answer.

1. It is argued that the 1,000,000 acre-feet of water mentioned in article III (b) of the Colorado River 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. Norviel, 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.

Senator MILLIKIN. You will come to a further consideration of *Arizona v. California*?

Mr. CARSON. No. I can stop right now.

Senator MILLIKIN. I do not wish to interrupt. I just wanted to take a look at the record. But I do not need to do it right now. Go right ahead with the way you intend to state your case.

Mr. CARSON. I was trying to shorten it as much as possible.

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 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 one 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 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.

I would like by reference to have incorporated in the record of this hearing 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.

Senator MILLIKIN. It will be incorporated in an appendix to the transcript.

Mr. CARSON. It is, therefore, clear that both the Metropolitan Water District and the Secretary of the Interior anticipated ratable sharing of such evaporation losses.

I further submit that by regulation dated February 7, 1933, the Secretary of the Interior, Mr. Ray Lyman Wilbur, offered to Arizona the contract for water set out in exhibit A of such regulation. The Hoover Contracts, by Wilbur & Ely, page 373 to 378, which I desire incorporated in this record.

Senator MILLIKIN. They will be incorporated in an appendix to the transcript.

Mr. CARSON. Mr. Wilbur was at that time Secretary of the Interior and Mr. Ely was an assistant to the Secretary. That offer clearly shows that the Department of the Interior recognized that Arizona was entitled to 2,800,000 acre-feet of main-stream water in addition to the use of all water of the Gila River and its tributaries with which recognition every argument here made by California spokesmen is in direct conflict.

In order to make this matter clear, I desire to set forth here a bare outline of the legal basis of Arizona's right to water of the Colorado River.

The Colorado River compact ratified by the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming apportions 8,500,000 acre-feet of water per annum in perpetuity to the lower basin from the Colorado River system.

The lower basin comprises parts of California, Nevada, Utah, New Mexico, and practically all of Arizona.

California, as required by the Congress in the Boulder Canyon Project Act, by act of the California Legislature, has irrevocably and unconditionally limited herself to 4,400,000 acre-feet of the 8,500,000 acre-feet apportioned to the lower basin.

Nevada has a contract with the United States for 300,000 acre-feet.

The Bureau of Reclamation estimates that the ultimate possible uses in the portions of New Mexico and Utah which are in the lower basin will not exceed 131,000 acre-feet.

Arizona recognizes the rights of her sister States and does not attempt or intend to use any water to which any of them are entitled as herein outlined.

All of these figures deal only with apportioned water for the reason that any surplus which is over and above the apportioned water is, under the compact, subject to further apportionment after 1963.

There is thus left approximately 3,700,000 acre-feet of apportioned Colorado River water which cannot lawfully be used anywhere except in Arizona.

Arizona uses approximately 1,100,000 acre-feet from the Gila River and its tributaries and is entitled to use approximately 2,600,000 acre-feet of apportioned water from the main stream of the Colorado River, which water can lawfully be used in Arizona and nowhere else.

Arizona has a contract with the United States for delivery of sufficient water from storage in Lake Mead to enable the consumptive use in Arizona of 2,800,000 acre-feet subject to its availability under the Colorado River compact and the Boulder Canyon Project Act.

Approximately 2,600,000 acre-feet is available under the compact and the act and cannot lawfully be used anywhere except in Arizona.

In amplification, I call the attention of the committee to my testimony given last year before the Irrigation and Reclamation Committee of the House of Representatives on H. R. 5434, which is already a part of the record on this hearing.

I desire particularly to call the attention of the committee to the quotations of the applicable compact provisions, statutory provisions, contract provisions, and the letter of Mr. Hoover and the picture of Mr. Hoover and the statements of Mr. Norveil, Governor Campbell, and Mr. Lewis which are there set out. And I think there can be no doubt of the intent of the negotiators of the compact nor the effect of the express language of the compact, which needs no interpretation, or of the provisions of the Boulder Canyon Project Act, which seem to me to be clear.

And when Congress required that California adopt its self-limitation statute, it did so in order to assure that there would be available for use in Arizona this 2,800,000 acre-feet of main-stream water plus all the water of the Gila River, as indicated by the succeeding paragraph in section 4 of the Boulder Canyon Project Act which, read with the California Limitation Act, established beyond peradventure of a doubt that that was the then intent of Congress.

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 right 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.

Now, there has been some mention here made of correspondence between Governor Warren of California and Governor Osborn of Arizona. I want to submit for this record copies of the letters of Governor Warren and the answers thereto of Governor Osborn, which express clearly, I believe, the official stand taken by the State of Arizona.

The first letter is from Governor Warren addressed to Governor Osborn and Governor Pittman, dated March 3, 1947. In that letter I desire to call to the attention of the committee that no statement is made of what claims California asserts or the basis of such claims, nor what controversies exist nor anything of the kind.

And then, answering that letter, under date of March 12, the letter of Gov. Sidney P. Osborn to Gov. Earl Warren in which Governor Osborn set forth clearly and succinctly the basis of the Arizona claim and of what we claim, and invited Governor Warren or any other governors of the basin to come over and talk it over. No further action was taken by Governor Warren to follow it up until, under date of May 16, 1947, he addressed another letter to Governor Osborn stating that it seemed to him a suit was necessary, but again setting forth no basis for any claim of California to water nor the amount of such claim.

And Governor Osborn's reply to that letter, dated May 23, 1947.

Senator MILLIKIN. What was the gist of the Governor's reply?

Mr. CARSON. The gist of the Governor's reply is that in his letter of March 12 he had set forth the basis of the Arizona claim and the foundation upon which it rests, and it contains these two paragraphs, that, I think, I should read:

I am sure if you will review my letters and the compact, statutes, contracts, and reports therein mentioned, you will recognize that the only thing required for cooperation between our great States in developing the use of the water of the Colorado River to which they are respectively entitled for their mutual benefit and for the benefit of the Southwest and the Nation, is for your great State to respect the agreements your State has already made.

I request that you again review my letters and if in your opinion there is any error in the facts, reasoning, or conclusions stated in my letters, I will appreciate your advising me concerning the same.

Senator DOWNEY. Mr. Chairman.

Mr. CARSON. Just a moment, Senator.

Mr. Chairman, may these be incorporated in the record in the order of dates?

Senator MILLIKIN. At this point in the order of dates, at this point in the transcript.

Senator Downey.

Senator DOWNEY. I was going to suggest that, to complete the record at that point, the letter of Governor Pittman replying to Governor Warren be also inserted.

Senator MILLIKIN. Isn't that among them?

Mr. CARSON. No. It isn't there because Governor Osborn didn't receive a copy of that letter from Governor Pittman at the time it was mailed to Governor Warren. I think later Governor Warren sent him a copy, but I do not have it there.

Senator MILLIKIN. Do you wish to have it included as a part of your showing?

Mr. CARSON. No.

Senator MILLIKIN. Well, then, include it please at the direction of the Chair.

Senator DOWNEY. At this point in the record?

Senator MILLIKIN. At this point please.

(The letter to Governor Warren from Governor Pittman follows:)

STATE OF CALIFORNIA,
GOVERNOR'S OFFICE,
Sacramento, March 3, 1947.

HON. SIDNEY R. OSBORN,
Governor of Arizona,
Phoenix, Ariz.

HON. VAIL N. PITTMAN,
Governor of Nevada,
Carson City, Nev.

MY DEAR GOVERNORS: We have just completed our review of the comprehensive plan for the Colorado River system as presented by the Bureau of Reclamation, and I am more than ever impressed by the staggering size and complexity of the proposal.

It is quite apparent, and it is admitted in the comprehensive plan, that the 134 projects inventoried will, if constructed, use more water than is available in the river system. This fact will undoubtedly emphasize the differences of opinion concerning the water to be made available to each State. It is therefore of the utmost importance to the lower-basin States that we reconcile our differences as soon as possible.

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.

I believe that either method could produce the desired results. If you agree with me, I suggest that the three of us meet at some time and place mutually agreeable for the purpose of further exploring the subject. If we can place our three States in position to maintain a common front in urging the speedy and orderly development of the Colorado River system, we will have rendered a great service to our people.

Hoping that I may have your reaction to this proposal and with best wishes, I am,

Sincerely,

EARL WARREN, Governor.

EXECUTIVE OFFICE, STATEHOUSE,
Phoenix, Ariz., March 12, 1947.

HON. EARL WARREN,
Governor, State of California,
Sacramento, Calif.

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.

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 Fourteen and Sixteen, whose name has now 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. Arizona is now cooperating in plans for the utilization of Colorado River water in the respective States within the allocation of water available to them.

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.

All seven of the Colorado River Basin States—Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming—five of which States are still represented on the Colorado River Basin States Committee, are parties to the Colorado River compact which apportions the water of the Colorado River system as between the upper basin and the lower basin and to Mexico. 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.

Portions of Utah and New Mexico are in the lower basin and are entitled to share in the apportionment made to the lower basin and in the use of any available water which is unapportioned by the Colorado River compact.

California, in consideration of the passage by the Congress of the Boulder Canyon Project Act and as a condition precedent to the taking effect of that act and the construction of Boulder Dam, Imperial Dam, and the All-American Canal, by chapter 16, California Statutes 1929, entered into a statutory agreement with the United States and for the benefit of each of the Colorado River Basin States, irrevocably and unconditionally limiting California's claim to water of the Colorado River to 4,400,000 acre-feet per annum of the apportioned water, plus not more than half of the water unapportioned by the Colorado River compact. The quantity of surplus water, that is, water unapportioned by the compact, varies from year to year and is subject to further apportionment by agreement between all of the compact States after 1963.

Arizona recognizes the right of California to use the quantity of water to which California, by the statutory agreement, is forever limited.

Arizona recognizes the right of Nevada to use 300,000 acre-feet of apportioned water per annum, plus one twenty-fifth of available unapportioned water, subject to further apportionment of the unapportioned water by agreement between the compact States after 1963.

Arizona has a contract with the United States for delivery for use in Arizona from the main stream of the Colorado River, subject to its availability for use in Arizona, under the Colorado River compact and the Boulder Canyon Project Act, of so much water as is necessary to permit the beneficial consumptive use in Arizona of main stream water to a maximum of 2,800,000 acre-feet of the apportioned water, plus one-half of the available surplus, less such part of the one-twenty-fifth thereof as Nevada may use, the quantity of which surplus, of course, varies from year to year, and which surplus is subject to further apportionment by agreement between all of the compact States after 1963.

Arizona does not claim the right to the use of any water to which California is entitled, nor the right to the use of any water to which Nevada is entitled, and I am sure that Nevada does not claim the right to the use of any water to which California is entitled, nor the right to the use of any water to which Arizona is entitled. It therefore appears that California and Nevada are now

in a position to join Arizona in urging the speedy consideration and passage of S. 433 now pending in the United States Senate and H. R. 1598, its companion bill, now pending in the House of Representatives, which are authorization bills to authorize the construction of the central Arizona project, and H. R. 1597, which is an authorization bill to relocate the boundaries of the Gila project heretofore authorized.

I am certain that the passage of these bills and the construction of the works which they seek to authorize will be of great and incalculable benefit, not only to Arizona, but to California and Nevada and to the United States as a whole.

They are vitally necessary to the welfare and to the economy of the whole southwest region. They do not in any way interfere with the full use in California and in Nevada of the water to which California and Nevada are respectively entitled.

If either California or Nevada are interested in the promotion and construction of projects for the utilization of water to which they are respectively entitled, I would like to know it in order that I may render such aid as seems appropriate.

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 contract.

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.

During your incumbency we in Arizona have not had the pleasure of a visit from you. We would like to see you over in our State and I will greatly appreciate it if you can arrange to come to Phoenix as soon as possible, either alone or with Governor Pittman, or with such other governors of the Basin States as you may desire to have present, in order that any matters which you may desire to further discuss can be gone into fully and thoroughly.

With all good wishes, I am

Sincerely,

SIDNEY P. OSBORN, *Governor.*

EXECUTIVE OFFICE, STATE HOUSE,
Phoenix, Ariz., May 23, 1947.

HON. EARL WARREN,
*Governor of California,
Sacramento, Calif.*

MY DEAR GOVERNOR WARREN: I have received your letter of May 16 and appreciate your personal good wishes.

In my letter to you of March 12 and in my letter to William E. Warne, Acting Commissioner of the Bureau of Reclamation, of November 22, 1946, a copy of which I sent to you, I clearly stated the facts and the reasoning which in my opinion lead to the inescapable conclusion that the quantities of apportioned water available for use in Arizona, California, and Nevada, respectively, from the Colorado River, are already determined.

If you do not agree with such facts and reasoning and my conclusions, it is regrettable that you do not specify wherein you disagree.

On page 8 of the Views and Recommendations of the State of California on Proposed Report of the Secretary of the Interior entitled "The Colorado River" there purports to be a list of relevant statutes, decisions, and instruments affecting the Colorado River, but no mention is there made of the California Self-Limitation Act, chapter 16, California Statutes, 1929.

I discussed the California Self-Limitation Act as well as the other relevant compact, statutes, contracts, and reports in my letters, but in your letters to me you make no exception to any statements in my letters, nor do you set forth any statement of any facts, reasoning, or conclusions as to what claim to water of the Colorado River you intend to assert for California nor the basis for such claim.

California has unconditionally and irrevocably limited herself forever to the quantity of water set out in the California Self-Limitation Act. Arizona has by contract recognized the right of California to the quantity of water set out in that act and Arizona does not intend to and will not attempt to utilize water to which California is entitled.

Arizona respects her commitments.

Any aspiration entertained in California to use water in excess of that limitation appears to be illegitimate. If California would be content with the use of the quantity of the water to which she has by solemn statutory agreement unconditionally and irrevocably limited herself forever all occasion for any feeling that any further compact, any arbitration or litigation is advisable would disappear.

I am sure if you will review my letters and the compact, statutes, contracts, and reports therein mentioned you will recognize that the only thing required for cooperation between our great States in developing the use of the waters of the Colorado to which they are respectively entitled for their mutual benefit and for the benefit of the Southwest and the Nation, is for your great State to respect the agreements your State has already made.

I request that you again review my letters and if in your opinion, there is any error in the facts, reasoning, or conclusions stated in my letters, I will appreciate your advising me concerning the same.

With all good wishes, I am

Sincerely,

SIDNEY P. OSBORN, *Governor.*

STATE OF CALIFORNIA,
GOVERNOR'S OFFICE,
Sacramento, May 16, 1947.

The Honorable SIDNEY P. OSBORN,
Governor of Arizona, Phoenix, Ariz.

DEAR GOVERNOR OSBORN: I did not bother you during the time you were ill in our State concerning my suggestions for settling the differences of opinion of Arizona and California regarding their respective rights to the use of the water of the Colorado River. However, now that you have recovered sufficiently to return to your home, I would like to discuss your letter of March 12, 1947, and the accompanying copy of your letter to William E. Warne, Acting Commissioner of the Bureau of Reclamation, dated November 22, 1946.

I gather from these two letters that you believe it is unnecessary to try to write a compact between the lower basin States or to have our respective claims arbitrated, because you consider the existing statutes, contracts, etc., have so settled the rights of Arizona, California, and Nevada in the Colorado River that there are no substantial differences between the States. It may well be that the suggestions of a compact and arbitration are not feasible at this late date, but I am of the opinion that there are such basic divergencies of interpretation of the statutes and documents mentioned above, particularly between Arizona and California, that without an authoritative determination as to which State is right, it is impossible for anyone to know what quantity of water either State is entitled to. If our States are to plan for their futures, they must know with certainty how much water is eventually to be made available to them, because everyone recognizes that there is not enough water in the river to fully serve the legitimate aspirations of both our States.

It seems to me that a suit in the Supreme Court of the United States, to which the lower basin States and the United States are parties, is essential to supply the necessary answer. This would of course require a jurisdictional act of Congress, authorizing the United States to be made a party to such suit. Governor Pittman of Nevada has expressed a similar opinion in a letter to me dated March 6, a copy of which is enclosed. I am sure that such a procedure will eventually redound to the benefit of both of our States.

With best wishes for the continued improvement of your health, I am

Sincerely,

EARL WARREN, *Governor.*

Senator MILLIKIN. Proceed, Mr. Carson.

Mr. CARSON. Mr. Chairman, in my testimony that I gave last year before the House committee, I reviewed rather thoroughly the history

of this controversy, the attempts that had been made to negotiate, the attempts that had been made to arbitrate, and the attempts that had been made by Arizona in the Supreme Court of the United States to secure an equitable apportionment of this water.

Now, California opposed that suit, moved that it be dismissed. They have known clearly since 1944 of our purpose and plan and they have not again threatened a suit until after Senator McFarland and Senator Hayden began to press for the date for this hearing. So in that suit, as in any contemplated suit, there is a grave question as to whether or not the Supreme Court will take jurisdiction to adjudicate an equitable apportionment of water unless and until one State can allege that it is in danger of injury by a planned and going action of another State.

If California's spokesmen can by the threat of a suit so block Arizona and the congressional acts and the United States in the utilization of water, there will be no necessity for their suit. If this Congress goes ahead and authorizes this suit, before any money could be spent, California would have an opportunity to go into court and test the question on a firmer and sounder basis than they would have in the absence of any authorizations. What we are doing now is trying to get the authorization, and until somebody has some method of going ahead and diverting water, it is very doubtful if the Supreme Court would take jurisdiction, even in the face of the declaratory judgment statute. They have consistently refused to do so.

Senator MILLIKIN. Your theory is that the Supreme Court would require a showing of injury before taking jurisdiction?

Mr. CARSON. Take jurisdiction—

Senator MILLIKIN. A showing of injury or, I assume—

Mr. CARSON. Potential injury.

Senator MILLIKIN. Threat of injury.

Mr. CARSON. Threat of injury to a going project.

So that I think now that in mentioning the possibility of a suit these California spokesmen have merely in mind the effect on this Congress, because they refused to join when we tried to sue. I think it is for the purpose of confusion and delay that that statement is here injected.

Senator MILLIKIN. I am speaking now about the interpretation or construction of the compact. Is there any contention on behalf of Arizona that the compact in any way has been amended?

Mr. CARSON. No, sir.

Senator MILLIKIN. Does California contend that the compact has in any way been amended?

Senator DOWNEY. Will you repeat the question?

I prefer to have Mr. Shaw answer.

Senator MILLIKIN. I am passing questions of interpreting the compact or construing the compact, assuming but not conceding that there is ambiguity in it. Is there any contention that the compact by any subsequent procedures of any kind, subsequent instruments, subsequent doings or acts or in any other manner has been amended?

Mr. SHAW. It has been amended in one particular, in effect. By the terms of article IV of the compact, navigation was subordinated to other uses, that is, domestic, irrigation, and power. By the terms of section 6 of the project act, navigation was made superior to the other uses. But article IV of the compact itself permitted Congress to do

that very thing, so that there has been no great violence, you might say, done to the terms of the compact since it was framed.

Senator MILLIKIN. That was a practical solution in order to make it possible to have a law, was it not?

Mr. SHAW. Yes, sir.

Senator MILLIKIN. Thank you.

Mr. CARSON, what is the citation of this Arizona-California case?

Mr. CARSON. 292, page 358; the sixth ground; stated on page 358. The paragraph begins "Sixth."

Senator MILLIKIN. When did Arizona approve the compact?

Mr. CARSON. In February 1944.

Senator McFARLAND. I was about to ask one question, Mr. Chairman.

Senator MILLIKIN. Proceed.

Senator McFARLAND. Mr. Carson, the Boulder Canyon Project Act outlined the conditions under which it would become effective. The compact had to be ratified by seven States and failing to do so within 6 months by six States including California and provided California agree to certain conditions including the following:

And, further, that 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, Wyoming as an express covenant to the consideration of the passage of this act, and that the aggregate annual consumptive use, diversions less return flow to the river of the water of and from the Colorado River—

that that is all-inclusive, that wording?

Mr. CARSON. Yes.

Senator McFARLAND. And that that is the only water they can take?

Mr. CARSON. That's right.

Senator McFARLAND. Because it says "of and from the Colorado River."

Mr. CARSON. Yes.

Senator McFARLAND. And for use in the State of California. There couldn't be used any of the Gila River water in the State of California, could there?

Mr. CARSON. No.

Senator McFARLAND (reading):

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.

Now, the only exception to that condition, as I understand your interpretation, is this "plus":

Not more than one-half of any excess or surplus water unapportioned by such compact, such uses always to be subject to the terms of said compact.

Now I will ask you if in the next paragraph the Congress itself doesn't interpret that provision by setting out what it will ratify if Arizona wants to come in and accept it by way of an agreement—

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 the exclusive, beneficial consumptive use in perpetuity. And that the State of Arizona may annually use one-half of the excess or surplus water unapportioned by the Colorado River compact, and that the State of Arizona shall have the exclusive beneficial con-

sumptive use of the Gila River and its tributaries within the boundaries of the State, and 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 or Mexico, but if, as provided in paragraph (c)—

and so forth.

In other words, as I understand your interpretation, the Congress of the United States, by setting out this, placed an interpretation on the California Limitation Act, provided for, as permitting that amount of use of water in Arizona.

Mr. CARSON. That's right. And that is emphasized, also, by the contract offered Arizona, to which I referred, by the Department of the Interior. It is already in the record, but I just want to read this much of it.

Senator MILLIKIN. You say "offered Arizona." Was the contract concluded? Was the contract made?

Mr. CARSON. No; this contract wasn't made. It was offered to Arizona by the Secretary of the Interior at that time.

It is article X:

From storage available in 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 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 from waters of the Gila River and its tributaries.

Senator McFARLAND. That is all the questions I have.

Mr. CARSON. Mr. Chairman, there is one more thing that I would like to volunteer.

Senator DOWNEY. Mr. Carson, before you leave that last subject, that contract that you just read and the part you have just read is followed by a stipulation that the contract does not in any way mean to interpret what shall be class A water and class B water?

Mr. CARSON. It has some clause in it that it is without prejudice of the claim of any State as to interpretations and so forth, I am sure, but I haven't it before me now.

Senator McFARLAND. Is that in all the contracts?

Mr. CARSON. Yes; I think that is in all of the contracts. But, now, in this contract of the metropolitan water district, which is incorporated and will be placed in the record, it contains within it, as do all of the other California contracts, a statement as to the priority of their claims and that they are subject to the availability of water under the compact and the act to the same degree as we are. There is no difference there, this priority.

Senator MILLIKIN. May I interrupt you just a moment.

Has anyone ever put under single cover all of the contracts and all of the instruments and documents that bear on the legal questions involved in this case?

Mr. CARSON. Most of the underlying contracts, compact, and the act, and some of the opinions that were given up until the time this was published in 1933 are accumulated in this Hoover Dam contract by Wilbur and Ely. There is no other that is complete.

Senator MILLIKIN. Would you remind me, Miss McSherry, to ask Legislative Reference to assemble within two covers all of the contracts and documents including, of course, the compact, the California

self-limitation statute, and any other laws that have legal bearing on the legal problems involved here and to submit their work before conclusion to the two Senators so that if anything is omitted it will be included, so that we may have one single source for ready reference to everything that is involved here as far as the legal questions are concerned.

Senator DOWNEY. Mr. Chairman, would it be appropriate to put in that compilation the different statements and interpretations that have been given by the Bureau of Reclamation and these responsible officials that we both here rely on?

Senator MILLIKIN. Let me rule on that in this way, that after Legislative Reference submits its tentative work to the two Senators that anything that either Senator thinks has relevant bearing may be included, and I ask for, and I know it will be forthcoming, a decent sense of restraint against unduly "padding" the record. But I would like to have under one cover everything that all of us consider relevant to the legal questions involved.

Mr. CARSON. May I just make a voluntary statement concerning this metropolitan contract? It contains all of the system of priorities that are set up in California internally that do not affect any other States.

The question here presented, in my judgment, is for California to respect its Limitation Act of 4,400,000 acre-feet per annum of apportioned water, and if it does, it is within California's power to readjust its internal priority agreement without injury to anyone and bring its present uses clearly within its 4,400,00 acre-feet. But they don't propose to do that. They propose to fight Arizona in order to irrigate 400,000 to 500,000 acres of new land on the east mesa and the west mesa of the Imperial Valley for which no distribution works have been built. True, it can be served through the All-American Canal, but no distribution systems have been built and it is nearly all publicly owned land and they could do it now without injury. But they propose to fight Arizona, and if I read them correctly, all of the other States of the basin, in order to assure that they themselves do not have to go in and readjust their own internal priority system.

Now, I am not familiar with California law, but Senator Downey states that they cannot condemn there without condemning everything in the Los Angeles Basin. I am sure if that is the case, the California Legislature can very easily correct it.

That is about all I can add at this time.

Senator MILLIKIN. I think I asked yesterday that there be put in by reference the priority scale California applies internally to these waters. I assume that will be put in.

Senator DOWNEY. Yes.

Mr. CARSON. It is all set out in this metropolitan contract and in each one of their other contracts.

Senator DOWNEY. Mr. Chairman, I have only one question.

I would like to read to Mr. Carson a paragraph of the Arizona-California case in the Supreme Court in 1933, and I would appreciate it if Mr. Carson could give me a "Yes" or "No" answer to my question. I think it simply admits of that, with any explanation that he wants thereafter.

In the opinion of the Court, October term, 1933, United States Reports, volume 292, appears this paragraph:

The considerations to which Arizona calls attention do not show that there is an 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 II (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 is 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.

That is the end of the paragraph. Mr. Carson, do you either agree or disagree with the accuracy of the statement made in the Supreme Court decision?

Mr. CARSON. I agree with it.

Senator DOWNEY. That is all, Mr. Chairman.

Mr. CARSON. I want to explain that, Mr. Chairman, then. I brought that suit for Arizona to perpetuate testimony of what had occurred at the original compact negotiations in order to establish what was testified to here by Mr. Meeker in a form that we could later use in any litigation that might later arise. That it was clearly understood is shown by the letters of Mr. Hoover and the statements made by Governor Campbell, Mr. Norveil and Mr. Lewis, and it was clearly understood at that time that immediately following the adjournment of that conference in Santa Fe, N. Mex., in 1922 there would be a tri-State agreement made between California, Arizona, and Nevada specifying that the million acre-feet of III (b) water was for Arizona.

But during the course of the years, when the California Limitation Act was passed, it became no longer necessary for us to support that position, because there is apportioned $8\frac{1}{2}$ million to the lower basin, $8\frac{1}{2}$ million acre-feet, of which California is limited to 4,400,000, which leaves for Arizona 3,800,000 less minor adjustments for Utah and New Mexico, of which amount we get a million acre-feet from the Gila and the balance from the main stream, so you come out the same.

Senator MILIKIN. What was the date of the California Limitation Act?

Mr. CARSON. 1929.

Senator MCFARLAND. Do you agree, then, Mr. Carson, with Mr. Matthew when he stated here under cross-examination that if this III (b) water is apportioned water, California couldn't use it; under the California Limitation Act?

Mr. CARSON. That they could not use it, as under the California Limitation Act it is apportioned water.

Senator MCFARLAND. That was admitted by California in their testimony here.

Senator MILLIKIN. What treatment did the Supreme Court give to the California Limitation Act?

Mr. CARSON. It wasn't raised in this case. This was merely a unique bill to perpetuate testimony, and they did not permit us to perpetuate it on the ground, among others, of this sixth ground stated in their opinion. And there was no ambiguity, that it was apportioned to the lower basin but not to Arizona alone and, therefore, there was no necessity of perpetuating the testimony.

Senator MILLIKIN. The California limitation statute was not before the Court at all?

Mr. CARSON. No. There was just a question of perpetuating testimony.

Senator DOWNEY. Mr. Chairman, I would also like to read into this record a different volume than I read from before. It is a different edition but from the same case.

This is 298 U. S. 563 to 568, Eightieth Law Edition.

Mr. CARSON. That is a different case.

Senator DOWNEY. Which case is it? Is this another case between the two States?

Mr. CARSON. Yes. This is 292 U. S.

Senator DOWNEY. Well, I am away behind.

Very well. Mr. Carson is evidently away ahead of me.

Under 564 appears this statement, and I am reading now from the Complaint of Arizona and this allegation of the Complaint of Arizona, I am informed, was adopted as a finding by the Supreme Court.

Senator MILLIKIN. Now, what case is this? And what is the citation?

Senator DOWNEY. This is *Arizona v. California* (298 U. S. 563 to 565):

* * * 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.

That is the opinion of the Court, deduced from the allegations of Arizona's complaint, which the Court's opinion adopted as its findings. That is the effect of the allegation made in Arizona's pleading.

Mr. Chairman, I have a luncheon engagement, so I think I will withdraw.

Senator MILLIKIN. We will close in just 1 minute.

Do you wish to make any comment on that, Mr. Carson?

Mr. CARSON. I haven't read the full opinion recently, but that was a case brought by Arizona to try to obtain a decision of the Supreme Court equitably to apportion the water of the river, the same kind of a case that they are talking about bringing now; but my recollection is that Arizona's allegations were not as stated by Senator Downey.

I had, previous to the bringing of that case, given an opinion to our people that we could not maintain it, and I did not participate in that suit.

But the Supreme Court refused to take jurisdiction, and made no decision on the merits.

Senator MILLIKIN. I think we should recess.

Senator McFARLAND. Mr. Chairman, I would just like to state this to the chairman. We have as remaining witnesses Judge Stone, Mr. Tipton, and Mr. Baker, whose testimony will be very short, and perhaps one other engineer on the cost of power.

The cross-examination here has lasted much longer than I anticipated and I am very anxious tomorrow that we rush through on the main statements and leave some cross-examination, if possible, to the last. I think it is very important that Judge Stone and Mr. Tipton be able to state their positions inasmuch as statements have been made here as to what they contend in regard to the interpretations of the compact.

Senator MILLIKIN. The Chair will control the meeting, or will try to.

Senator McFARLAND. I just want to give the Chair an idea of what our desires are.

Senator MILLIKIN. But I mean as to interruptions the Chair will be the judge of that as we go along.

Senator McFARLAND. Yes; I understand that.

Senator MILLIKIN. We will meet again at 2:30 tomorrow afternoon.

(Whereupon, at 12:40 p. m., the subcommittee adjourned until 2:30 p. m., Thursday, July 3, 1947.)

BRIDGE CANYON PROJECT

THURSDAY, JULY 3, 1947

UNITED STATES SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON PUBLIC LANDS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 2:30 p. m., in the District of Columbia room, the Capitol Building, Senator Eugene D. Millikin, presiding.

Present: Senators Millikin (presiding), Ecton, McFarland, and Watkins.

Present also: Senator McCarran and Congressman Murdock.

Senator MILLIKIN. The committee will be in order.

Will the reporter please put into the transcript the replies which have been received from the Bureau of Reclamation to interrogatories addressed to V. E. Larson by Senator Downey. There appear to be copies of this, gentlemen, for those who are interested.

Senator MILLIKIN. Mr. Shaw.

Mr. SHAW. On Senator Downey's behalf, may I be permitted to offer and ask that there be printed in the record three resolutions:

First, a resolution of Los Angeles Central Labor Council adopted June 2, 1947;

Second, a resolution of American Public Power Association adopted May 23, 1947; and

Third, Resolution No. 13 of the National Reclamation Association adopted October 9 to 11, 1946. I have that in the form of a booklet of resolutions but only desire that the one resolution, No. 13, be presented.

Would it be desired that these resolutions be read at this time?

Senator MILLIKIN. Not unless you wish. We will have them printed in the record.

Mr. SHAW. I hardly think that it is necessary.

Each of them opposes the principle of the diversion of the interest component upon power investment to capital repayment of irrigation costs.

(The three resolutions named above follow:)

RESOLUTION OF THE LOS ANGELES CENTRAL LABOR COUNCIL

Be it resolved, That the Central Labor Council of Los Angeles is opposed to the practice of diverting interest component in rates for energy in multiple-purpose reclamation projects to subsidize irrigation, as set up in the Lemke bill, H. R. 1977.

That the practice of charging power users with interest on money allocated to power development be approved, but that the interest component in the power

rate should not be applied as though it were repayment of principal on investment allotted to irrigation. The practice of so diverting interest is believed to be against the best interest of reclamation in the West, and against the interest of public development of power; be it further

Resolved, That legislation be approved requiring the return of the interest component in power rates to the Treasury or to the reclamation fund, as provided in the Rockwell bill, H. R. 2873, and prohibiting the application of such interest to the retirement of the principal allotted to irrigation, except as specifically appropriated therefor by Congress; be it further

Resolved, That copies of this resolution be transmitted to the chairmen of the Public Lands Committees of the Senate and House of Representatives in Washington, and to the Members of the Congress from California.

Adopted in regular session of the Los Angeles Central Labor Council, June 2, 1947.

[SEAL]

W. J. BASSETT, *Secretary*.

RESOLUTION ADOPTED BY THE AMERICAN PUBLIC POWER ASSOCIATION AT ITS ANNUAL CONVENTION IN CLEVELAND MAY 23, 1947

Resolved, The American Public Power Association favors the continuing development of the West through Federal reclamation, and the construction of the multiple-purpose projects upon which such development depends. But in view of the heavy subsidies to irrigation which are carried by power on these projects, the following safeguards for the power users are deemed essential:

1. Power developed on Federal multiple-purpose projects should be disposed of in such manner as to encourage the most wide-spread use thereof at the lowest possible rates to consumers consistent with sound business principles.

2. The burden supported by power in a multiple-purpose project should not exceed the amount which power would have to pay if the project were constructed as a single-purpose power project.

3. Inasmuch as the irrigator pays no interest and the power user does, the interest rate which enters into the calculation of the power rate should be as low as can be justified, and there should be no discrimination between projects with respect thereto. A rate of 2 percent is recommended.

4. Inasmuch as the purchaser of power from a Government reclamation project pays rates sufficient to return to the United States the capital invested in power facilities, plus interest, he is entitled to an accounting by the Government which makes it clear that he is repaying capital, plus interest, and is not receiving power at a rate subsidized by the United States Treasury. It is difficult to make this clear answer to the critics of public power under the Reclamation Bureau's present practice of applying the interest paid by the power user as though it were capital being returned, with resulting confusion as to whether a subsidy is thereby extended to irrigation, as intended, or to power, as contended by some critics of public power. The accounting practices of the Bureau should be corrected, in the best interests of public power and the reclamation program.

I certify that the foregoing is a true and correct copy of resolution duly adopted by the American Public Power Association at its meeting in Cleveland, Ohio, May 23, 1947.

CARLTON L. NAU,
Secretary and Manager.

RESOLUTIONS RECOMMENDED BY THE RESOLUTIONS COMMITTEE AND ADOPTED BY THE NATIONAL RECLAMATION ASSOCIATION, FIFTEENTH ANNUAL CONVENTION, OMAHA, NEBR., OCTOBER 9-11, 1946

THE VOICE OF THE RECLAMATION INTERESTS OF THE 17 WESTERN STATES,
NATIONAL RECLAMATION ASSOCIATION, WASHINGTON, D. C.

RECLAMATION—THE HOPE OF A STARVING WORLD!

FOREWORD

Reclamationists from every State in the West, including representatives of irrigation districts, water users' associations, State reclamation associations, agricultural, commercial and civic associations; State and

Federal officials; and farmers, businessmen, and industrialists assembled at Omaha, Nebr., October 9-11, 1946, to attend the Fifteenth Annual Convention of the National Reclamation Association.

They expressed themselves through the 24 resolutions contained herein. This is the voice of the reclamation interests of the 17 Western States.

The resolutions were prepared for submission to and approval by convention delegates by a resolutions committee composed of 17 men—one from each of the 17 reclamation States—chosen at the State caucus meetings on the first day of the convention. The membership of the committee will be found on the back cover of this pamphlet.

We are presenting these resolutions to you and urge your support in bringing about the action requested by each to accomplish their purpose.

They are the foundation of the program of this association for the coming year.

Sincerely yours,

NATIONAL RECLAMATION ASSOCIATION,
ROBERT W. SAWYER, *President*.
DON MCBRIDE, *Secretary-Manager*.

RESOLUTION No. 1. IN MEMORY OF JIM FAUVER

Through the corridors of time march the millions who are born on earth. Many leave their mark above the level of the crowd for services to their fellow men.

In the aisle-way through which pass the men and women devoted to the cause of reclamation, many great leaders and men of vision, have left their mark of service.

In the top-most line of achievement we find the mark of our own Jim Fauver, California director of the National Reclamation Association for 7 years, and chairman of its budget and finance committee.

Jim was one of the founders of the National Reclamation Association. He was devoted to its principles and objectives. Ever solicitous for its reputation and welfare, he was an untiring worker in its behalf and to the cause of reclamation.

Jim was one of the founders of the Central Valley Project Association, an organization which has sponsored and worked for that great reclamation project since its inception. Ever vigilant in the cause of reclamation, he was sagacious, wise and fair in his judgment of men and principles. Standing four square against all the winds that blow he never wavered in his faith that the right program would inevitably be brought about.

His last action was to participate in the annual gathering of the National Reclamation Association last year at Denver, Colo., where he acted as one of the principal sponsors of a resolution that was approved and supported by the great majority of the States represented, which would give the association blessing to any State desiring to initiate special legislation that would give it relief from the application to private lands of the onerous and unsuited acreage limitation restrictions of the reclamation laws.

Jim had particularly enjoyed the convention for he had an opportunity to greet friends of long standing and he knew when the business of the convention was over that he was to leave for a vacation fishing trip after salmon, a sport that he dearly loved.

His cheery smile, his fund of humor, the warmth of his greeting, wise counsel and friendly manner had endeared him to most of the reclamationists throughout the West. He was welcome at any gathering or in any crowd. He found warm friends in every group and in every walk of life.

Jim Fauver left for his long planned fishing trip as soon as he returned to his home in Exeter, Calif. While on the trip he was stricken with a severe illness and passed away on December 9, 1945, in the hospital at Arcata, Calif.

He is survived by his widow, one daughter and two granddaughters.

No man has contributed more to the advancement of reclamation than has Jim Fauver. Those of us from California know and appreciate the great debt we owe to Jim Fauver for his years of unselfish service and devotion to the advancement of the Central Valley project. This great project will ever serve as a perpetual memory to the honor of this great reclamationist.

His passing is a loss to California, to the National Reclamation Association and to the cause of reclamation. He was a man of great vision, of magnificent accomplishment, of shrewd judgment, of an abiding warmth of heart and friendliness of manner. May his memory live in our hearts and his soul rest in peace.

RESOLUTION NO. 2 IN MEMORY OF ORA BUNDY

Ora Bundy, president of the National Reclamation Association, died June 12, 1946 at his home in Ogden, Utah. He left his mark of high service in the cause of reclamation.

With his passing, Utah lost a leader, a statesman, a conservationist and an able and worthy representative in the councils of the association. The association lost a president, a councillor, a champion of its aims and ideas, and a tireless worker in the cause of reclamation. The West lost a man devoted to its progress and economic security.

Ora Bundy served the people of his State well. He endeavored to keep constantly before the opportunities and blessings that were in store for them and their children through uniting the life-giving waters from our mountains with the rich lands of our arid valleys. Long before the organization of the National Reclamation Association he was affiliated with State organizations in many different capacities, pioneering in the field of education, promotion and construction of irrigation projects that has set a pattern influencing for good developments in many western States. He represented the reclamation interests of Utah from 1936 to the time of his death as their director on the Board of the National Reclamation Association. The services he rendered the people of Utah will long be remembered and memory will be enriched as the years go by and the things he planned and worked for—dams, canals and prosperous farms, become realities through the continued labor of those who must carry on.

The National Reclamation Association also has sustained a great loss in the death of Ora Bundy. He was one of its founders and a most able supporter. He sat in its governing councils for 10 years nourishing it with his ideas and the fruits of his labor. He had the satisfaction of watching it grow from a foundling to the powerful and respected body it is today. He was elected first vice president in 1937 and the board made him president in 1944. His service and worth to the association was recognized by reelection to this high and responsible office at their 1945 annual meeting. It was while he was president that he passed away. During the past few years Ora suffered with an impaired heart, a fact known to but few of his close friends and coworkers. His conviction that this work to which he had set his heart and hand was of great importance to his State and the Nation, and the seriousness with which he regarded the office of president of the National Reclamation Association can be appraised by the fact that, knowing he was risking health and even life itself, he continued unabated the exacting and trying duties of the office of president of this association.

We extend our sincere condolence to his wife and children in the loss they are called upon to bear, together with our great appreciation for the part they played in the contribution their husband and father made to the development of irrigation agriculture in the West.

RESOLUTION NO. 3. AUTHORIZING THE PRESIDENT OF THE ASSOCIATION TO APPOINT A COMMITTEE TO STUDY ACREAGE LIMITATION PROVISIONS OF THE RECLAMATION LAWS

Whereas customs of land use and occupation have developed and vested rights have attached through ownership and use which make it difficult and uneconomical for existing and potential reclamation projects to conform to the fixed acreage limitations now required by the National Reclamation Act of 1902, as amended; and

Whereas this association at its fourteenth annual convention adopted resolution No. 12 relating to the subject of the acreage limitations of the National Reclamation Act as amended: Now, therefore, be it

Resolved by the National Reclamation Association in convention assembled, That this association reaffirm and readopt the position expressed in said resolution No. 12; and be it further

Resolved, That the president of this association be authorized and empowered to appoint a committee to make a study and investigation of the acreage limitation provisions of the reclamation laws and ascertain the facts relative thereto, including the enforcement thereof, and to recommend to this association remedial legislation of general application.

RESOLUTION No. 4. REQUEST CONTINUED SUPPORT OF WATERSHED RESEARCH PROGRAM ON FOREST AND RANGE LANDS

Whereas the National Reclamation Association, by resolutions adopted at its annual conventions in 1943, 1944, and 1945, has consistently advocated the development of a comprehensive program of watershed research in the upstream portions of western drainage basins; and

Whereas efforts of the association were successful last year in gaining recognition by the Congress of the need for such a program, and which resulted in the initiation of studies on a limited basis: Now, therefore, be it

Resolved, That the officers of the National Reclamation Association again be authorized and requested:

(a) To promote the development of a more comprehensive western-wide program of investigation by the Forest Service into the management of forest and range lands in relation to the water resources;

(b) To give their full support to such a program of watershed research;

(c) To take all necessary steps to advise members of Congress of the importance of such investigations, and

(d) To urge adequate appropriations for their full development.

RESOLUTION No. 5. URGES THE ESTABLISHMENT OF A SMALL PROJECTS DIVISION WITHIN THE BUREAU OF RECLAMATION

Whereas the procedure of the Bureau of Reclamation on investigating and reporting on projects is primarily designed to apply to large irrigation development; and

Whereas within the boundaries of the 17 Western States there are hundreds of thousands of acres of land in small isolated projects which need either a supplemental supply of water or complete development; and

Whereas larger consolidated projects normally have adequate community support which is usually lacking in small isolated projects: Now, therefore, be it

Resolved, That the Bureau of Reclamation, Department of the Interior, be urged to establish a small projects division with a simplified procedure in order that small projects may have equal opportunity of participating in the Federal reclamation program.

RESOLUTION No. 6. NATIONAL RECLAMATION ASSOCIATION CONTINUES TO FOSTER AND SUPPORT PROGRAMS OF IRRIGATION AND DRAINAGE RESEARCH

PROPOSED RESOLUTION COVERING IRRIGATION RESEARCH

Whereas the experience of the 17 Western States during the past 100 years has demonstrated the importance and necessity of an agriculture based on irrigation; and

Whereas the permanence and prosperity of western agriculture depends upon irrigation; and

Whereas there are now some 21,000,000 acres of land under irrigation in these States; and

Whereas there remain extensive undeveloped land and water resources; and

Whereas the continued success of the present irrigation agriculture and the future development of the potential irrigation agricultural resources depends upon the proper use of land and water resources; and

Whereas the artificial application of water to soil introduces many new and complex problems relating to the water supply, the soil and water relations, the water and plant relations, the disposal of excess water and alkali, and the organizations necessary for the orderly acquirement and determination of water rights and the distribution of water; and

Whereas the answers to these many complex problems can be obtained through careful basic and applied research and the application of the findings of such research to field practices: Now, therefore, be it

Resolved, That the National Reclamation Association continue to foster and support both State and National programs of research in the field of irrigation and drainage.

RESOLUTION NO. 7. FAVORS CONTRIBUTIONS TO LOCAL SCHOOL AGENCIES, TOWARD ADDITIONAL SCHOOL FACILITIES REQUIRED DURING CONSTRUCTION OF FEDERAL RECLAMATION PROJECTS

Whereas the National Reclamation Association favors the provisions by local school districts and other appropriate public bodies of elementary and secondary school facilities in the areas in and about Federal reclamation projects; and

Whereas local school districts and other public bodies in areas where Federal reclamation projects are under construction are frequently required, by reason of the sudden influx of workers and their families, to provide additional school facilities with resultant expense to local taxpayers; and

Whereas in those communities which rely upon real property taxes for funds with which to operate and maintain their school systems, the acquisition of lands by the Federal Government, thus removing them from the tax rolls, together with the fact that many Federal employees and their dependents reside on federally-owned property not subject to assessment for real estate taxes, create severe problems in connection with the raising of sufficient revenue for school purposes: Now therefore be it

Resolved, By the National Reclamation Association:

1. That this association favors enactment into law of provisions that will authorize Federal contributions to local school agencies, in proper cases, toward the cost of additional school facilities required during the construction period by reason of an influx of workers and their families in connection with the construction of Federal reclamation projects and toward the cost of operation and maintenance of primary and secondary school facilities, in cases where the provision of such facilities for dependents of employees engaged on work in connection with the Federal reclamation projects casts an undue burden upon local taxpayers.

2. That this association hereby directs its officers to seek enactment by the Congress and approval by the President of legislation appropriate in the premises.

RESOLUTION NO. 8. COMMENDING THE CHIEF OF ENGINEERS AND COMMISSIONER OF RECLAMATION FOR CONFORMING TO SECTION 1 OF THE 1944 FLOOD CONTROL ACT, AND OTHER SIMILAR ACTS, FAVORING MAKING SUCH LEGISLATION PERMANENT LAW, AND FAVORING THE PROTECTING OF BENEFICIAL CONSUMPTIVE USE OF WATER AGAINST DOWNSTREAM USE FOR HYDROELECTRIC POWER AND DIRECTS OFFICIALS TO SEEK APPROPRIATE LEGISLATION

Whereas section 1 of the act of December 22, 1944 (58 Stat. 887), commonly known as the Flood Control Act of 1944, and section 1 of the act of March 2, 1945 (59 Stat. 10), commonly known as the Rivers and Harbors Act of 1945, establish the policy of Congress to protect the beneficial consumptive use of water in the West; and

Whereas section 1 of each of said acts likewise contains procedural requirements to be followed by the Secretary of War and the Chief of Engineers, the Secretary of the Interior and the Commissioner of Reclamation, with respect to the investigation of and reports on proposed projects: Now therefore be it

Resolved, by the National Reclamation Association:

1. That this association notes with gratification the action taken by the Seventy-ninth Congress, in providing that the provisions of section 1 of the aforesaid Flood Control Act of 1944 should govern with respect to projects authorized in the act of July 24, 1946 (Public No. 526, 79th Cong., 2d sess.) and with respect to investigations and reports thereafter made or submitted.

2. That this association commends the Secretary of War and the Chief of Engineers, the Secretary of the Interior and the Commissioner of Reclamation for the manner in which they have striven to conform to the spirit as well as the letter of the provisions contained in section 1 of each of the acts above mentioned.

3. That this association favors the enactment into permanent law of provisions designed to accomplish the purposes set forth in section 1 of each of the three acts above mentioned.

4. That this association favors protection of the beneficial consumptive use of water against downstream demands for water to be used in the development of hydro-electric power similar to the protection afforded by existing law to the beneficial consumptive use of water against demands for navigation purposes.

5. That this association hereby directs its officers to seek enactment by the Congress and approval by the President of legislation appropriate in the premises.

RESOLUTION No. 9. URGES STATES LEGISLATURES AND CONGRESS TO PROVIDE NECESSARY FUNDS FOR TOPOGRAPHIC MAPPING

Whereas the developments of the natural resources of our country, and especially the water resources, is dependent primarily upon the availability of accurate factual and scientific information; and

Whereas the first requisite for studying drainage, basin problems, locating reservoir sites and determining the water resources of an area is an accurate topographic map, supplemented with aerial photographs; and

Whereas the work of most Federal and State agencies and many private enterprises is handicapped and greatly impaired by the lack of accurate map information so that many agencies which are primarily map-users have been forced to become map-making agencies to supply this essential information, resulting in a great duplication of effort and waste of time and money, without providing the maps so urgently needed; and

Whereas new methods of mapping have been developed using aerial photographs and photogrammetry whereby the work of map compilation can be greatly accelerated and a very high degree of accuracy maintained; and

Whereas accurate topographic maps are available for only about 25 percent of the area of the United States and many of these maps are 30 to 40 years old and in need of revision; and

Whereas the United States Coast and Geodetic Survey and the United States Geological Survey have been designated as Federal mapping agencies to provide the necessary primary ground control and to prepare these basic topographic maps in cooperation with the various States: Now therefore be it

Resolved, That the National Reclamation Association urges the various State legislatures and the Congress of the United States to provide the necessary funds to expand the activities of the Federal mapping agencies as rapidly as possible so as to complete all the essential topographic mapping of the United States within the next 10 years.

RESOLUTION No. 10. OFFICERS OF ASSOCIATION ARE DIRECTED TO URGE CONGRESS TO APPROPRIATE MONEY FOR IMMEDIATE CONSTRUCTION OF AUTHORIZED PROJECTS AND PROTEST IMPOUNDMENT OF SUCH FUNDS

Whereas the National Reclamation Association at its annual meetings for the past several years has endorsed the construction of flood control reclamation and multiple-purpose projects having sound economic justification; and

Whereas the Congress of the United States has authorized many of such projects and in a great many cases appropriated funds for the commencement of construction, which funds have been recently impounded by an executive order of the President of the United States; and

Whereas the failure of various Federal agencies to construct said projects because of the impounding of construction appropriations will continue to expose communities, agricultural and industrial areas, public utilities and transportation facilities to hazardous floods and deprive highly productive agricultural areas of vitally needed water for irrigation of critical foods and fibers: Now therefore be it

Resolved by this association, That it reaffirms the action taken at previous annual meetings concerning such projects and the impounding of construction funds; and *Be It Further*

Resolved, That the officers of this association be and they are hereby authorized and directed to continue to constantly and diligently urge Congress to appropriate money for the immediate construction of projects authorized by Congress, and whenever funds which have been appropriated are impounded, to protest vigorously against such action, and urge their immediate release.

RESOLUTION No. 11. EXTENDING AN INVITATION TO WESTERN STATE ENGINEERS ASSOCIATION TO HOLD ANNUAL MEETING AT SAME TIME AND PLACE WITH A COORDINATED PROGRAM

Whereas the interest of the Western State Engineers Association and the Board of Directors of the National Reclamation Association are in agreement in the development and progress of water uses in the seventeen western States; and

Whereas a number of engineers and directors attend both the Western State Engineers Association meeting and the National Reclamation Association meeting and both are responsible for attendance at each: Now therefore be it

Resolved, That the directors of the National Reclamation Association extend an invitation to the engineers of the Western State Engineers Association to hold both meetings at the same time and place with a coordinated program.

RESOLUTION No. 12. URGING THAT FEDERAL AGENCIES COMPLY WITH STATE LAWS RELATING TO OWNERSHIP, CONTROL, ADMINISTRATION AND USE OF WATERS

Whereas it is imperative for the protection and proper administration of the use and right to divert or store water that the laws of the respective States where irrigation, flood control and other uses of water are contemplated be fully complied with; and

Whereas failure to observe such laws leads to controversy often and in expensive litigation and makes it difficult, if not impossible at times, for the administrative officials of a State to protect rights entitled to recognition under the laws of such State; and

Whereas Congress had declared in Public Law 534, Seventy-ninth Congress, that it is the policy of the Congress to recognize the interests and rights of the States in determining the development of the water resources within their borders and likewise their interests and rights in water utilization and control as herein authorized to preserve and protect to the fullest possible extent established and potential uses for all purposes of the waters of the Nation's rivers; Now therefore be it

Resolved, That the National Reclamation Association recommends and urges in the strongest terms that these several acts, and all similar acts, be amended at the earliest possible date to include provisions requiring that in the prosecution of all works designed for flood control, water conservation and use the particular Federal agency or department involved shall, in all respects, comply with State laws relating to the ownership, control, administration, and use of waters as now required by section 8 of the National Reclamation Act.

RESOLUTION No. 13. REAFFIRMS OPPOSITION TO SOLICITOR'S OPINION: AUTHORIZES THE PRESIDENT TO APPOINT A COMMITTEE TO STUDY RECLAMATION BENEFITS, OTHER RECLAMATION PROBLEMS, AND SECURE ENACTMENT OF APPROPRIATE LEGISLATION

Whereas the National Reclamation Association at its fourteenth annual meeting, held in 1945, adopted in its resolution No. 1 an expression of its position adverse to the opinion of the solicitor of the Department of the Interior respecting the application of power revenues in fixing the power rates on reclamation projects and affirm its position as to the intent and application of the 1939 Reclamation Act; and

Whereas bills were introduced in the Seventy-ninth Congress intended to clarify and elaborate the factors to be used in the determination of the economic justification of reclamation project development, and according to the report, will be reintroduced in the Eightieth Congress, and the Department of the Interior, with respect to such legislation continues to support in principle the solicitor's opinion; and

Whereas it appears that the formula for the determination of the economic justification of Federal reclamation projects, now prescribed by law, except by action of Congress on each separate project, provides an inadequate basis, in most instances, for the continuation of the reclamation program in the West; and the appraisal of benefits arising from reclamation developments and the policies for the allocation and reimbursability of the costs thereof are subjects for study and appropriate action of Congress; and

Whereas the Appropriations Committee of the House of Representatives has directed critical attention to these problems affecting existing and prospective reclamation projects and has requested an investigation and report on the practices followed by the Secretary of the Interior and in determining economic justification and an appropriate clarification of the pertinent provision of Federal statutes: Now therefore be it

Resolved, That the National Reclamation Association reaffirms its position set forth in resolution No. 1, respecting the solicitor's opinion on the application of the 1939 Reclamation Act: asserts its belief that while the formula now used for the determination of economic justification of reclamation projects may not meet the current demands for the authorization of such projects, effort should be continued to secure favorable action of Congress for authorization of individual project or basin-wide development until a proper and acceptable formula is set up by law; and be it further

Resolved, (1) That the president of this association be and he is authorized and directed to appoint a committee to make a study of the benefits from reclamation project and basin-wide development and the problems and appropriate policies incident to economic justification of such undertakings, and in addition, to study any related reclamation problems and to confer with the Secretary of the Interior, the Bureau of Reclamation, the Members of the United States Senate and of the House of Representatives, and interested citizens.

(2) That this committee shall assist the president and secretary-manager of the association in securing the enactment of such legislation as may be determined after review by the board of directors to be necessary and appropriate to accomplish the purpose set forth herein.

RESOLUTION No. 14. URGES THAT DOMESTIC REQUIREMENTS FOR COMMERCIAL FERTILIZER BE GIVEN FIRST CONSIDERATION

Whereas an inadequate supply of commercial fertilizer, particularly nitrogen and superphosphate, restricted crop production on reclamation projects in 1946; and

Whereas the American Plant Food Council, Inc., estimates the supply of nitrogen for 1947 crops in the United States and possessions at 715,908 tons, or 9,320 tons less than used in 1946 crops; and

Whereas a larger supply of commercial fertilizer is a simple means of increasing the Nation's supply of sorely needed sugar; and

Whereas the National Reclamation Association firmly believes the fertilizer used in the United States of America, where food production per man is the highest of any nation in the world, contributes most to help feed the hungry world: Now therefore be it

Resolved, That the association strongly urge the Combined Food Board and the United States Army to give first consideration to fulfilling domestic requirements for commercial fertilizer as a means of increasing the world's supply of food.

RESOLUTION No. 15. URGES ENACTMENT BY 80TH CONGRESS OF PORTIONS OF H. R. 5654 TO WHICH THE PRESIDENT DID NOT OBJECT

Whereas the National Reclamation Association recognizes the need for basic legislation that will provide a ready answer to points of order that may be raised against particular items regularly contained in appropriations to the Bureau of Reclamation; and

Whereas H. R. 5654 passed by both Houses of Congress in the closing days of the Seventy-ninth Congress was vetoed by the President because of two objectionable provisions; and

Whereas the remaining items in said H. R. 5654 should be enacted into law promptly as essential to the proper administration of the reclamation program: Now therefore be it

Resolved, That the National Reclamation Association urges the enactment early in the sessions of the Eightieth Congress of H. R. 5654 without the provisions to which the President objected, provided that the authorization to the Bureau of Reclamation for the dissemination of information shall be limited to facts, including recordings, solely in connection with the reclamation law.

RESOLUTION No. 16. RECOMMENDING THAT FEDERAL LEGISLATION DEALING WITH POLLUTION RECOGNIZES STATES' INTERESTS

Whereas it has been generally recognized throughout the history of this country that the primary responsibility for dealing with stream pollution abatement problems rests with State and local governmental units; and

Whereas efforts have been made during recent years to bring about the enactment of a Federal stream pollution abatement law; and

Whereas indications point to the probability of passage of some form of Federal stream pollution abatement legislation during the next session of Congress; and

Whereas the National Reclamation Association has consistently urged that Federal legislation dealing with the development and control of water and natural resources should contain provisions designed to protect and preserve States' interests: Now, therefore, be it

Resolved, That the National Reclamation Association recommends that any Federal legislation dealing with stream pollution which may be enacted by Congress shall include:

(1) A specific declaration of policy to recognize and protect States' interests in the formulation and administration of stream pollution abatement programs.

(2) Provision for representation of State governmental officials upon any policy-making advisory board which may be created under the terms of such legislation.

(3) Appropriate provisions setting forth procedures to be followed in order to afford State governments a reasonable opportunity to bring about the abatement of stream pollution before any action to this end can be instituted by an agency of the Federal Government.

RESOLUTION No. 17. REQUESTING ASSOCIATION TO URGE PRESIDENT OF UNITED STATES TO WITHDRAW HIS CURTAILMENT ORDER

Be it resolved, That the National Reclamation Association, in convention assembled, endorse the action taken at the national conference of flood control and navigation interests called jointly by Senator McKellar, of Tennessee, chairman of the Senate Appropriations Committee; Senator Overton, of Louisiana, chairman of the Senate Flood Control Committee; Congressman Mansfield, of Texas, chairman of the House Rivers and Harbors Committee; and Congressman Whittington, of Mississippi, chairman of the House Flood Control Committee and held in New Orleans, La., on September 20, 1946, protesting the curtailment order of the President, dated August 2, 1946, limiting expenditures for reclamation improvements and for other purposes; and be it further

Resolved, That the officers of the association be and they are hereby requested to take such action as is deemed necessary to respectfully urge the President of the United States to withdraw his curtailment order.

RESOLUTION No. 18. DIRECTING THE ASSOCIATION TO SECURE ALTERATION OF CONTRACTS DEALING WITH INCREMENTED VALUE UPON SALES OF LAND

Whereas in the construction of irrigation projects under the Federal reclamation program, the United States has entered into contracts with the several irrigation districts for the repayment of the cost of construction thereof; and

Whereas under some projects the United States has in the contract with the irrigation district required that the land within the project's boundaries be initially appraised without regard to the probability of water being applied to the land, which contracts also provide for appraisal of subsequent betterments and improvements as well as that in the subsequent sale of said lands one-half of the difference between the appraised value and the selling price—if the selling price exceeds the appraised value—be paid out of moneys due the seller of such sale into the district treasury in cash to be applied upon operation and maintenance and construction sums thereafter to be levied against the land involved; and

Whereas such appraisals are made by boards of shifting and changing personnel with the result that the appraisal of betterments and improvements reflect the temperament of the changing personnel board membership and are greatly lacking in uniformity and invite confusion, criticism, and dissatisfaction; and

Whereas the system invites collusion between the buyer and seller to avoid the payment to the district of the one-half portion of the incremented value; and

Whereas the announced purpose of the United States in requiring the contract in such form is to discourage speculations in project lands to insure the integrity of the district and its ability to make repayment of the construction costs; and

Whereas it has become apparent that the theory in operation does not support or effectuate the purpose intended; and

Whereas it would appear that the best interests of the projects involved and the ability of such projects to fully respond to contract obligations would be conserved by the elimination of all appraisals subsequent to the initial classification and appraisal and that in lieu thereof a provision be adopted requiring that at the time of each sale of land a percentage of the sale price be paid out of the moneys due the seller of such sale in the treasury of the district to be applied on sums subsequently levied on the land involved: Now, therefore, be it

Resolved by the National Reclamation Association in annual session assembled:

(1) That we approve the elimination from the contracts between the United States and irrigation districts of the condition providing for the appraisal of betterments and improvements and the payment into the treasury of the district of a portion of the incremented value upon sales of such land.

(2) That we approve in lieu thereof a provision requiring that upon sale of any land within the project, 5 percent of the sale price be paid into the treasury of the district to be credited upon sums thereafter levied against the land involved in such sale for construction costs and that such credit be allowed at the rate of 20 percent of such sum in each of the first 5 years after said sale.

(3) That the United States offer modified contracts containing the provisions provided in paragraph (2) hereof to such districts as heretofore contracted with the United States and which contracts contain the provisions for appraisal of betterments and improvements and the payment of a portion of the incremented value into the treasury of the district.

(4) That the officers, directors, and manager of the association be, and they hereby are, instructed to take such steps as may be necessary to accomplish as reasonably as possible the purpose of this resolution.

RESOLUTION No. 19. AUTHORIZING THE PRESIDENT TO APPOINT A COMMITTEE TO WORK WITH REPRESENTATIVES OF THE LEGISLATIVE AND EXECUTIVE BRANCHES OF THE FEDERAL GOVERNMENT TO PERFECT A COORDINATED PROGRAM OF WATER RESOURCE DEVELOPMENT

Whereas the National Reclamation Association recognizes that future resource development will consist of multiple-purpose enterprises involving as a major aspect the development of irrigation farms and will affect all departments of government concerned with the various major purposes to be served; and

Whereas it is an established constitutional policy of this association to work with all Federal agencies concerned with the development, control, conservation, and utilization of the water resources of the West: Now, therefore, be it

Resolved, That the National Reclamation Association reaffirm its policy of encouraging participation in the development of natural resources, including irrigation, of all Federal agencies concerned with any major phase of the task; and be it further

Resolved, That this association hereby empowers and authorizes its president to appoint a committee from its members to work with the representatives of the legislative and executive branches of the Federal Government to perfect such a program on a coordinated basis.

RESOLUTION No. 20. ENDORSES PUBLIC LAW No. 478, SEVENTY-NINTH CONGRESS, SECOND SESSION—"UTILIZATION OF POWER REVENUES;" COMMENDS SENATOR CARL HAYDEN IN PASSAGE THEREOF; REITERATES NO INTENDED DISCRIMINATION BETWEEN PROJECTS, AS EXPRESSED IN RESOLUTION No. 11, 1945, AND INSTRUCTS ASSOCIATION OFFICERS TO AID IN CLARIFICATION OF STATUTES, AND AUTHORIZES APPOINTMENT OF COMMITTEE BY PRESIDENT FOR THAT PURPOSE

Whereas in Public Law No. 478, Seventy-ninth Congress, second session, it was enacted:

"Utilization of power revenues: No power revenues on any project shall be distributed as profits, before or after retirement of the project debt, and nothing contained in any previous appropriation act shall be deemed to have authorized such distribution: *Provided*, That the application of such revenues to the cost of operation, maintenance, and debt service of the irrigation system of the project, or to other purposes in aid of such irrigation system, shall not be construed to be such a distribution"; and

Whereas the foregoing legislation, as shown by the legislative history thereof, was enacted in response to resolution 11 of the National Reclamation Association adopted at its Denver meeting in 1945; and

Whereas the Senate Appropriations Committee Report No. 1:34, on said amendment stated:

"It is the intent of the reclamation laws that the power revenues shall be applied for project purposes and not distributed as profits to any individual before or after the United States has been repaid its investment. The application of the power revenues to reduce the cost of water service is one of the uses intended by the Congress of the power produced as an incident to the operation of a reclamation project. No discrimination is intended by the statutes in this respect, between projects operated by the United States, those operated by irrigation districts, and those operated by water users' associations or other types of water users' organizations. The reclamation laws speak throughout of all three types

of projects, collectively and indiscriminately. The proposed amendment removes any doubt as to this intent, arising from the language of the cited appropriation act"; and

Whereas said legislation and the quoted committee report are sound statements of the reclamation law as it has been understood and administered for many years; and

Whereas it is the intention of the Federal laws that no discrimination shall be recognized between the various reclamation projects arising out of the differences in the types of operating organizations, whether such projects are operated by the United States, by irrigation districts, or by water users' associations; Now therefore, be it

Resolved by the National Reclamation Association, in annual convention assembled at Omaha this eleventh day of October 1946:

1. The National Reclamation Association endorses the declaration and interpretation of existing law as stated in the provisions captioned "Utilization of power revenues" in Public Law No. 478, Seventy-ninth Congress, second session;

2. The National Reclamation Association commends and thanks Senator Carl Hayden of Arizona for his effectiveness in the enactment of this legislation, and for the clear statements in explanation thereof made by Senator Hayden in the committee report and in debate;

3. The National Reclamation Association reiterates that the reclamation laws and other Federal statutes affecting reclamation projects were and are intended to effect no discrimination whatever between projects operated by the United States, projects operated by irrigation districts, and projects operated by water users' associations or other forms of farmers' organizations as to utilization of power revenues as set forth in resolution No. 11, adopted by this association in 1945;

4. The officers and appropriate committees of the National Reclamation Association are instructed to use all proper means to aid in the clarification of any statute which may involve the principles stated in this resolution. The president of the National Reclamation Association is authorized and directed to appoint a committee to implement this resolution.

RESOLUTION No. 21. RECOMMENDS AMENDMENT TO SECTION 9-E OF RECLAMATION ACT OF 1939

Whereas irrigation districts are now being offered water contracts in the nature of rental contracts not to exceed 40 years under section 9-E of the Reclamation Project Act of 1939, act of August 4, 1939, chapter 418; and

Whereas said section 9-E is ambiguous, uncertain, and incomplete, in that it permits the inclusion of construction costs in the rental figures, but recognizes no interest of the district in the project at the conclusion of the period of the rental contract, and recognizes no permanent interest in the water or water rights as having been acquired by the district, and recognizes no right to the renewal of the contract, and recognizes no termination of the operation of the project even though the construction costs have been completely paid: Now, therefore, be it

Resolved, That we recommend that amendments be made to said section 9-E so as to recognize (a) the interests of the district as to the amount paid for construction costs; (b) the rights of the district in the water rights it has been using; (c) the right to the renewal of the contract; (d) the termination of the Bureau of Reclamation control when the construction costs have been fully paid.

RESOLUTION No 22. AGAIN EXPRESSING THE ASSOCIATION'S OPPOSITION TO REGIONAL AUTHORITY LEGISLATION

Whereas the National Reclamation Association has heretofore expressed its opposition to legislation for purpose of creating regional authorities and has supported the programs of the Bureau of Reclamation, Department of the Interior; Corps of Engineers, War Department and Department of Agriculture for the development of our land and water resources: Now, therefore, be it

Resolved, That we reaffirm our opposition to creation of any regional authority, for numerous reasons, among which are the following:

(1) An authority would interfere with and destroy the programs for complete development of our natural resources now under way by the existing Federal agencies.

(2) The citizens of an affected area would have no voice in the selection of the board of directors of an authority charged with unlimited power over the development of their natural resources.

(3) Existing water rights established under State law would be subject to condemnation under provisions of acts creating an authority and when condemned, the directors of an authority would have power to rent water so acquired to farmers of their choice.

(4) Acts creating an authority would take away from State courts jurisdiction over all litigation in which an authority is involved, including water litigation, and place exclusive jurisdiction in the Federal courts.

(5) An authority would supersede and nullify existing law under which we have acquired our water rights and by which these rights are protected and administered.

RESOLUTION NO. 23. A FAITHFUL SERVICE TRIBUTE TO FLOYD O. HAGIE

Floyd O. Hagie, secretary-manager of the National Reclamation Association, as he comes to the close of a 9-year term of day-by-day continually useful service, with reluctant expression, finds that he must return to his homeland and accept a highly advantageous leadership as executive vice president of the chamber of commerce of the progressive west coast city, Seattle, Wash. With a responding reluctance, this board of directors, representing 17 great reclamation States, wishes to place within its volume of permanent record grateful acknowledgment of signal service through the years, and a sincere tribute to the personal worth of one who has been a faithful official in a great cause that looks to national betterment.

His direction of the Washington office of the National Reclamation Association has been a never-ceasing support of water conservation and beneficial use as a sound regional and national policy—always courageous in planning and aggressive in legislative advocacy of building the West upon a sure natural resource foundation, constantly believing that the land and the water and the protecting forests have been and are a heritage of paramount value whereby there may yet be built thousands of western homes.

He has been a master mind in the progress of reclamation. History will so record his persevering efforts, all the way from the simple diversion of water upon the land, and on through greater usefulness in multiple-purpose projects—and now as we enter upon coordinating plans to develop all the great watersheds of the Nation, his tactful counsel has values that have not yet been fully measured in our legislative and economic progress.

This, we are sure, then, is a moment for grateful acknowledgment of personal service, and an expression of good will and confidence as we extend to Floyd Hagie our well wishes for continued usefulness and high attainment in his new field of effort.

RESOLUTION NO. 24. EXTENDING THANKS AND APPRECIATION TO ALL WHO HELPED MAKE THE 1946 CONVENTION A SUCCESS

Whereas the fifteenth annual meeting of the National Reclamation Association has been attended by representatives of the reclamation States and their friends and has been most interesting and instructive; and

Whereas many persons and organizations have contributed to the interest and success of the meeting and to the comfort and the enjoyment of the delegates attending the meeting: Now, therefore, be it

Resolved, That we, the members of the National Reclamation Association in convention assembled at Omaha, Nebr., at said fifteenth annual meeting extend our thanks and appreciation to the agricultural committee, the convention bureau, the women's division, and the junior division of the Omaha Chamber of Commerce; and particularly Chairman Louis S. Clarke and Vice Chairman Edwin N. Van Horne who headed the convention committee; to the newspapers and radio stations; to the hotels of Omaha; to those who have provided entertainment and to those who have participated in the program of the meetings, including in particular Dr. Thomas R. Niven, Omaha, Nebr.; Charles W. Leeman, Omaha, Nebr.; C. Petrus Peterson, Lincoln, Nebr.; Dwight Griswold, Lincoln, Nebr.; Wells A. Hutchins, Berkeley, Calif.; Merrill Bernard, Washington, D. C.; Warner W. Gardner, Washington, D. C.; N. E. Dodd, Washington, D. C.; Lt. Gen. R. A. Wheeler, Washington, D. C.; Michael W. Straus, Washington, D. C.; Marshall N. Dana, Portland, Oreg.; Harry W. Bashore, Mitchell, Nebr.; Col. Gerald Fitzgerald, Washington, D. C.; Lachlan Macleay, St. Louis, Mo.; William E. Welsh, Boise, Idaho; Charles Marshall, Lincoln, Nebr.; Rt. Rev. Msgr. E. J. Flanagan, Boys Town, Nebr.; A. L. Miller, Kimball, Nebr.; Carl Curtis, Minden,

Nebr.; Ben F. Jensen, Exira, Iowa; Carl Hatch, Clovis, N. Mex.; Hugh Butler, Omaha, Nebr.; Chan Gurney, Yankton, S. Dak.; Brig. Gen. Lewis A. Pick, Omaha, Nebr.; W. G. Sloan, Billings, Mont.; William E. Warne, Washington, D. C.; J. C. Dykes, Washington, D. C.; John R. MacNicol, Ottawa, Canada; M. Q. Sharpe, Pierre, S. Dak.; and William H. Webb, Washington, D. C.; be it further

Resolved, That we also express our thanks to the city of Omaha and to the people of Omaha for the excellent manner in which all matters pertaining to the meeting have been handled.

NATIONAL RECLAMATION ASSOCIATION, WASHINGTON, D. C.

OFFICERS

Robert W. Sawyer, president, Bend, Oreg.
 Harry E. Polk, first vice president, Williston, N. Dak.
 Clifford H. Stone, second vice president, Denver, Colo.
 J. A. Ford, treasurer, Spokane, Wash.
 Don McBride, secretary-manager, Washington, D. C.

RESOLUTIONS COMMITTEE

Charles L. Kaupke, chairman, Fresno, Calif.	Robert T. Lingle, Raton, N. Mex.
Hugo B. Farmer, Yuma, Ariz.	A. U. Anderson, Crosby, N. Dak.
George M. Corlett, Monte Vista, Colo.	Hollis Arnett, Mangum, Okla.
Chas. W. Welteroth, Jerome, Idaho.	Robert B. Lytle, Vale, Oreg.
John E. Kissell, Portis, Kans.	Raymond F. Lund, Rapid City, S. Dak.
Don C. Treloar, Kalispell, Mont.	John D. McCall, Dallas, Tex.
C. Petrus Peterson, Lincoln, Nebr.	A. W. Watson, Salt Lake City, Utah.
A. J. Shaver, Las Vegas, Nev.	Rufus Woods, Wenatchee, Wash.
	Earl Lloyd, Cheyenne, Wyo.

Mr. SHAW. May I also ask for the privilege of filing such comments as we may be advised concerning the answers which Mr. Larson has just presented to the interrogatories submitted to him by Senator Downey; also such comments as we may be advised as to the testimony of the two witnesses to be heard this afternoon, Judge Stone and Mr. Tipton, which will not be subjected to cross-examination. And we understood generally at an earlier stage of the hearings that the chairman would permit us to file such general statements in rebuttal as the testimony may seem to require.

Senator MILLIKIN. That is right. The requests are granted.

Mr. SHAW. And that such comments may be printed in the record.

Senator MILLIKIN. That is right.

Mr. SHAW. Thank you.

(Supplemental statement by Mr. Shaw follows:)

SUPPLEMENTAL STATEMENT OF ARVIN B. SHAW, JR., ASSISTANT ATTORNEY GENERAL OF CALIFORNIA

At the hearing held July 3, 1947, the chairman granted California leave to file such supplemental statements commenting on statements of Arizona witnesses, or otherwise, as might appear advisable. At that hearing Attorneys Clifford H. Stone and Charles A. Carson and Engineer Royce J. Tipton, testifying for Arizona, attempted to answer certain legal propositions which had been advanced for California.

PURPOSE OF CALIFORNIA'S PRESENTATION OF LEGAL ISSUES

California witnesses presented to the subcommittee the following information and views:

1. There has been for many years a deep-seated controversy between California and Arizona as to the meaning of the Colorado River compact and associated documents which collectively constitute the "law of the river."

2. This controversy has not been determined by any competent tribunal.

3. On the solution of the issues in this controversy depend claims of the two States to large quantities of water, on the order of 2,000,000 acre-feet annually.

4. Witness James H. Howard, for California, isolated three of the major issues between Arizona and California and presented the contrasting views of the States on these issues, together with a sketch of some legal material tending, in his view, to support California's position. The primary purpose of this presentation was, not to convince the subcommittee of the correctness of California's views, but to illustrate the general statements made in paragraphs 1, 2, and 3 above and to show that the issues between the States are, in legal contemplation, substantial and debatable and such as lie within the jurisdiction of the judicial branch of government.

5. The Bureau of Reclamation bases its estimate of water available for a central Arizona project upon the assumption that interpretations of the compact, contracts, etc., made by "responsible officials of the State of Arizona," are right. The Bureau and the Department of the Interior, however, have maintained a correct position of neutrality between the States and do not assert the opinion that Arizona's interpretations are actually right.

6. If Arizona is right in all its contentions, the water supply for the Central Arizona project would be drawn away from constructed projects in California and these constructed projects would, to that extent, be rendered useless. These California projects have been planned for more than 25 years, have been constructed to substantial completion under Federal authority and in part by the Government, and are in operation. To construct them, California communities have obligated and committed their taxpayers for sums aggregating over half a billion dollars. Upon the integrity of the water rights of these projects depends the existence and development of agricultural districts comprising over 1,000,000 acres, and of the third largest metropolitan area in the United States.

7. On the other hand, if Arizona is not right in all its contentions, if it is wrong in any of them, there is no adequate water supply for the proposed central Arizona project. In that event, any works built for the project by Government would, long before the cost is repaid, be dry.

8. It is, therefore, not prudent for the United States to construct a billion-dollar project in reliance upon a bare assumption, nor upon the legal opinions of "responsible officials," or of attorneys or engineers. No opinion upon the complex of issues which makes up the controversy between California and Arizona, other than that of the Supreme Court, has binding validity.

9. No decision by the Congress would prevent the ultimate solution of the controversy by the Supreme Court.

10. It is the orderly and sound procedure not to risk the billion dollars until the rights of the States have been determined by the Supreme Court.

LEGAL SHOWING OF ARIZONA WITNESSES

Attorney Clifford H. Stone and engineers Royce J. Tipton and Ralph I. Meeker presented to the subcommittee material designed to rebut the views on legal issues presented by California witnesses. This material consisted largely of information upon which the witnesses based certain opinions, without, however, asserting that the issues have in any manner been determined. The end result of their testimony is to demonstrate the correctness of the California thesis; i. e., that there exists between Arizona and California a controversy, made up of substantial and debatable issues of profound importance.

Attorney Charles A. Carson took a different position. In his opinion there is no controversy; all issues have been settled in favor of Arizona. Since this conclusion rests upon his mere ipse dixit and since the two States, unhappily, remain in adverse positions, Mr. Carson's view is evident sophistry and requires no further comment.

In California's opinion, the testimony of witnesses Stone, Tipton, and Meeker, exhibits a variety of flaws of reasoning, misconceptions, and failures to join direct issue. Particularly it is noted that the Colorado witnesses for Arizona do not deny the accuracy of the quotations made by California witnesses from the hearings on the Mexican treaty and the official comments of the State of Colorado on the report of the Secretary of the Interior on the Colorado River. Since the determination of the controversy does not rest within the jurisdiction of the Congress, it does not appear useful, at this stage of the hearings, to analyze their arguments in detail, nor to burden the subcommittee with a comprehensive brief upon the three issues discussed for California by Mr. Howard.

It should here be noted for the record that the three issues selected by Mr. Howard for discussion do not comprehend the entire controversy. There are a considerable number of other major issues and a very great variety of subissues into which the main issues ramify.

The Congress has neither the function nor the procedural machinery to try this kind of lawsuit. Its duty is to ascertain whether it is proper to invest funds of taxpayers of the Nation in a particular project. The first criterion of feasibility of such a project is whether a dependable water supply is assured. The burden is upon the proponents of the project to show that a water supply is available. That showing, in view of the magnitude of the project, should approach demonstration.

When the Congress has ascertained:

1. That the water supply for the proposed project is involved in uncertainty, because it is the subject of an interstate controversy.

(a) That the controversy is one of long standing.

(b) That each State stoutly maintains its position and considers that it is fortified by acceptable facts and argument.

2. That many of the most acute issues in the controversy relate to the interpretation and application of a long series of writings, consisting of a compact, a number of statutes, a group of contracts, and a treaty, in each of which exist real, or asserted, ambiguities and such issues are therefore issues of law determinable only by a court.

3. That the factual field of the controversy relates—

(a) To a great and erratic river, of which the quantity of dependable flow is still an uncertainty.

(b) To the ultimate future economic development, agricultural, industrial and urban, of two large States of which the river is the last known water source; and

(c) To the predictability of movements of population and changing scientific and industrial processes which will affect such development.

4. And, finally, that the States have, over a period of 25 years, from time to time striven to compose their differences by compact, but without avail.

Then, the Congress has before it information sufficient to require it, in the exercise of ordinary business judgment, to defer authorization of the proposed project until it has been established by Arizona, through a decree of the competent court, that the project will have a water supply.

Senator McFARLAND. Mr. Chairman, may we have a limit on these comments? We would like the same privilege, if they are going to file further statements. Of course, we can have rebuttal and sur-rebuttal and just keep it up indefinitely.

It is not our object to want to keep out anything that is material, but we would like the hearings to be concluded and the record printed. Two or 3 days is all right but I do not think these hearings should be drawn out indefinitely.

Senator MILLIKIN. I shall not set any time, but I think you should be expeditious in doing it.

Mr. SHAW. Certainly, sir.

May I point out, if you please, that some of the questions addressed to California witnesses, either by Senator Millikin or Senator McFarland, asking for further information to be filed, will require reference to data which are at home in California and cannot be furnished, probably, until sometime next week.

Senator MILLIKIN. Just move it along as expeditiously as possible.

Mr. SHAW. We will attend to the matters just as promptly as we can.

Senator MILLIKIN. And, Senator McFarland, if the California material referred to calls for any answer on the part of Arizona, put it in and that then will be the end of the matter.

Senator McFARLAND. Yes. All right.

Judge Stone is our first witness.

STATEMENT OF CLIFFORD H. STONE, DIRECTOR, COLORADO WATER CONSERVATION BOARD, AND COMMISSIONER FOR COLORADO ON THE UPPER COLORADO RIVER BASIN COMPACT COMMISSION

Senator MILLIKIN. Judge Stone, will you take a seat and give the reporter your name, your address, and your business.

Mr. STONE. My name is Clifford H. Stone. For a period of 10 years I have been identified in various capacities with matters which concern the Colorado River.

I am a lawyer and have practiced in Colorado for 28 years. At the present time I am director of the Colorado Water Conservation Board and commissioner for Colorado on the Upper Colorado River Basin Compact Commission. My work has entailed a study and consideration of the Colorado River compact, Boulder Canyon Project Act, California's Self-Limitation Statute, and various contracts and documents relating to the Colorado River.

The compact, legislative acts, contracts, and related documents have been described as the law of the river.

Any proposed legislation which involves an interpretation of the Colorado River compact is of concern to each of the seven signatory States to that compact. Such interpretation is injected in the hearings on S. 1175 now before this committee.

In my appearance here, I shall confine my statement to two principal issues dealing with interpretation of the Colorado River compact. They are:

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?

It is my position that the million acre-feet of water, covered by paragraph (b) of article III of the Colorado River compact, is apportioned water to the lower basin. It is not excess or surplus water unapportioned by the compact.

Paragraph (b), article III, reads:

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 paragraph follows paragraph (a), which provides:

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.

Article III contains a paragraph (f) which, since the compact was approved by the Congress in 1928, has been commonly understood as the only provision of the compact defining excess or surplus waters of the Colorado River system, unapportioned by other provisions of article III.

This paragraph is important, and I shall discuss it extensively. It reads:

Further equitable apportionment of the beneficial uses of the waters of the Colorado River System—

and I wish the committee would note these reports—

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).

California makes the contention before this committee that III (b) water is a part of "excess or surplus waters unapportioned by the Colorado River compact."

In considering this question, the essential nature of an interstate compact must not be overlooked. A compact is an agreement or treaty of sovereign States. Under the Federal Constitution such a treaty or agreement may be made only with the consent of the Congress. After negotiation by representatives or commissioners of the compacting States, it may be effectuated only by ratification of the legislatures of such States. The terms and conditions of a compact must be construed and interpreted so as to reflect the understanding of the legislatures in the ratification of the compact.

The Colorado River compact, after ratification by six of the basin States, was approved by Congress by the Boulder Canyon Project Act, passed in 1928.

Senator MILLIKIN. Is it your contention that there is ambiguity in the compact requiring construction?

Mr. STONE. I am going to point that out to you. I take that up later, Senator.

The Supreme Court of the United States, in *Arizona v. California*, 292 U. S. 341, at page 359, held:

The Boulder Canyon Project Act rests, not upon what was thought or said in 1922 by negotiators of the compact, but upon its ratification by the six States.

This same case holds that when the meaning of a compact is not clear recourse may be had to written statements and documents communicated to the respective governments of the negotiators or to their ratifying bodies. This rule, no doubt, would also apply to written reports or communications transmitted to the Congress by a Federal representative who participated in the negotiation of a compact.

This rule is rational when it is kept in mind that it is the intent, purpose, and understanding of the ratifying bodies of participating State governments, which is of permanent concern. It is the will of the ratifying governments which gives effect to an interstate agreement. Compacts would be of little value, indeed, if their intent and purpose could be thwarted, changed, and modified by strained interpretations, founded on oral statements of negotiators and debates in Congress.

In any event, no resort should be made to written documents and legislative history of either the ratifying acts of the signatory States or of the Congress, if the language of a compact is clear, unambiguous, and unequivocal.

It is my position that the language of the Colorado River compact, respecting apportioned water and that which is unapportioned,

is so clear and unambiguous that there is no necessity of going beyond the language of the instrument itself to understand its terms, conditions, and provisions, which were ratified by the legislatures of the signatory States.

That answers your question, Senator.

It is against all rules of legislative and judicial procedure to equivocate concerning an agreement among sovereign States, when the language of an agreement made by them is reasonably clear. In this case, we contend that the compact language is so unquestionably clear and unambiguous that any effort to change its patent meaning by interpretations, allegedly supported by collateral documents and statements is equivalent to an attempt to thwart the will of the States. Extreme caution should be exercised to prevent a State, signatory to an interstate compact, from circumscribing by this method its solemn agreement with sister States.

Let us look at the language of the compact on the subject under discussion.

First, we observe that the compact deals with all of the water of the Colorado River and its tributaries within the United States of America. This is shown by article II (a) of the compact defining the "Colorado River system." It is also shown by other language throughout the compact.

Second, article III clearly shows that all of the water of the Colorado River system, except that provided for Mexico and the unapportioned surplus as specified in paragraph (f), is apportioned between the upper basin and the lower basin, and no apportionment of water is made to any particular State of either of the basins.

Paragraph III (a) "apportioned" from the Colorado River system in perpetuity to the upper basin and lower basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum. Article III (b) provided that "in addition to the apportionment in paragraph (a)," the lower basin is given "the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum."

The words "such waters" in paragraph (b) refer back to the waters of the "Colorado River system" mentioned in paragraph (a).

The dictionary defines the word "apportion" as meaning "to divide and assign in just proportion; to portion out; to allocate." It is only common sense to conclude that when the compact used the word "apportioned" in paragraph (a), and the words "the lower basin is hereby given the right to increase its beneficial consumptive use," in paragraph (b), the probative effect in each instance was the same.

The compact itself recognized that these terms were used in a synonymous sense when it provides in paragraph (f), article III, that—

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.

I think we cannot mistake that language.

Note that there, the negotiators of the compact, by their own language, which was subsequently approved by legislatures of the signatory States, used the word "unapportioned" to describe water which was not "apportioned" by either paragraphs (a) or (b) or (c). It is

this paragraph (f) which covers "excess or surplus waters." By its own language, it excludes the water in paragraph (b) which, under the contention of California, is attempted to be added to it. If it is the position of California that there is some other type of "excess or surplus water" that is unapportioned, then may we point out that by the terms of paragraph (f) all water is covered except that specified in paragraphs (a), (b), and (c).

It is folly to speculate, or attempt to draw conclusions, as do the spokesmen for California, that there is any significance in the manner by which the compact covers apportioned water in two separate paragraphs. We suspect that there were reasons which are not disclosed by the language of the compact. This is unimportant, however, if the effect of either or both paragraphs is to actually divide, apportion, or allocate water to the two basins or either basin. Effect must be given to the plain wording of the compact.

Nor is there any support in the fact that paragraph (f) mentions paragraph (c), as well as paragraphs (a) and (b), as apportioned water. It is contended by those who support California's position that paragraph (c) does not apportion any water. The fact remains that paragraph (b) is described by paragraph (f) as apportioned water. Further, may we point out that paragraph (c) does affect the apportionment of water. It provides that in the event the United States of America should recognize in Mexico any right to the use of any of the waters of the Colorado River system, such water 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 borne by the upper basin and the lower basin. The effect of paragraph (c) is to cut down the apportionment to each basin upon the happening of a certain contingency. Careful draftsmanship would surely dictate the inclusion of paragraph (c) in setting up in paragraph (f) what constitutes surplus water.

And, may we call attention to the language of paragraph (c) which, itself, clearly supports the conclusion that the water mentioned in paragraph (b) is not excess or surplus water unapportioned by the Colorado River compact. This paragraph states that any water for Mexico shall be provided "first from the waters which are surplus over and above the aggregate of the quantities specified in (a) and (b)." The definition and meaning of "surplus," over and above the aggregate of the quantities specified in paragraphs (a) and (b), is clearly shown by the compact. This paragraph (c) also provides that any future right of Mexico should be supplied from water surplus over (a) and (b). It demonstrates beyond question that all unapportioned surplus water is covered by paragraph (f), which, according to the expressed provisions of the compact, is water "unapportioned by paragraphs (a), (b), and (c)."

We urge, therefore, that by clear and unambiguous language the Colorado River compact provided that III (b) water is not excess or surplus but is apportioned. As a corollary to this conclusion, we submit that the will and understanding of the legislature which ratified the compact cannot be thwarted and changed by an attempt to vary its terms through collateral documents, statements, or by debate

in the Congress when the Boulder Canyon Project Act was under consideration.

This language was not misunderstood by Herbert Hoover, Federal representative, who participated in the negotiation of the compact. He was Chairman of the Colorado River Compact Commission. On March 2, 1923, he transmitted a report of the proceedings of the Commission and of the compact to the Speaker of the House of Representatives (Doc. 605, 67th Cong., 4th sess.). In his letter of transmittal he stated:

Due consideration is given to the needs of each basin, and there is apportioned to each $7\frac{1}{2}$ 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 $8\frac{1}{2}$ million acre-feet annually in perpetuity.

It will be noted that he used the word "apportioned" as applying both to the $7\frac{1}{2}$ million acre-feet provided for the upper and lower basins and to the additional million acre-feet of annual flow for the lower basin. He also stated that the apportionment of these two amounts was an apportionment of a total of $8\frac{1}{2}$ million acre-feet annually to the lower basin.

The Supreme Court of the United States supports the contention which we here make. In *Arizona v. California* (292 U. S. 341), the Court did not sustain Arizona's claim that the million acre-feet covered by III (b) water was specifically apportioned to Arizona alone. However, this same case held that III (b) water was apportioned to the lower basin. It also held that there is no ambiguity in article III (b) of the compact. It, accordingly, overruled the contention which California now makes that III (b) water is unapportioned. As we shall later show, under the California self-limitation statute, even though the compact does not apportion the million acre-feet specifically to Arizona, the effect of the compact in connection with that statute is to make such water available only to Arizona.

On page 358 of the Supreme Court case cited above, it is stated (*Arizona v. California*, 292 U. S. 341, p. 358, sixth ground):

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 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 Boulder Canyon Project Act, passed by the Congress in 1928, which provided for the approval of the Colorado River compact, included a section IV (a) which required California to pass what has been called a self-limitation statute. The effect of this statute, sub-

sequently passed by the California Legislature, is to limit California's use of Colorado River water under the Colorado River compact. The act provided that it should not take effect, and there should be no authority exercised under it and no moneys expended in connection with the works authorized by the act, until California passed such a statute.

The act further provided that it would not be effective unless within 6 months the compact was ratified by all of the signatory States; or if not, by such unanimous ratification, until six of such States, including the State of California, had ratified the compact and consented to waive the provisions of the compact requiring approval by all six States. The act further specified that as a condition to its becoming effective, 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 expressed 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, 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 use always to be subject to the terms of said Compact.

It is my opinion that the statute passed in 1929 by California in conformity with this provision of section IV (a) of the Boulder Canyon Project Act limits California to 4,400,000 acre-feet of water, plus one-half of the water unapportioned by paragraphs (a) and (b) of article III of the compact, exclusive of any water apportioned to Mexico by treaty. California, on the other hand, through its contention that water covered by paragraph (b) of article III is unapportioned water, takes the position that III (b) water is available as a part of excess or surplus water for use in the lower basin, including California.

We believe that we have shown that III (b) water is apportioned and that the only surplus or excess water is that specified in III (f) as being unapportioned by paragraphs (a), (b), and (c) of the compact.

Section IV (a) of the Boulder Canyon Project Act and the California statute on the subject clearly specify that the aggregate annual consumptive use "of water of and from the Colorado River for use in California" should not exceed 4,400,000 acre-feet of III (a) water, plus not more than one-half of the water unapportioned by the compact. This share of the apportioned water and of the unapportioned water makes up the total water supply which, under the compact and the self-limitation statute, is available to California from the Colorado River. III (b) is not included in the amount which may be used in this specification in California but, on the contrary, is expressly excluded from such use.

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.

It must be noted in this connection that the confluence of the Gila River with the Colorado is so far down, no part of it can be used in California.

**BENEFICIAL CONSUMPTIVE USE OF WATER UNDER THE COLORADO RIVER
PROJECT**

This is the second point, the question of the beneficial consumptive use of water under the Colorado River compact, which I am discussing.

It is contended by witnesses for California before this committee that beneficial consumptive use of water of the Gila River in Arizona is not measured by depletion of the virgin flow of the river at its confluence with the Colorado River, but is equal to the various increments of consumptive use at the points of use. If this principle is valid, it could be contended by California that it applied to the Upper Basin.

Technical phases of this subject will be discussed by other witnesses. The determination of this matter affects the amount of water which is available to Arizona, under the provisions of the Colorado River compact, to the extent of over 1,000,000 acre-feet.

Article III of the compact, which apportions water between the two basins, makes such apportionment for "beneficial consumptive use." Beneficial consumptive use, as applied to the compact, is nowhere defined in that document. An effort should first be made to determine the intended meaning from the compact itself. Patent evidence of what was intended by the States in making the compact is shown by article III (d), which provides:

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 first day of October next succeeding the ratification of this compact.

It will be noted that in specifying the measure of beneficial consumptive use of the water apportioned by the compact to the upper basin, depletion at Lee Ferry was used. It cannot be assumed that a measure of beneficial consumptive use would be used for the upper basin differently from that for a large tributary of a river, such as the Gila. The use of the phrase, we believe, would be applied consistently throughout the compact.

Since the use of the term by the compact is not defined therein and because of the importance of its application, resort may be had to statements and documents concerning the compact which were available to the governments of the States in ratifying the compact. The minutes of the Colorado River Compact Commission are extremely enlightening on this subject.

Here I quote from Reuel Leslie Olson, and Reuel Leslie Olson prints a large part of the minutes in the back of his book, The Colorado River Compact. These statements no doubt are taken from them. At page 35, Mr. Olson states:

The phrase "exclusive beneficial consumptive use" and the word "apportion" used in Article III, paragraph (a), defining the right of the Basins, gave great concern to the Commissioners. The first one of these terms, the phrase "exclusive

beneficial consumptive use" was taken by some of the Commissioners to raise the legal problem of whether or not representatives of the separate States could apportion or divide the corpus of the water. The second was selected to express the idea of division of the water between the Upper Basin and the Lower Basin because several of the Commissioners believed that its connotation was somewhat different from the meaning suggested by other terms. It was thought that the word apportioned did not imply appropriation and therefore did not raise the question of whether or not the interstate agreement would have any effect upon the existing system of vesting of water rights by appropriation under State law in the several States of the Colorado River area.

* * * It caused much argument at the time the Compact was drafted, and in the minutes of the meetings of the Commission we find remarks forewarning us * * * of the controversy.

On page 36, we find this further statement on the subject; by Olson :

The Commissioners sought to use language in the Compact which would avoid the issue. The phrase "beneficial consumptive use" was decided upon as the most nearly satisfactory expression. It was supplemented by a statement inserted in the official records of the proceedings to the effect that "the States of the upper division * * * wish to state affirmatively * * * that it is the understanding that the use of the language in Article III constitutes no waiver on their part or on the part of any one of them to any claim of ownership which they may have to the corpus of the water or any recognition of any right or claim on the part of the United States to the corpus of any of the unappropriated water of the stream, it being the understanding of these States that the language used is the medial ground which in no way raises or affects the title of ownership." This was subsequently adopted as the statement of all of the Commissioners.

The extended discussion of the matter appears from the Colorado River Commission minutes of the twenty-second meeting, November 1922, Bishop's Lodge, Santa Fe, N. Mex. Reference is made to the minutes on this subject, and as indicative of the discussion in support of the statement made by Mr. Olson, may I quote as follows :

Chairman HOOVER. The whole proposition here is whether you are going to divide the corpus of this water or whether you are going to divide the use. If you are going to divide the corpus of the water you are going to be in a mighty lot of trouble before the Federal Government. If you are going to divide the use of the water, I don't see any difficulties in the matter at all. Now if you are going to divide the corpus of the water you are going to adopt the extreme State view. If you are going to the other extreme and adopt the extreme Federal view you would acknowledge in this pact the unappropriated water belonged to the Federal Government and that by this act the Federal Government consented to transfer its rights to the States and it would never get through Congress.

The question is to find a medial ground which does not have either extreme, and finding that ground on the ground of use has struck me all along as being the medial ground which doesn't raise the question. If you are going to take Mr. Carpenter's view you are going to divide the corpus of the water. That is a contention I don't think the Federal Government would be inclined to stand for. It is not for me to decide, it is purely for you.

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.

Mr. Howard, in his statement before this committee, quotes from the State of Colorado's views and comments on the Colorado River

report of the Bureau of Reclamation. These Colorado statements are not inconsistent with the position which we take here. It is a technical matter which will be explained by engineering witnesses.

I might add Mr. Tipton will go into the matter in some detail.

Mr. Howard, in his statement before this committee, said that the phrase "beneficial consumptive use" is a "common one and well understood in water law as meaning diversions from a river minus return flow to the river." We most emphatically disagree with this statement.

From actual experience in compact making on other rivers, I know that the definition of "beneficial consumptive use" and the method of determining such use varies to apply to the specific conditions which are dealt with in a compact. The phrase has a very technical meaning and has been the subject of much study and discussion by the engineering profession. The technical use of the term is not well defined in the law. We do not believe that such technical use was understood or considered by the commissioners when they negotiated the Colorado River compact, nor by the States when it was ratified.

On the contrary, we have here submitted from the minutes of the compact commissioners what they had in mind when they considered the use of the term, and the only measure evidenced by the compact itself of beneficial consumptive use is that of depletion.

Then, in conclusion, the Congress, we believe, will not approve an unconscionable position in interpreting the Colorado River compact for the purposes 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.

California, under the compact, has proceeded with extensive development. California, according to the statements made before this committee, now claims that there is no water for the proposed central Arizona project or any other water development—future development, I mean—in the State. The California spokesmen arrive at this conclusion through the interpretations of the Colorado River compact which they asked this committee to accept. May I submit that if these interpretations are approved by this committee or should be approved in the future by a court, the terms of the Colorado River compact would be held to deny one of the signatory States an equitable share of Colorado River water.

Senator MILLIKIN. Any questions?

Senator McFARLAND. No questions.

Senator MILLIKIN. Thank you, Judge.

Senator McFARLAND. Our next witness is Mr. Tipton.

**STATEMENT OF R. J. TIPTON, CONSULTING ENGINEER FOR
THE STATE OF ARIZONA AND CENTRAL ARIZONA PROJECT
ASSOCIATION**

Senator MILLIKIN. Mr. Tipton, will you take a seat, and give the reporter your name, residence, and business.

Mr. TIPTON. Yes, sir.

My name is R. J. Tipton. I am a consulting engineer from Denver, Colo. I am appearing at this hearing in behalf of the State of Arizona and the Central Arizona Project Association. Among my clients is the Colorado Water Conservation Board for which I am consulting engineer. I am appearing with the full knowledge of responsible officials of the State of Colorado, including the Governor. I have no knowledge of the physical features or merits of the central Arizona project. My statement will be confined to a discussion of water supply and its availability under the Colorado River compact and related documents.

The statement of Mr. James H. Howard, presented to the committee on June 28, makes it necessary for me, in behalf of the State of Colorado, to correct certain impressions which he left with the committee as to Colorado's interpretation of some of the matters which affect the water supply available under the compact to the upper basin as well as to Arizona.

He quoted statements which I made in connection with the Mexican water treaty hearings and quoted from an official report of the State of Colorado which commented on the Colorado River Basin report of the Bureau of Reclamation. The Colorado report was signed by the Governor of the State of Colorado; Clifford H. Stone, director of the Colorado Water Conservation Board; C. L. Patterson, chief engineer of the board; Jean S. Breitenstein, attorney for the board; and myself as consulting engineer of the board. The interpretations which Mr. Howard accredited to me and to the State are directly opposed to the State's interpretation and my interpretation of the matters involved.

In my statement I desire to discuss the following phases of the problem: (1) Beneficial consumptive use; (2) water supply of the Colorado River Basin and the amount available for use by Arizona; and (3) the California situation.

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 water as a result of man's activities.

By California's interpretation, all of the water salvaged by man on tributaries of the Colorado River by converting natural losses to beneficial use would be charged against the amount of the basin's apportionment and against the State's equitable shares of such apportionment, this in spite of the fact that water so salvaged under virgin conditions never did reach the main stream and never could have been used by any other water user in the Colorado River Basin except the one who salvages the water.

Simply stated, California's position is that the upper basin's 7,500,000 acre-feet of annual beneficial consumptive use apportioned by the

compact shall be determined by adding up all of the small increments of consumptive use along all of the tributaries, large and small, in the upper basin, each increment of consumptive use to be ascertained by the measurements of diversions from the stream and by deducting from the amount of the diversions the returns to the stream from which each individual diversion is made. California's interpretation would involve the measurements of the thousands of diversions in the upper basin and the measurements of the thousands of returns to the streams from the lands irrigated by those diversions.

The State of Colorado's position is that the upper basin under the Colorado River compact has the right to deplete the virgin flow of the Colorado River at Lee Ferry by 7,500,000 acre-feet annually. This difference in interpretation means a difference in the estimated water supply available to Arizona under the compact and related documents of over 1,000,000 acre-feet, all of which difference is involved in the application of the two interpretations to the use of water on the Gila River. In the upper basin a substantial amount of water is involved.

Mr. James H. Howard, in his statement, assumed the problem to be a simple one. He stated:

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 the river. The words "consumptive use" have been defined in other documents relating to the Colorado River.

Mr. Howard makes this statement despite the fact that the Supreme Court of the United States in an important interstate water case interpreted evidence with respect to consumptive use to mean to divert, take, and use. When in a subsequent case it was sought to have the Supreme Court interpret its decision, the Supreme Court said that it meant gross head-gate diversion, so apparently there is some legal confusion about the legal meaning of the term.

From an engineering standpoint, the conception of consumptive use as it affects the flow of the stream has gradually gone through a process of evolution since the term was first coined in the suit over the uses of water of the Laramie River, *Wyoming v. Colorado*. Much work is still being done on this subject by engineers who are studying the problem in various river basins.

In my discussion concerning the meaning of "beneficial consumptive use" as it appears in the Colorado River compact, I shall approach the problem, first, on the basis of intent of the Colorado River Compact Commissioners at the time the Colorado River compact was negotiated and, second, on the basis of the technical conception of consumptive use at the present time and the evolution which has brought about such conception.

The Colorado River Compact Commission at the time it apportioned the water between the two basins—

Senator MILLIKIN. Is it your contention that we should be governed by the present as distinguished from the then current conception of the meaning of the words "consumptive use?"

Mr. Tipton. No. It is my position that we should be governed by the conception that the Colorado River Commission had of the term and the intent that the commission had in apportioning the water.

Senator MILLIKIN. What is the relevancy of the present conception of the words?

Mr. TIPTON. The reason for bringing that into the discussion, Mr. Chairman, is to make clear the meaning of Colorado's comments on the Colorado River report by the Bureau of Reclamation, which Mr. Howard quoted.

In my oral presentation, I need not dwell on the technical conception if it seems desirable, in order to save time—I mean during the hearing. But that is the only purpose.

Senator MILLIKIN. Proceed please.

Mr. TIPTON. The Colorado River Compact Commission at the time it apportioned the water between the two basins was not thinking in terms of the technical meaning of "beneficial consumptive use" when it used such term in the compact. The commission used the term for legal reasons. The Colorado River compact commissioners were thinking in terms of dividing between the basins the virgin (termed by them reconstructed flow) of the river in the amount estimated at or near the international boundary. The 7,500,000 acre-feet apportionment to each basin was from the virgin flow at Lee Ferry. The Colorado River Compact Commission in considering the consumptive use of the Gila River was thinking in terms of the depletion of the river at the mouth. The Colorado River Compact Commission, when considering consumptive use in the upper basin was thinking in terms of the depletion of the flow of the river at Lee Ferry. The above conclusions with respect to the intent of the commission are plainly indicated in the minutes of the various meetings of the commission.

I am submitting herewith as appendix A excerpts from the minutes of the seventeenth meeting held in Santa Fe, N. Mex., on November 15, 1922, and the minutes of the eighteenth meeting held at the same place on November 16, 1922, all of which contain the discussion of the commission when it was considering the division of the water of the Colorado River.

In my discussion I wish to quote a portion of the minutes which show plainly the intent of the commission. The emphasis is supplied by me by underlining in the quotations as well as in the appendix.

Senator MILLIKIN. Is that excerpt similar to the one Judge Stone mentioned?

Mr. TIPTON. No, sir. It is entirely different.

Senator MILLIKIN. Proceed please.

Mr. TIPTON. The commission in its attempt to estimate the virgin flow of the river gave consideration to the recorded flow at Laguna, which was a gaging station on the river below the old Laguna Dam diversion and above the old Imperial diversion. In its studies the commission chose to add to that flow the consumptive use of the upper basin and the consumptive use in the Gila Basin plus its outflow at the mouth. At an early point in the minutes which I am attaching, the following statements were made:

Mr. HOOVER. Then the problem also goes into the consumptive use in the upper basin. In order to reconstruct the river the consumptive use in the upper basin must be taken into account. It is true that the Laguna gagings include the Imperial Valley?

Mr. A. P. DAVIS. Yes.

It may be noted that Mr. Hoover stated that in order to reconstruct the river the consumptive use in the upper basin must be taken into account. I quote the following from the minutes:

Mr. HOOPER. And if you were to reconstruct the river you must also take account of the consumptive use of the upper basin and add that to the Laguna gagings, and ought to add also the Gila flow. Have you a rough idea as to what the flow of the Gila would be if it had not been used for irrigation, or what the consumptive use, plus the present flow, is?

Mr. A. P. DAVIS. I can estimate that fairly closely. The mean annual flow as measured during the last 20 years is 1,070,000 acre-feet. The areas that are irrigated there are given in this document, 142, and we can apply a duty of consumptive use of water on that area and approximate fairly well, I believe, the consumptive use in the Gila Basin, if that is what is wanted.

Mr. HOOPER. My only point on that is, Does it approximate, possibly, the amount of consumptive use in the upper basin?

Mr. A. P. DAVIS. Oh, no. It is smaller. The consumptive use in the upper basin is on that table I gave you.

Mr. HOOPER. About 2,400,000?

Mr. A. P. DAVIS. In 1920 the consumptive use was about 2,400,000 acre-feet.

Mr. CARPENTER. This is a progressive increase from 0 up?

Mr. A. P. DAVIS. Yes.

Mr. CARPENTER. You would think the Gila consumptive use would be something over a million and a half feet?

Mr. A. P. DAVIS. Very likely less than a million and a half. But I am not sure about that till I figure on it a little.

Mr. CARPENTER. In other words, there might be——

Mr. A. P. DAVIS (interrupting). There would be a good deal less.

Mr. CARPENTER. There might be, then, a million acre-feet to go into this calculation for translating back from Laguna gagings?

Mr. A. P. DAVIS. To include the Gila; yes. It doesn't seem like it would apply to the Little Colorado as its contribution is offset by evaporation. There is very little outside the Gila Basin that is not thus offset.

Mr. CALDWELL. Mr. Davis, just where is the Gila measured?

Mr. A. P. DAVIS. There have been different points; one at Dome.

Mr. CALDWELL. Tell me where it is with respect to the mouth?

Mr. A. P. DAVIS. Dome is about 12 miles above the mouth, and that was changed on account of difficulties of measurement, but not very materially.

Mr. CALDWELL. This million seventy thousand you speak of is an average flow, is it?

Mr. A. P. DAVIS. Yes.

Mr. CALDWELL. Average annual flow over how many years?

Mr. A. P. DAVIS. Eighteen years, I believe. It is all published in Senate Document 142.

Particular attention is directed to Mr. Hoover's question where he asked Mr. Davis:

Have you a rough idea as to what the flow of the Gila would be if it had not been used for irrigation, or what the consumptive use, plus the present flow, is?

It is significant that Mr. Hoover's intent was to determine what the flow of the river would have been to the Colorado River had there been no irrigation on the river. He considered consumptive use and depletion as synonymous because he suggests that the flow before irrigation would be the consumptive use plus the present flow (at the mouth). This is subsequently made plain.

Attention is directed particularly to Mr. A. P. Davis' statement to the effect that:

It doesn't seem like it would apply to the Little Colorado, as its contribution is offset by evaporation. There is very little outside the Gila Basin that is not thus offset.

In other words, the commission in estimating the amount of water available for apportionment was not considering any of the water which did not reach the main stream of the Colorado River, and as a matter of fact in considering any contributions that in the virgin state did not reach Laguna and the mouth of the Gila.

I call attention to the following statement by Mr. Hoover taken from the minutes of the meeting as shown in appendix A:

Mr. HOOVER. What would be added here, as a rough guess, would be the flow and consumptive use of the Gila and Little Colorado and the consumptive use of the Colorado below Lee Ferry and above Laguna. This all comes to about a million and a half, and the consumptive use in the upper basin is 2,400,000 so it would be a credit of water to the Laguna readings of approximately a million feet, something like that.

He considers that the flow of the Gila River plus the contribution of the Little Colorado, plus the consumptive use of the Colorado below Lee Ferry and above Laguna amounted to about 1,500,000 acre-feet. Mr. Davis had already stated that the Little Colorado contributed nothing and that there was very little contribution except by the Gila. It is apparent, therefore, that the 1,500,000 acre-feet which the commission was to add to the flow at Laguna was to represent the virgin flow of the Gila River made up of 1,070,000 acre-feet at the mouth (at Dome, about 12 miles above the mouth) plus approximately 500,000 acre-feet of consumptive use. It is interesting in view of information we now have to check Mr. Davis' estimate of the consumptive use on the Gila and of its virgin flow.

Table CXLVI on pages 284 and 285 of the March 1946 report of the United States Department of the Interior and the Bureau of Reclamation report on the Colorado River shows the estimated virgin flow of the Gila River at the mouth. This is shown in the last column in the table. For the 18 years mentioned by Mr. A. P. Davis, the estimated virgin flow was 1,920,000 acre-feet. This may be compared with the 1,500,000 acre-feet mentioned by Mr. Hoover, cited above. In further explanation of the 1,920,000 acre-feet, that is merely the arithmetical mean of the 18 years mentioned as taken from the last column of the table which was cited as appearing in the Bureau's 1946 report.

If from the 1,920,000 acre-feet there is subtracted Mr. Davis' estimate of the flow of the Gila at the mouth, there results the value of 850,000 acre-feet of indicated depletion of the Gila River at the mouth for the 18-year period.

And at that point I might say that the 850,000 acre-feet would be Colorado's interpretation of the beneficial consumptive use on the Gila at that time, using more complete estimates that are available to us as to the virgin flow which occurred for the 18-year period.

The mean annual total water supply at the point of use in central Arizona for the same 18-year period is indicated by values in the table to have been 3,100,000 acre-feet.

This, again, is an arithmetical mean of the values, appearing in the Bureau's table.

By the California interpretation, the consumptive use in the Gila River during the 18-year period would have been 2,030,000 acre-feet. This may be compared with the 850,000 acre-feet arrived at above. It may be noted that the difference in the Gila consumptive use arrived at by the one interpretation as opposed to the other interpretation

again is something over 1,000,000 acre-feet. It does not appear that the commission was interpreting "consumptive use" in the same fashion that California is.

The following is quoted from the minutes which appear in appendix A:

Mr. HOOVER. I should think for matters of discussion we could take it that the reconstructed mean at Lees Ferry is a minimum of 16,400,000 and perhaps, with this elaborate calculation, half a million above, i. e., 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.

Mr. S. B. DAVIS. With all due respect to these eminent gentlemen, I am still from Missouri, I have to be shown, but I am willing to enter into a discussion on that line.

Mr. HOOVER. I should think the result of the deliberations and of our advices on that matter have been to establish the 16,000,000 as a sort of least mean.

Mr. S. B. DAVIS. As the average mean at Lees Ferry.

Mr. HOOVER. Yes; and that an apportionment of a minimum would be half that sum, 8,200,000 acre-feet instead of the 6,260,000 feet as suggested by Mr. Carpenter—so that this would be the question of your proposal, delivering approximately 82,000,000 acre-feet in 10-year blocks.

It may be noted that the commission, after going through the various calculations to reconstruct the flow of the river at Lee Ferry, arrived at a minimum estimate of 16,400,000 acre-feet per year which Mr. Hoover mentioned might be as high as 17,000,000 acre-feet. At that point in the deliberation, the commission was considering a 50-50 division of the water supply. Mr. Hoover therefore suggested an apportionment of a minimum of the 8,200,000 acre-feet to the lower basin, which was one-half the estimated minimum reconstructed flow at Lee Ferry of 16,400,000 acre-feet.

It is apparent, therefore, at this point the commission was engaged in apportionment of the virgin flow of the river between the two basins. The final apportionment so far as the division of the water at Lees Ferry is concerned was made on that basis as evidenced from the following discussion quoted from the minutes which appear in appendix A:

Mr. HOOVER. In our discussions yesterday we got away from the point of view of a 50-50 division of the water. We set up an entirely new hypothesis. That was that we make, in effect, a preliminary division pending the revision of this compact. The seven and a half million annual flow of rights are credited to the south, and seven and a half million will be credited to the north, and at some future day a revision of the distribution of the remaining water will be made or determined.

An increasing amount of water to one division will carry automatically an increase in the rights of the other basin and therefore it seemed to me that we had met the situation. This is a different conception from the 50-50 division we were considering in our prior discussions.

Mr. NORVIEL. If this includes reconstruction of the river, then, I concede it is a more nearly fair basis. But if it does not—if it is a division of the water to be measured at the point of demarcation, I still insist that it is not quite fair, because it is simply dividing what remains in the river.

Mr. HOOVER. We are leaving the whole remaining flow of the basin for future determination.

Mr. NORVIEL. What I am getting at is this: That the upper basin takes out and uses a certain amount of water, and as this reads, it proposes to divide the rest of it, 7,500,000 acre-feet per annum.

Mr. HOOVER. No.

Governor CAMPBELL. That is inclusive, Mr. Norviel.

Mr. NORVIEL. It reconstructs the river?

Governor CAMPBELL. Yes; in effect, as I understand it.

Mr. NORVIEL. Well, if it does that, then my objection will be removed.

Mr. HOOVER. Any other comment? If not all those in favor of this clause 7 as read please say "Aye."

(Thereupon a vote having been taken upon the paragraph No. 7, the same was unanimously passed.)

It may be noted that 7,500,000 acre-feet was apportioned to each basin from the reconstructed flow of the river at Lee Ferry. Mr. Norviel was concerned because he feared that the discussion related to the division of the flow of the river at "the point of demarcation" (Lee Ferry) without its being reconstructed or brought to virgin conditions. When he was assured that the intent was to apportion the reconstructed flow of the river in terms of 7,500,000 acre-feet to each basin, he stated that he would remove his objections. The commission then unanimously voted to adopt such apportionment.

Judge Stone has already shown that the Colorado River Compact Commission used the words "beneficial consumptive use" in the compact to avert implying that the commission was dividing the corpus of the water. The use of the term was for legal reasons and had nothing to do with the technical conception of consumptive use at the present time. In the interest of saving time I shall not read all my discussion on the present technical conception of consumptive use.

Senator MILLIKIN. You might state the end point, Mr. Tipton.

Mr. TIPTON. Summarizing then, it is recognized by definition that there is "farm consumptive use," there is "project consumptive use," there is "valley consumptive use," and there is "basin consumptive use."

Consumptive use is measured by inflow to an area minus outflow from the area; for a farm, consumptive use is diversions minus the return; for a project area, it is the diversions by the main canals minus the return; for a valley, it is the inflow to the valley minus the outflow. For a basin it is likewise the inflow minus the outflow.

The man-made consumptive use or depletion within incremental areas will reflect itself at the mouth of a valley or a basin as depletion, and the difference between the consumptive use of a valley in the virgin state as evidenced by the inflow minus the outflow, and the consumptive use after man has developed the valley evidenced by the then inflow minus outflow represents the beneficial valley consumptive use.

Valley consumptive use so measured is a smaller item than the sum of the incremental consumptive uses in the valley because of the salvaging of water. The same is true for the basin as a whole. The basin consumptive use is less than the sum of the valley consumptive uses on account of the salvaging of water within the valleys which never did reach the mouth of the basin under virgin conditions.

That is, virtually, the substance of my technical concept, the depletion factor of consumptive use. In the middle of page 15 of my written statement is the sentence "Valley consumptive use is determined by measuring inflow to the valley and deducting the outflow."

At that point I desire to submit a definition which appears in the Report of the Joint Investigation on the Upper Rio Grande to make the problem somewhat clearer. I will not read it at this time but, with the chairman's permission, I would like to submit that as part of my testimony.

Senator MILLIKIN. All right.

Mr. TIPTON. I shall resume, then, reading my written statement.

To get further insight to the Commissioner's thinking, I wish to quote an excellent statement of Mr. Delph Carpenter's made at the

eleventh meeting of the commission held in Santa Fe on November 11, 1922:

Mr. CARPENTER. When you proceed to reduce the adjustment to one of a definite fixing of quantities, or limitations of use as to each State, you have to proceed to a degree of refinement that is hazardous and at this time calls for a knowledge which no man possesses.

We do not have and cannot obtain, except by long years of study hereafter, basic data upon which to work. Between States in either of these great divisions very different principles should be applied on each different and distinct river, and may have to be applied. The facts are different. *For illustration, some of the rivers rise in the mountains to wither away on the plains before they reach the lower States within a division.* Others are increasing rivers as they flow out from their original source. The territory is new, the conditions will develop and if allowed to develop naturally will call for the ultimate solution between the interested States as respects any particular river.

In preparing the draft which I have submitted, I first proceeded upon the theory of the individual allocation. My advisers and I myself found ourselves in the position of saying that, as respects a virgin territory, we would be called upon to fix an artificial limitation that might work great injustice later. The river is new, the territory is new, and, thereby, after studying stream after stream that flowed out from the mouth, it became evident that *it would be unwise and imprudent to attempt to deal definitely with each detailed river, each individual tributary stream.*

Proceeding upon that hypothesis, or proceeding upon that conclusion, it became then a problem of seeing if it could not be worked out on a *divisional basis, that division basis largely having been fixed by nature.* We have a great catchment basin like the receptacle basin of a funnel; we have the funnel neck, the canyon, and below the territory that receives the water through this funnel neck with certain additional supplies arising and flowing in that territory, so, in order to attempt to work the problem out and avoid the conflict that would invariably be provoked in this council if you were to attempt to go into detail with respect to each State, it was thought by us more prudent to strike at the root of the whole problem on a *divisional allocation of the waters of the river.*

The italics are mine.

Mr. Carpenter's statement concerning some rivers which rise in the mountains and wither away on the plains before they reach the lower States within a division is quite significant. It appears that he recognized the waters of such rivers were not available for apportionment among the States. He came to the conclusion that it would be unwise to deal with each detailed river and each individual tributary stream and that there should be a divisional allocation of the waters of the river. He described the physical conditions of the canyon section between the two basins which made such a divisional allocation practicable.

It is my conclusion that the Colorado Compact Commission did apportion the virgin flow of the Colorado River and that it is 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.

From a technical standpoint, consumptive use is the amount of water consumed by plants plus the incidental evaporation that takes place due to the irrigation of the plants. Consumptive use includes both the consumption of rainfall and the depletion of stream flow. On a short-time basis, it may also involve a change in ground water from one season to the next. For the purpose of this discussion, I shall consider only that part of consumptive use which causes stream depletion due to man's activities. That is the element of consumptive use with which we are concerned and with which the Colorado River Commission was concerned at the time the compact was negotiated.

Since the term was first coined, engineers have given much study to consumptive use, its effect, and means of measuring it. A technical subcommittee of the irrigation division of the American Society of Civil Engineers gave some attention to the problem in the middle 1920's. This committee recognized the difference between consumptive use as applied to various sizes of areas ranging from individual farms to an entire valley. During the hearings in the last Arkansas River Supreme Court suit in the 1930's, *Colorado v. Kansas*, it was fully recognized that basin consumptive use was not equal to the sum of all the increments of consumptive use in the basin. It was recognized that a material salvage of water takes place as a result of the irrigation of a basin. Much work along the same line has been done since that time.

By definition, there is farm consumptive use, project consumptive use, valley consumptive use, and basin consumptive use. Farm consumptive use is the amount of stream flow actually consumed by plant growth and burned up by incidental evaporation on the farm. Project consumptive use represents the amount of water consumed on the project which causes depletion of the stream flow between the head of the project and the point where the return flow reaches the stream. In general, consumptive use, aside from rainfall, and disregarding annual change in ground water, is determined by measuring the inflow to an area and deducting the outflow.

For example, farm consumptive use is measured by deducting the flow of water leaving the farm from the diversion to the farm. This is ordinarily difficult because some of the return from the farm reaches the ground water and is not susceptible of measurement as it passes the boundaries of the farm.

Project consumptive use is measured by measuring the diversion through the main canals to the project and deducting therefrom the measured returns in drainage canals and waste ditches crossing the project boundaries.

Valley consumptive use is determined by measuring inflow to the valley and deducting the outflow.

The following definitions are quoted from page 88 of Regional Planning, Part VI—Upper Rio Grande, February 1938, National Resources Committee.

"Definitions: The following definitions of consumptive use were used by the Bureau of Agricultural Engineering in its study:

"Consumptive Use (evapo-transpiration): The sum of the volumes of water used by the vegetative growth of a given area in transpiration or building of plant tissue and that evaporated from adjacent soil, snow, or intercepted precipitation on the area in any specified time.

"Valley consumptive use: The sum of the volumes of water absorbed by and transpired from crops and native vegetation and lands upon which they grow, and evaporated from bare land and water surfaces in the valley; all amounts measured in acre-feet per 12-month year on the respective areas within the exterior boundaries of the valley.

"The valley consumptive use (K) is equal to the amount of water that flows into the valley during a 12-month year (I) plus the yearly precipitation on the valley floor or project area (P) plus the water in ground storage at the beginning of the year (G_1) minus the amount of water in ground storage at the end of the year (G_2) minus the yearly outflow (R): all amounts measured in acre-feet. The consumptive use of water per acre of irrigated land is equal to (K) divided by irrigated area (A_1); and consumptive use per acre of the entire valley floor is equal to (K) divided by the entire valley area. The unit is expressed in acre-feet per acre.

"Stream-flow depletion: The amount of water which annually flows into a valley, or upon a particular land area (I), minus the amount which flows out

of the valley or off from the particular land area (R) is designated 'stream-flow depletion' ($I-R$). It is usually less than the consumptive use and is distinguished from consumptive use in the Rio Grande studies."

The report from which the above is quoted gives results of the so-called Rio Grande joint investigation which was participated in by all of the major Federal agencies interested in water development. The interested States—Colorado, New Mexico, and Texas—cooperated in the investigation.

The report indicates consumptive use, set up as a formula to be as follows:

$$K=I-R+P+(G_0-G_e)$$

in which K is the consumptive use, I is the inflow to the area, R is the outflow from the area; P is the precipitation, G_0 is the ground-water storage at the beginning of the period and G_e is the ground-water storage at the end of the period. In the equation, depletion is represented by $I-R$. The reason that depletion is usually less than consumptive use is apparent because consumptive use includes consumption of precipitation as well as depletion. Disregarding precipitation and change in ground-water storage, the equation indicates that consumptive use is synonymous with depletion. As I have indicated in my discussion, I am considering only that part of consumptive use which is represented by depletion.

In a river valley the water supply is considered as the outflow from the valley. In the virgin state this would be considered the valley water supply. It is only reasonable to interpret valley consumptive use occasioned by man in terms of the depletion of the valley water supply as represented by the outflow from the valley.

Beneficial consumptive use by man in the valley from the valley standpoint is the difference between the valley consumption as it existed before man entered the valley and valley consumption as it existed after he made his water-consuming development. Valley beneficial consumptive use is a smaller amount than the aggregate of all the project and farm consumptive uses which is taking place within the valley. By like token the sum of all the valley beneficial consumptive uses within a basin is a larger quantity than basin beneficial consumptive use measured as the depletion of the outflow from the basin by man's activities within the basin. This is true because of the salvaging and putting to beneficial use water which was lost under natural conditions.

Two major sources for salvage exist. One is the reduction of stream flow losses by diverting and putting the water otherwise so lost to beneficial use. The other is the conversion of natural losses of river water occurring on raw land to beneficial use after the land is irrigated.

The first type of salvage can best be illustrated by reference to a hypothetical transmountain diversion in the upper Colorado Basin. Assume that such a diversion exports from the headwaters of the Colorado River 500,000 acre-feet of water per year. The exporting of such amount of water represents a depletion of tributary flow of 500,000 acre-feet at the immediate point of exportation. It could be considered so far as the Colorado River is concerned as project consumptive use in the full amount at that point. However, the diversion out of the basin of the 500,000 acre-feet would not deplete the flow of the river at Lee Ferry by 500,000 acre-feet because had this quantity been left in the river, some of it would have been lost in transit by natural processes.

Many areas of raw land in the upper basin of the Colorado River were consuming water from the tributaries of that river in the state of nature before these areas were irrigated. The same is true with

respect to many areas that will be irrigated in the future. This is particularly true with respect to native meadowlands such as exist in the Green River Basin in Wyoming and along the upper tributaries in Colorado and Utah. In the state of nature large areas of these lands were perennially overflowed by the streams which caused them to consume water. When man entered the picture, built his ditches, and started to apply water to the land artificially, the consumption of river water by those lands may not have caused much more depletion of the stream than was taking place under virgin conditions. He was merely putting to beneficial use some of the water that was being dissipated by nature in the virgin state. The effect of man's activities in this case on valley consumptive use and basin consumptive use would be the extent to which he increased the depletion of the outflow from the valley and the outflow from the basin.

The salvage of water in the upper basin by these processes after ultimate development has been made may be a substantial item. Testimony already before the committee indicates the item in the Gila River Basin amounts to some million acre-feet per annum. If California's theory were accepted, she would ask that all the small incremental items of consumptive use in the upper basin which occur on the farms and on the projects be added up and that this be considered the beneficial consumptive use that was apportioned to the upper basin under article III (a) of the Colorado River compact. By such process she would be charging the upper basin with natural losses which the upper basin will have salvaged. This salvaged water never did reach the lower basin and never could have reached the lower basin in the state of nature. Nevertheless, California maintains that the equivalent of such salvage water shall flow past Lee Ferry in order to increase the amount of surplus or unapportioned water in the Colorado River Basin.

A hypothetical example may be given to show the effect of this on an individual State. Approximately 80,000 acres of native meadow land exists at the present time in the Green River Basin in the State of Wyoming. At the point of use these lands probably are consuming in the order of 100,000 acre-feet of river water per annum. In the state of nature before man entered the picture those lands probably were consuming about 60,000 acre-feet per annum. Man therefore has increased the consumption of river water by 40,000 acre-feet. All of the 40,000 acre-feet of water which man's activities are causing to be lost at the present time at the point of use did not reach Lee Ferry in the state of nature because some of it was lost in transit. Under California's theory, there would be charged against Wyoming's equitable share of the water apportioned to the upper basin the total of 100,000 acre-feet now being consumed by the lands although the citizens of Wyoming caused the flow to the lower basin to be depleted by less than 40,000 acre-feet. California would charge Wyoming with all of the natural losses estimated at some 60,000 acre-feet on those particular lands which occurred before Wyoming was settled and some of the river losses between the meadow lands and Lees Ferry which existed under virgin conditions. A similar situation exists with respect to the other upper basin States.

On the other hand, during periods of protracted droughts should it become necessary for the upper basin to curtail the use of water

in order to deliver the 75,000,000 acre-feet (at Lee Ferry) in a 10-year period in accordance with article III (d) of the compact, the curtailment must be in sufficient amount to make up the deficiency at Lee Ferry. The increments of consumptive use which are curtailed will in the aggregate exceed the deficiencies at Lee Ferry by the amount of channel loss required to get the water to Lee Ferry. California therefore in the one instance would not permit the upper basin to enjoy the use of the river losses it salvages, but in the other instance would require that the upper basin make up the river losses by curtailing the increments of consumptive use an amount sufficient to supply such losses.

Mr. Howard in his statement quotes from the Mexican Water Treaty hearings where I call attention to the fact that the treaty uses the term "consumptive uses." Such term was deliberately used in the treaty to include consumptive uses on the various tributaries of the stream.

I want to call particular attention to the use of the word in the plural, "consumptive uses." It was used so that neither deliveries nor basin consumptive use would be the controlling item when the extraordinary drought provision of the treaty is invoked.

Senator MILLIKIN. We will take a 5-minute recess.

AFTER RECESS

Senator MILLIKIN. All right, Mr. Tipton.

Mr. TIPTON. Such provision has no relation whatsoever to the apportionments of water made by the compact. The aggregate of the consumptive uses as used by me in connection with the treaty will be greater than the basin consumptive use because they include water salvaged which in the virgin state was lost by natural processes to the basin and did not reach Lee Ferry.

The same principle was recognized in Colorado's comments on the Colorado River report by the United States Bureau of Reclamation (project report No. 34-8-2). The Bureau underestimated the water supply that would be available to take care of the aggregate of the consumptive uses in the basin by the amount of water that would be salvaged when the basin is entirely developed. The Bureau made an estimate of the consumptive use by each individual project, then added these estimates together and compared the sum with its estimate of the virgin flow of the river at the international boundary in order to determine whether sufficient water was available to supply the quantity of water represented by the sum of the individual project consumptive uses. Colorado's comments pointed out the technical error involved in such a process. Various increments of salvaged water which do not appear as a part of the estimated virgin flow of the Colorado River at the international boundary will be available to take care of some of the consumptive use of those projects which are constructed.

In my opinion, the basin beneficial consumptive use in the upper basin will reach a total of 7,500,000 acre-feet under the terms of the Colorado River compact when the depletion at Lees Ferry caused by man's activities equals 7,500,000 acre-feet. This will be less than the sum of the project consumptive uses in the basin.

Mr. Howard reached the interesting conclusion that California's interpretation of beneficial consumptive use as used in the Colorado

River compact would be beneficial to the upper basin. He stated that such interpretation would increase the surplus water—water unapportioned by the Colorado River compact—which then would be available to supply the Mexican burden. In this way, he said the call on the upper basin to make up deficiencies in Mexican deliveries would be less frequent and the amounts required to be supplied would be less. In the process, however, the upper basin would be deprived of the current use of a significant quantity of water which I recognize and concede, under California's interpretations, would fall in the category of surplus. California claims one-half of the surplus; Arizona has a water-delivery contract providing for use by her of one-half the surplus at least until 1963. Who finally gets the surplus on a permanent basis depends upon the results of negotiations by commissioners appointed by the Governors of the seven States of the Colorado River Basin some time after 1963. I am of the opinion the upper basin will be content to enjoy the use of the salvaged water under its interpretation of the compact and not permit the salvaged water under California's interpretation to fall into the category of surplus or unapportioned water.

California's witness, Mr. Raymond Matthew, apparently has the same conception of the compact meaning of "consumptive use" in the upper basin as has Colorado because he estimates consumptive use under the compact in terms of depletion at Lee Ferry. Mr. Matthew, on April 16, 1947, appeared before this same subcommittee in connection with hearings on S. 483, "Reduce the Area of the Gila Federal Reclamation Project." On page 198a of the typewritten transcript of the hearings appears a table submitted by Mr. Matthew. Mr. Matthew states that—

It (the table) is headed, "Estimated available water supply for consumptive use in the upper basin under provision of the Colorado River compact."

Mr. Matthew then states, page 199:

The water supply in the upper basin is best indicated by the flow at Lee Ferry.

The table submitted by Mr. Matthew was based on a critical period such as 1931–40 inclusive. The first item in the table is estimated virgin flow at Lee Ferry, 12,200,000 acre-feet average annually. The second item in the table represents the minimum flow required at Lee Ferry by the compact—7,500,000 acre-feet. The third item is designated as available water supply for consumptive use for upper basin without withholding storage—4,700,000 acre-feet.

As Mr. Matthew suggested:

Item 3 is simply the arithmetical difference between items 1 and 2 and constitutes the available water supply for consumptive use in the upper basin without hold-over storage.

In other words, he is interpreting depletion of the flow at Lee Ferry to be synonymous with the available water supply under the compact for beneficial consumptive use in the upper basin. If Mr. Matthew were to apply exactly the same kind of analysis to the Gila River Basin, he would conclude from the last column of table CXLVI on page 285 of the Colorado River report, March 1946, of the United States Department of Interior, that the average annual amount of water available in the Gila River Basin for beneficial consumptive use is 1,272,000 acre-feet, this being the natural (virgin) flow of the

river at the mouth. From this quantity it would be necessary that he deduct whatever flow reaches the mouth due to inability of Arizona entirely to deplete the flow.

I now pass to the subject of water supply of the Colorado River Basin and the amount available for use by Arizona.

Mr. E. B. Debler, consulting engineer for the State of Arizona, submitted a statement on water supply to this committee on June 27, 1947. I concur in Mr. Debler's conclusions with respect to water supply because I collaborated with him in making the studies.

Mr. R. Matthew for California submitted to the committee his conclusions with respect to water supply and requirements of existing projects in the lower basin based on critical periods such as 1931-40 inclusive and 1930-46 inclusive. His conclusions are contained in table No. 1 which he submitted with his statement. While Mr. Matthew stated that his table is only of an engineering nature and is intended to show the estimated available water supply and the requirements of existing projects in the lower basin, nevertheless, it represents the results of the application of California's interpretation of the Colorado River compact and related documents.

The section of the table relating to Arizona projects has to do with requirements of existing (operating) and authorized projects. The section of the table having to do with California's requirements is labeled "California (as limited by existing contracts)." A similar section might have been placed in the table showing the Arizona requirements as limited by the existing water delivery contract between Arizona and the Secretary of the Interior. We believe that Mr. Matthew's table reflects California's legal theory as borne out by Mr. Howard's statement that the effect of his interpretation so far as available water is concerned would be presented by an engineer.

My major differences with Mr. Matthew is with respect to (1) his treatment of Gila River water, (2) his assumption that 200,000 acre-feet of excess delivery to Mexico will be required in order to fulfill the Mexican water treaty obligation, and (3) in the setting up in his table of California's water requirements for projects which under California's system of priorities have junior priorities and are therefore on an infirm status so far as water supply is concerned.

Under item 3, Mr. Matthew sets up Gila River water and tributaries as an item of water supply in the amount of 2,300,000 acre-feet. He states that this represents the amount of water supply available for consumption on the Gila River and its tributaries. Contrary to this, he sets up item 9 as a requirement on this water supply in the amount of 2,270,000 acre-feet. He suggests that instead of setting up the 2,300,000 acre-feet, had he used as a water supply the virgin flow at the mouth that is available for depletion by Arizona, that a corresponding amount would have been set up for item 9, and the final result of the table would have been the same. This is true. But the form of the table is misleading. Item 14 implies a present use and requirement by existing authorized projects in Arizona of 3,500,000 acre-feet. Although he insists that the table has nothing to do with the interpretation of the compact or any related documents, and that it is merely an engineering table, nevertheless the above quantity of water could be interpreted to mean the consumptive use by Arizona as intended under the terms of the compact.

I again submit that what the compact commission had in mind with respect to the Gila River and with respect to the upper basin at Lee Ferry was that depletion at the mouth was synonymous with beneficial consumptive use as such term is used in the compact. This being the case, the 3,550,000 acre-feet should be reduced by over 1,000,000 acre-feet which represents natural losses on the Gila River under virgin conditions with which California is charging Arizona by its interpretation.

In passing, I call attention to the fact that if his theory were correct Mr. Matthew's estimate of item No. 3 is wrong because he has used the long-time average and actually he is dealing with a period of low water supply. On this basis, this item should be less. However, he should have estimated consumptive use on the Gila, by taking the estimated virgin flow of the Gila minus the present flow of the Gila at the mouth.

Senator WATKINS. And the mouth is at this end of the Colorado.

Mr. TIPTON. Yes.

Senator WATKINS. It is theoretical because it does not actually dump any water in there now, does it?

Mr. TIPTON. Very little water comes in.

Senator WATKINS. What you are saying is more or less theoretical?

Mr. TIPTON. There is some. The estimated virgin flow of the river at the mouth by the Bureau of Reclamation is 1,272,000 acre-feet. That is a long-time mean. The estimated consumptive use on the Gila as made by the Bureau is 1,135,000 acre-feet. During the last 17 years there has been a drought. Prior to that there was a period of fairly good water supply which, if it recurred, might produce some flow out of the mouth of the Gila.

Shall I proceed?

Senator MILLIKIN. Yes.

Mr. TIPTON. Under item 5 Mr. Matthew assumes that it will be necessary to deliver to Mexico 1,700,000 acre-feet of water in order to insure Mexico's receiving 1,500,000 acre-feet in accordance with the scheduled delivery which she might set up. He states that this is necessary on account of the difficulty of measuring accurately the large quantity involved and of controlling precisely the rate of flow from points of release in the United States to the international boundary. He suggests that this point of release is Davis Dam. Mr. Matthew is wrong in assuming that the rates must be precisely controlled. Article 15, paragraph A of the treaty provides:

The water allotted in subparagraph (a) of article 10 of this treaty shall be delivered to Mexico at the points of delivery specified in article 11, in accordance to the following two annual schedules of deliveries by months, which the Mexican section shall formulate and present to the Commission before the beginning of each calendar year.

It should be specifically noted that the schedules of delivery are by months and not by days. This is borne out again by paragraph F of article 15 which reads as follows:

Subject to the limitations as to rates of delivery and total quantities set out in schedules I and II, Mexico shall have the right, upon 30 days' notice in advance to the United States section, to increase or decrease each monthly quantity prescribed by those schedules by not more than 20 percent of the monthly quantity.

Since the accounting is on a monthly delivery basis, overdeliveries and underdeliveries are averaged out over the monthly periods.

Item 9 of Mr. Matthew's table purporting to show the requirements of California's projects in the amount of 5,362,000 acre-feet is misleading and unfair to Arizona and other States. Again Mr. Matthew says that this is a mere showing of water requirement and has no relation to interpretation of the compact or any related documents. Since Arizona also has an existing contract, the amount of water covered by it could also have been set up in the table even though it is recognized that the contract cannot be filled in its full amount. Mr. Matthew did state that the amounts shown in items 15 to 18 of the table as well as the total shown as item 19 are exactly the same as the amounts covered by the various water delivery contracts held by California interests with the Secretary of the Interior. Mr. Matthew failed to mention California's statute of self-limitation and the system of priorities which she has set up to account for the 5,362,000 acre-feet and the fact that 962,000 acre-feet of the so-called requirements are covered by junior priorities which are on an unfirm status.

Before leaving the water supply question and going to the California situation, I would like to comment on a part of Mr. C. C. Elder's statement made before the committee on July 1. Mr. Elder discusses the probable return flow from the Central Arizona project and calls attention to the difference between the estimates made by Mr. Larson of the USBR and by Mr. E. B. Debler. He then concludes that none of the water from the Gila Valley released to take care of salt balance "will dependably reach the Colorado River or at such times as credit can be claimed under the terms of the Mexican Treaty". Mr. Elder then makes the following statement:

It seems not unfair to recall that only 2 years ago, at the Senate's hearing on the Mexican Treaty, the burden of this treaty allocation on Lake Mead storage was testified to, by USBR and other Federal and State witnesses of distinction, as never to exceed 600,000 acre-feet annually, due to return flow and other related fallacies. In contrast, present USBR and Arizona statements, as well as 1946 and 1947 editions of the USBR Colorado Basin Comprehensive Report, all agree that this burden will be 1,500,000 acre-feet annually. Such sudden and unexplained variations of profound estimates and solemn, even if unsworn, testimony, should at least in some degree affect the weight now given to estimates, equally important and similarly unrelated to observable factual conditions.

Mr. Elder assumes that the Mexican burden on Lake Mead now is shown to be 1,500,000 acre-feet instead of the maximum of 600,000 acre-feet as testified to by witnesses in the hearings on the Mexican Water Treaty. It is inconceivable that an engineer of Mr. Elder's experience would knowingly make such a misleading statement. The USBR Colorado Basin Comprehensive Report as well as the testimony of both Arizona and California witnesses in this hearing dealt with the consumptive use of water when considering water requirements and the comparison of the aggregate of such requirements with the total available virgin water supply. No consideration was given to diversion requirements nor was consideration given to return flow as an element of water supply. Such was not necessary. Although the 1,500,000 acre-feet must come out of the original water supply of the basin because there is no other source, nevertheless, much of the 1,500,000 acre-feet can be and will be supplied by return flow from United States projects which now and will reach the stream too low to be used by gravity diversion in the United States. The testimony in this hearing together with the testimony in the hearing on S. 483 concerning the Gila Federal Reclamation Project indicates that the

Mexican burden on water reaching Imperial Dam will not be greater than 600,000 acre-feet per annum.

I wish to call attention to Mr. G. W. Lineweaver's statement referring to the Gila project. He testified as to the total diversions to the various units of the project and the return flow that could be expected to reach the river from those units. His testimony is summarized in a table which I am submitting for the record, which is taken from page 70 of the hearings before the Committee on Irrigation and Reclamation on H. R. 5434, House of Representatives, Seventy-ninth Congress, second session.

(Table 2 above-described follows:)

TABLE 2.—*Estimated diversion of water at Imperial Dam return flow and consumptive use in acre-feet—Gila project, Arizona*

Diversion	Area (acres)	Diversion at dam		Estimated return flow		Consumptive use	
		Per acre	Total	Per acre	Total	Per acre	Total
Yuma Mesa.....	51,000	11.0	561,000	7.0	357,000	4.0	204,000
Wellton-Mohawk.....	75,000	9.2	590,000	5.2	390,000	4.0	300,000
North and South Gila Valleys.....	15,000	6.0	90,000	2.0	30,000	4.0	60,000
Total.....	141,000	-----	1,341,000	-----	¹ 420,000	-----	564,000

¹ Does not include return flow from Yuma Mesa as return flow within the United States from that area is not assured.

It may be noted that he estimates that there will return from the Wellton-Mohawk area 390,000 acre-feet, and from the North and South Gila 30,000 acre-feet. He also testified that the return from the Yuma-Mesa unit would be 357,000 acre-feet but he stated that there is some question whether this return would reach the river before it crossed the boundary into Mexico. S. 483, as reported out by the Senate subcommittee, has the effect of limiting consumptive uses by the Yuma-Mesa and North and South Gila to a total of 300,000 acre-feet per annum and likewise consumptive use by the Wellton-Mohawk unit to 300,000 acre-feet, making a total of 600,000 acre-feet. Assuming that none of the Yuma-Mesa returns do reach the stream in the United States, the following totals can be expected to reach the river below Imperial Dam and be available to satisfy deliveries to Mexico:

Source:	Return acre-feet
Gila project.....	420,000
Yuma project.....	190,000
Central Arizona project.....	225,000
Desilting water.....	100,000
Total	935,000

The burden on the water supply from above Imperial Dam to take care of Mexican delivery in its full amount on the above basis, therefore, would be 565,000 acre-feet. The Mexican delivery will be curtailed during a long drought period which existed for the period

covered by Mr. Debler's study. If it is curtailed to the extent assumed by him and by me, the burden on the water above Imperial Dam to satisfy the Mexican delivery would be 433,000 acre-feet. It is reasonable to assume that ultimately the Yuma-Mesa unit of the Gila project will develop to the extent that it will consume 300,000 acre-feet less than which is being consumed by the North and South Gila units. It is assumed the acreage will be increased to the maximum extent possible even though to do this may require the construction of major drainage canals to insure that the return flow from the unit reaches the river in the United States.

The provisions in the Senate bill will further such procedure because any water that returns to the stream below the boundary will be classed as consumptive use, so it will be to the benefit of Arizona to construct drainage canals to insure that returns reach to the river above the boundary.

If this is done, an additional 357,000 acre-feet (Mr. Lineweaver's estimate) will return to the river below Imperial Dam and above the international boundary. This will reduce the burden on the water above Imperial Dam to satisfy normal Mexican deliveries to about 300,000 acre-feet. Under this condition 375,000 acre-feet would have to be delivered to Mexico past Imperial Dam on account of the treaty provisions, which makes that the minimum delivery through the All-American Canal.

If, during a protracted drought period such as envisioned in Mr. Debler's study, the Mexican deliveries were curtailed to the extent estimated by him, very little water would be required to pass Imperial Dam to satisfy the Mexican burden. It would be limited to the minimum amount required to be delivered to Mexico through the All-American Canal.

The amount of return flow might be increased somewhat beyond that indicated above by seepage losses from the All-American Canal when increased amounts of water are carried by it.

Finally, with respect to the water supply available to Arizona for use by its central Arizona project during a critical water period, I am in agreement with Mr. Debler that the full consumptive use requirement of something over 1,000,000 acre-feet would be available.

I shall now pass on to the California situation.

Prior to the ratification of the Colorado River compact by the various States other than California, California was required to limit by statute the use of waters allocated under article III (a) of the Colorado River compact to 4,400,000 acre-feet per year and not over one-half of the surplus water not apportioned by the compact. California passed this self-limiting statute. A copy of the statute has been introduced in the record of these hearings and the committee is familiar with its terms.

California then set up a system of priorities covering the use of 4,400,000 acre-feet of article III (a) water and 962,000 acre-feet of unapportioned surplus water. The priorities as set up by California are given in the table which I present herewith. The table also indicates the estimated present use under each priority.

(The table submitted by Mr. Tipton follows:)

Prior- ity No.	Description	Acre-feet	Total	Estimated present use under each prior- ity (1945)
1	Palo Verde irrigation district, 104,500 acres.....			
2	Yuma project, 25,000 acres.....			
3	(a) Imperial irrigation district and lands under All-American canal in Imperial and Coachella Valleys. (b) Palo Verde irrigation district in lower Palo Verde mesa, 16,000 acres.....			
	Total for 1, 2, 3.....	3, 850, 000		2, 794, 000
4	Metropolitan water district of Southern California and city of Los Angeles.....	550, 000		66, 000
	Total from III (a) water.....		4, 400, 000	2, 860, 000
5	(a) Metropolitan water district of Southern California and the city of Los Angeles.....	550, 000		
	(b) City and county of San Diego.....	112, 000		
6	(a) Imperial irrigation district and lands under the All-American canal in the Imperial and Coachella Valleys. (b) Palo Verde irrigation district in lower Palo Verde mesa, 16,000 acres.....			
	Total for 6 (a) and (b).....	300, 000		
	Total from surplus.....		962, 000	None
	Total of all priorities.....		5, 362, 000	2, 860, 000

Mr. TIPTON. Attention is called to the fact that the total priorities are 5,362,000 acre-feet and that the use of water under the priorities during the year 1945 was 2,735,000 acre-feet. I do not have the 1946 values. No water was used under the junior priorities.

California interests then negotiated contracts with the Secretary of the Interior for the delivery of water from Lake Mead to satisfy the several priorities.

The contracts for the delivery of water from Lake Mead are all made—

subject to the availability thereof for use in California under the Colorado River Compact and the Boulder Canyon Project Act.

The contracts provide, further:

The United States shall not be obligated to deliver water to the district when for any reason such delivery would interfere with the use of Boulder Canyon Dam and reservoir for river regulations, improvement of navigation, flood control, and of states or private perfected rights in or to the waters of the Colorado River or its tributaries in pursuance of Article III of the Colorado River Compact; and this contract is made for the express condition and with the express covenant that the right of the district to the waters of the Colorado River or its tributaries is subject to and controlled by the Colorado River Compact.

Attention is called to subsection (f) of article III of the Colorado River compact. This subsection provides that further equitable apportionment of the beneficial uses of the water of the Colorado River system unapportioned by paragraphs (a), (b), and (c) may be made after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as provided in paragraphs (a) and (b) of article III of the compact. Therefore, until the upper basin is consuming its total allocation of 7,500,000 acre-feet or until the lower basin is consuming its total allocation of 8,500,000 acre-feet, no State in either basin can acquire any title to

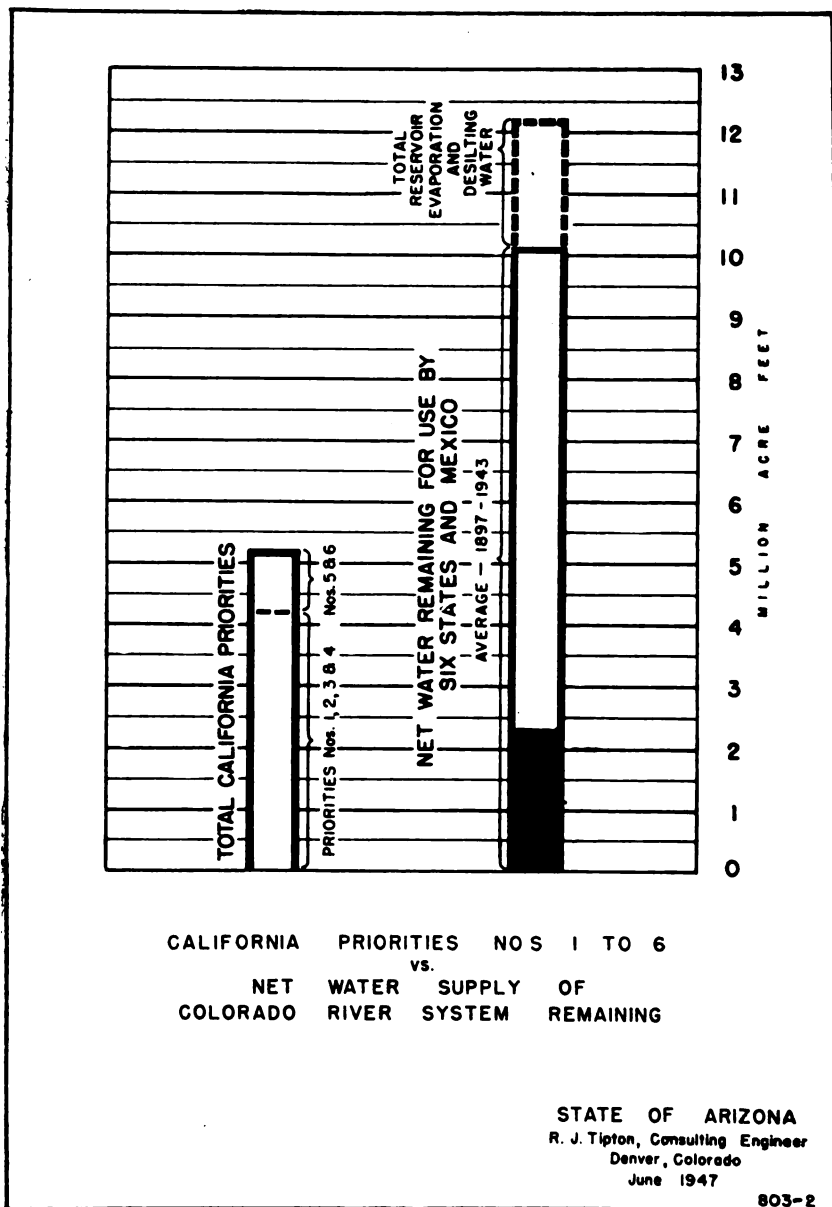
surplus, and it should be noted that any surplus apportioned in the future under subsection (f) must be from surplus after any treaty obligations are satisfied.

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. The status of the various California priorities in relation to the apportionment of water, as made by the Colorado River compact and as visualized by the Boulder Canyon Project Act, is shown graphically on drawing No. 803-2. The drawing is self-explanatory [exhibiting chart, which follows on p. 542]:

The bars below the first (lower) horizontal line on the drawing represent the water apportioned by article III (a) and (b) of the Colorado River compact. The left-hand bar represents the total apportionment of 8,500,000 acre-feet to the lower basin. It is divided into two parts. The upper part represents the 4,400,000 acre-feet of article III (a) water to which California by statute has limited herself. The lower part of the bar represents 4,100,000 acre-feet for Arizona, Nevada, Utah, and New Mexico. The 4,100,000 acre-feet is that which remains for those States out of the total water apportioned to the lower basin after taking out of it the amount to which California has limited herself. The right-hand bar on the graph represents the total allocation of 7,500,000 acre-feet to the upper basin. Above the first horizontal line is the water apportioned by article III (c). It represents the 1,500,000 acre-feet that has been allotted to Mexico by treaty. Above the second (upper) horizontal line appears a zone to represent surplus water to be apportioned in accordance with article III (f) and (g) of the compact. It is in this category that the 962,000-acre-feet represented by the junior priorities of California are found. The bar extending above the second horizontal line represents the 962,000 acre-feet.

Mr. Debler's analysis checked by me indicates that during periods as long as 17 years or possibly up to 20 years there will be no water in the river to satisfy any such priorities. These priorities are not only unfirm due to the provisions of the compact and Boulder Canyon Project Act but they are unfirm from the standpoint of water supply itself. The water-delivery contracts provide for delivery of water from Lake Mead. During a protracted period of drought such as the one which commenced in 1930 and has not yet ended, under full development in the basin, there would be no surplus water in the meaning of the Colorado River compact to satisfy such junior priorities.

California has been making continuing efforts by various means to provide a firm water supply to satisfy such priorities. At the moment, by the interpretation of the Colorado River compact and related documents, she is attempting to carve out a water supply for such



priorities from a water supply which, in my opinion, should go to Arizona and to the upper basin States under the compact. Her interpretation of the meaning of III (b) water probably would provide some 500,000 acre-feet for the junior priorities. Her interpretation of beneficial consumptive use would provide a substantial amount from Arizona and the upper basin water supplies.

The following describes the situation as it would be if California were successful in her attempts. The total average annual virgin-water supply of the Colorado River Basin as estimated by the United States Bureau of Reclamation is 17,720,000 acre-feet. The Bureau's estimate of main-stream-reservoir losses is 1,701,000 acre-feet. Other reservoir losses together with desilting water probably would bring man-made losses close to 2,000,000 acre-feet. There would therefore remain a virgin supply of 15,720,000 acre-feet for net use.

By California's interpretation, she claims that she has a right to the use of 5,362,000 acre-feet from this net supply. There would remain for net use by the other six Colorado River Basin States and Mexico 10,358,000 acre-feet. California's supply would be more than one-half of that remaining for the six States and Mexico. In other words, the only State in the basin which produces no water is attempting to gain the right to use 35 percent of the total net available supply as against the compact and contract rights of the six remaining States and the Republic of Mexico. California by her interpretation would leave to Arizona out of the water supply indicated above only about 2,300,000 acre-feet, which is slightly over 14 percent of the total net water supply. Drawing No. 803-1 shows graphically the above situation (exhibiting chart 803-1, which faces p. 542):

The left-hand bar on the drawing indicates the total of the California priorities in terms of net water consumption. The bar on the right indicates graphically the remaining total water supply. The top portion of the bar outlined by a dotted line represents total reservoir evaporation and desilting water. The balance of the bar outlined by a solid line represents the net water that would remain for use by the other six States of the Colorado River Basin and Mexico. The amount of water that would remain for use by Arizona under California's theory is shown as the black portion of the right-hand bar.

That finishes my statement, Mr. Chairman.

Senator MILLIKIN. Any questions?

Senator MCFARLAND. No questions.

Senator MILLIKIN. Thank you, Mr. Tipton.

Senator MCFARLAND. Mr. Chairman, we have one or two additional witnesses. We will abide by the wishes of the Chairman; I would like to have one of them testify if agreeable. His testimony will consume about 10 minutes. I do not wish to burden the Chairman and the members of the committee unduly.

(Appendix A. Excerpts from minutes of seventeenth meeting of Colorado River Compact Commission, R. J. Tipton:)

APPENDIX A

MINUTES OF THE SEVENTEENTH AND EIGHTEENTH MEETINGS OF THE COLORADO RIVER COMMISSION HELD IN SANTA FE, N. MEX., ON THE 15TH AND 16TH OF NOVEMBER 1922

Mr. HOOVER. My mind is a little mixed. In the first place, on page 5, Senate Document 142, are given the gagings at Laguna Dam, which do not include the Gila flow. Mr. Carpenter's calculation is based on the gagings at Yuma, which I understand include the Gila, and that is the difference between M. Carpenter's basis and the basis of the Laguna gagings. Is that not true?

Mr. CARPENTER. No; partly correct. I didn't deduct the loss in the river from Lee Ferry to Laguna.

Mr. HOOVER. I was saying the difference between your calculations and the Laguna gagings is simply the flow of the Gila. The Laguna gagings do include water which goes into the Imperial Valley.

Mr. CARPENTER. Yes, sir.

Mr. HOOVER. So that if we take the Laguna gagings instead of the Yuma gagings we will exclude the Gila flow.

Mr. A. P. DAVIS. We exclude the Gila flow, but we include the diversion for the Yuma project. The measurements at Yuma, on the other hand, do not include water diverted for the Yuma project, but include the Gila. When you measure at Yuma you are measuring above the Imperial diversion and below the Laguna Dam diversion.

Mr. HOOVER. The Laguna Dam gagings include water which goes to the Yuma project?

Mr. A. P. DAVIS. They do.

Mr. HOOVER. So they include the whole flow of the Colorado River at that point?

Mr. A. P. DAVIS. At that point; yes, sir. That is what they are intended to include, the whole flow there, which is above the Gila and, of course, excludes that.

Mr. HOOVER. Then the problem also goes into the consumptive use in the upper basin. In order to reconstruct the river, the consumptive use in the upper basin must be taken into account. Is it true that the Laguna gagings include the Imperial Valley?

Mr. A. P. DAVIS. Yes.

Mr. HOOVER. The Imperial Valley diverts below.

Mr. A. P. DAVIS. Yes.

Mr. HOOVER. Consequently, at Laguna you have the whole flow of the Colorado River at that point?

Mr. A. P. DAVIS. Yes.

Mr. HOOVER. Without deductions, except the Gila.

Mr. A. P. DAVIS. Yes.

Mr. HOOVER. And if you were to reconstruct the river, you must also take account of the consumptive use of the upper basin and add that to the Laguna gagings, and ought to add also the Gila flow. Have you a rough idea as to what the flow of the Gila would be if it had not been used for irrigation, or what the consumptive use, plus the present flow, is?

Mr. A. P. DAVIS. I can estimate that fairly closely. The mean annual flow as measured during the last 20 years is 1,070,000 acre-feet. The areas that are irrigated there are given in this document, 142, and we can apply a duty of consumptive use of water on that area and approximate fairly well, I believe, the consumptive use in the Gila Basin, if that is what is wanted.

Mr. HOOVER. My only point on that is, does it approximate, possibly, the amount of consumptive use in the upper basin?

Mr. A. P. DAVIS. Oh, no; it is smaller. The consumptive use in the upper basin is on that table I gave you.

Mr. HOOVER. About 2,400,000?

Mr. A. P. DAVIS. In 1920 the consumptive use was about 2,400,000 acre-feet.

Mr. CARPENTER. That is a progressive increase from 0 up?

Mr. A. P. DAVIS. Yes.

Mr. CARPENTER. You would think the Gila consumptive use would be something over a million and a half feet?

Mr. A. P. DAVIS. Very likely less than a million and a half. But I am not sure about that till I figure on it a little.

Mr. CARPENTER. In other words, there might be—

Mr. A. P. DAVIS (interrupting). There would be a good deal less.

Mr. CARPENTER. There might be, then, a million feet to go into this calculation for translating back from Laguna gagings?

Mr. A. P. DAVIS. To include the Gila; yes. It doesn't seem like it would apply to the Little Colorado, as its contribution is offset by evaporation. There is very little outside the Gila Basin that is not thus offset.

Mr. CALDWELL. Mr. Davis, just where is the Gila measured?

Mr. A. P. DAVIS. There have been different points; one was at Dome.

Mr. CALDWELL. Tell me where it is with respect to the mouth?

Mr. A. P. DAVIS. Dome is about 12 miles above the mouth, and that was changed on account of difficulties of measurement, but not very materially.

Mr. CALDWELL. This 1,070,000 you speak of is an average flow, is it?

Mr. A. P. DAVIS. Yes.

Mr. CALDWELL. Average annual flow over how many years?

Mr. A. P. DAVIS. Eighteen years, I believe. It is all published in Senate Document 142.

Mr. CALDWELL. That is near enough.

Mr. HOOVER. On the table on page 5, Senate Document 142, take 1920 for instance, you have 21,000,000. That is the Laguna flow.

Mr. A. P. DAVIS. Yes.

Mr. HOOVER. What would be added here, as a rough guess, would be the flow and consumptive use of the Gila and Little Colorado and the consumptive use of the Colorado below Lees Ferry and above Laguna. This all comes to about a million and a half, and the consumptive use in the upper basin is 2,400,000 so it would be a credit of water to the Laguna readings of approximately a million feet, something like that.

Mr. CARPENTER. Yes. If there are others, like the Virgin and other rivers, that would be still more of a reduction.

Mr. SCRUGHAM. I thought the Imperial Valley had a heading somewhere at Laguna. What was all the disturbance by the Yuma people?

Mr. A. P. DAVIS. They have contracted for building their canal and heading it at Laguna and have agreed to do that, but never have done it. They have never taken any water out above the Yuma project. The best use of the Gila, as I said yesterday, is in its own valley and that probably will be accomplished some day.

Mr. HOOVER. Would it be possible for you to recast some figures in the light of the counteraction of deducting the Gila flow and consumption from the upper basin flow and consumption?

Mr. A. P. DAVIS. The lower basin consumptive use you mean, don't you? Make some approximation of a difference in consumptive use between the lower basin and the upper basin, exclusive of the Imperial Valley, and add that to these figures.

Mr. HOOVER. You would have to add to the consumptive use the flow of the Gila over and above its consumptive use.

Mr. A. P. DAVIS. Did you want the flow of the Gila included also?

Mr. HOOVER. It is a part of the drainage basin.

Mr. CARPENTER. You are now revolving as I revolved at one time and I decided consumptive uses had better offset one another and took the figures as printed.

Mr. A. P. DAVIS. I don't know how near they would do that. You don't mean to undertake to run that back over 20 years—take it as it is now; is that what you mean?

Mr. CALDWELL. Run it back over 20 years.

Mr. A. P. DAVIS. If given time I could make an estimate that would be worth something. The present consumptive use we practically know. How that has grown is a matter of history.

Mr. HOOVER. I might phrase it in another way perhaps. On page 5 of Senate Document 142 your mean flow at Laguna is 16,400,000. Now if you went into this elaborate calculation to account for the Gila consumptive use below and consumptive use about it might add a certain amount to that mean flow—it might add between 500,000 and a million feet. That is just a guess that might be the result of such an elaborate calculation.

Mr. A. P. DAVIS. That is true.

Mr. HOOVER. And if you took the low years as being 500,000 less than that, it probably wouldn't vary materially or affect the mean?

Mr. A. P. DAVIS. No.

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.

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; i. e., 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.

Mr. S. B. DAVIS. With all due respect to these eminent gentlemen, I am still from Missouri; I have to be shown, but I am willing to enter into a discussion on that line.

Mr. HOOVER. I should think the result of the deliberations and of our advice on that matter have been to establish the 16,000,000 as a sort of least mean.

Mr. S. B. DAVIS. As the average mean at Lee Ferry.

Mr. HOOVER. Yes; and that an apportionment of a minimum would be half that sum—8,200,000 acre-feet instead of the 6,260,000 acre-feet, as suggested by Mr. Carpenter—so that this would be the question of your proposals—delivering approximately 82,000,000 acre-feet on 10-year blocks.

Mr. NORVIEL. As the minimum average.

Mr. HOOVER. That's the total they agree to deliver in 10-year blocks. Then, just to further the discussion, if the Mexican deduction is to be borne by both sides, and we take the maximum Mexican position, it would mean, so far as the southern basis is concerned, their needs, as worked out by the Reclamation Service, including the projects in view, are 7,450,000 feet, so that 8,200,000 covers that with a comfortable margin.

Mr. A. P. DAVIS. It includes half the water to be delivered to Mexico on the basis of 800,000 acres.

Mr. HOOVER. So the southern basin would be protected as to their end and still have a margin of about 800,000 acre-feet.

Mr. NORVIEL. That would be for possible future development.

Mr. HOOVER. Or anything that may happen to you.

Mr. NORVIEL. Delivered at the point of delivery.

Mr. CARPENTER. Delivered at Lees Ferry; you may already have figured your evaporation on the river.

Mr. NORVIEL. Not this one. We figured that for the purpose of calculation.

Mr. CARPENTER. You told us that power was many times more valuable than any other use. We are letting you tear all the fire out of that water clear down to Laguna.

Mr. NORVIEL. You have more miles above and the fire will already have been torn out.

Mr. CARPENTER. It recovers itself; it's just as good; our evaporation is already taken out.

Mr. NORVIEL. The evaporation is not taken out of the 2,000,000 if it is to be delivered to us.

Mr. CARPENTER. If we use it for power above, our evaporation is already out.

Mr. NORVIEL. The evaporation has not been deducted from the million and a half-acre feet that you are going to deliver in Mexico. You have to make delivery at the point of delivery, not 600 miles above.

Mr. HOOVER. Mr. Norviel, you have a margin of 750,000 feet to take care of all needs all along. That's pretty liberal.

Mr. NORVIEL. That makes 8,200,000 acre-feet-a-year minimum.

Mr. HOOVER. That's the total to be delivered at Lees Ferry.

(Mr. Norviel requests time for consultation.)

Mr. NORVIEL (after recess). As I understand the proposition, Mr. Chairman, it is to divide the water so that the lower basin will receive—including the one-half to be furnished the Mexican lands—82,000,000 acre-feet per annum over a period of 10 years average, with 4,500,000 acre-feet minimum annual flow.

Mr. HOOVER. It might be worth discussion. I wouldn't want to put it in the mouth of the gentlemen from the North that it is their proposition.

Mr. CALDWELL. There is no proposition; there is recorded a "no" vote against that minimum yet.

Mr. CARPENTER. That's a subject of discussion.

Mr. NORVIEL. I thought when we retired we were to consider that on the basis of 4,500,000 acre-feet minimum annual flow.

Mr. CARPENTER. From the last poll of the vote on the minimum there were five for and two against, but the period was left undecided.

Mr. NORVIEL. Now we are fixing the period at the greatest number of years suggested, which is 10.

Mr. CARPENTER. We thought the period was left open. The minimum is for 1 year, an irreducible minimum predicated on no period. The low year goes regardless of period.

Mr. HOOVER. Supposing I take the onus of a suggestion for the consideration of the upper States—the 82 million 10-year block and a minimum flow for 1 year of 4½ million.

Mr. CARPENTER. If you crowd us on the minimum we will have to have a protecting clause on precipitation, because we can't control that. Nature will force us into a violation, any possibility of which we should strenuously avoid in our compact, because that would provoke turmoil and strife. The mere matter of 500,000 acre-feet as the minimum is small, but it might be decisive at such a time. It is not with the idea of trying to avoid delivering the water that I am suggesting the low figure, it is to avoid that which would result from nature's

forcing a minimum that we could not control; therefore, we want to avoid that as nearly as we can.

Mr. HOOVER. You are seeking protection from a shortage on precipitation beyond that heretofore known. (Colorado River Commission, minutes of the sixteenth meeting, Bishop's Lodge, Santa Fe, pp. 19-29, Tuesday, 3 p. m., November 14, 1922.)

Mr. S. B. DAVIS: Mr. Norviel, in order that we may know how far apart we are in this matter—offer of 65,000,000 acre-feet in a 10-year period—would you state what you do consider a fair amount to be guaranteed to you at Lees Ferry?

Mr. NORVIEL. I think, inasmuch as your needs are practically even, we will accept the burden of the losses below Lees Ferry, and take a reconstructed river on an even basis at Lees Ferry. * * *

Mr. NORVIEL. I will go back to the proposition made to us yesterday. We will accept 8,200,000 acre-feet, on a 10-year basis with a 4,500,000 minimum, while on a 5-year basis a 4,000,000 minimum flow will be acceptable. * * *

Mr. CARPENTER. That is, for any 5-year period there is to be a minimum of 4,000,000 acre-feet per year?

Mr. NORVIEL. Yes. * * *

Mr. HOOVER. What Mr. Norviel means is for any 1 year the minimum shall not be less than 4,000,000 for a 5-year period, or less than four and a half a year for a 10-year period.

Mr. S. B. DAVIS. The difficulty with 82,000,000, as I have said, is that we have already experienced 10 years in which it would have been impossible for us to comply.

Mr. HOOVER. The difficulty is in guaranteeing in the face of an unknown quantity?

Mr. S. B. DAVIS. Yes, sir (Colorado River Commission, minutes of the seventeenth meeting, Bishop's Lodge, Santa Fe, pp. 12, 13, 14, Wednesday, 11 a. m., November 15, 1922.)

Mr. NORVIEL. Before we recess, perhaps, I might state another little proposition and let them give it consideration if they care to.

The State of Arizona proposes to allocate the waters of the Colorado River between the proposed upper and lower divisions upon a 50-50 division as follows:

The river is to be reconstructed annually by measuring the flow at or near Lee Ferry in Arizona and by adding thereto the consumptive use of water in the upper basin, the total amount of water thus found to be the basis for an equal division between the two divisions, each division contributing equally to the amount that may hereafter be allotted to Mexico by international agreement or otherwise. In the event that the upper division should in any year exceed its percentage and thus deprive the lower division of its percentage the deficiency shall be compensated for during the next two succeeding years. * * *

Mr. CALDWELL. Just how would you determine the consumptive use in the upper basin?

Mr. NORVIEL. It is to be determined each year.

Mr. CALDWELL. Just a minute. Would you predetermine the consumptive use in acre-feet, or would you use the actual consumptive use?

Mr. NORVIEL. It would have to be measured.

Mr. CALDWELL. It would be very difficult, impossible practically.

Mr. NORVIEL. I think I said so in the beginning of our meetings.

Mr. CALDWELL. I think it would be impossible

Mr. NORVIEL. Practically.

Mr. HOOVER. We will recess until 3 o'clock this afternoon.

Thereupon the meeting adjourned to meet again at 3 p. m., November 15.

CLARENCE C. STETSON,
Executive Secretary.

(Colorado River Commission, minutes of the seventeenth meeting, Bishop's Lodge, Santa Fe, pp. 24-25, November 15, 1922.)

(NOTE.—The caucus continued the afternoon and evening of November 15, the commission resuming executive sessions Thursday, November 16, at 10 a. m.)

Mr. HOOVER. * * * During the term of this compact the States in the upper division shall not deplete the flow of the river (at the point of division) below 75,000,000 acre-feet for any 10-year period, or below a flow of 4,000,000 acre-feet in any 1 year. Provided, however, that the lower division may not require delivery of water unless it can reasonably be applied to beneficial agricultural and domestic uses; and the upper division shall not withhold any water which may not be applied within such divisions to beneficial agricultural and domestic use. * * *

Mr. NORVIEL. Mr. Chairman, I can't get away from the idea that the figures are too low. While there is in it an element of a guaranty it is lower than the lowest 10-year period we have any knowledge of and it is also after the division is made—after the whole use in the upper division is taken out and would include the total use in the lower division. In other words, it is the excess over and above what the upper States have not heretofore used. It is less than half of the lowest 10-year period that has ever existed.

Mr. CARPENTER. That we have any record of.

Mr. NORVIEL. Yes; and I rather think that former years, if they had been measured, would have shown perhaps a worse condition, so I can't think that that is a fair division over a 10-year period, nor one which gives the fullest protection.

Mr. HOOVER. In our discussions yesterday we got away from the point of view of a 50-50 division of the water. We set up an entirely new hypothesis. That was that we make, in effect, a preliminary division pending the revision of this compact. The seven and a half million annual flow of rights are credited to the south, and seven and a half million will be credited to the north, and at some future day a revision of the distribution of the remaining water will be made or determined.

An increasing amount of water to one division will carry automatically an increase in the rights of the other basin and therefore it seemed to me that we had met the situation. This is a different conception from the 50-50 division we were considering in our prior discussions.

Mr. NORVIEL. If this includes reconstruction of the river, then, I concede it is a more nearly fair basis. But if it does not—if it is a division of the water to be measured at the point of demarcation, I still insist that it is not quite fair, because it is simply dividing what remains in the river.

Mr. HOOVER. We are leaving the whole remaining flow of the basin for future determination.

Mr. NORVIEL. What I am getting at is this: That the upper basin takes out and uses a certain amount of water, and as this reads, it proposes to divide the rest of it, 7,500,000 acre-feet per annum.

Mr. HOOVER. No.

Governor CAMPBELL. That is inclusive, Mr. Norviel.

Mr. NORVIEL. It reconstructs the river?

Governor CAMPBELL. Yes; in effect, as I understand it.

Mr. NORVIEL. Well, if it does that, then my objection will be removed.

Mr. HOOVER. Any other comment? If not all those in favor of this clause 7 as read please say "Aye."

(Thereupon a vote having been taken upon the paragraph numbered 7, the same was unanimously passed. (Colorado River Commission, minutes of the eighteenth meeting, Bishop's Lodge, Sante Fe, pp. 30-33, Thursday, 10 a. m., November 16, 1922.))

Senator MILLIKIN. If the witness is here, let us proceed with him.

Senator MCFARLAND. Mr. Baker, please.

STATEMENT OF R. GAIL BAKER, STATE RECLAMATION ENGINEER, ARIZONA

Senator MILLIKIN. Mr. Baker, will you state your name, your residence, and your business to the reporter?

Mr. BAKER. My name is R. Gail Baker. I live in Phoenix, Ariz. I represent the State of Arizona on water matters as irrigation engineer. I have been associated with irrigation development in central Arizona for the past 25 years.

GILA RIVER WATER

Arizona maintains that the total use of Gila River water cannot exceed the natural flow at the mouth. These flows are recorded by the Bureau of Reclamation, Colorado River Report, March 1946, page 285.

Natural flow of Gila River at mouth 1897-1943, 1,272,000 acre-feet;
Low 10-year period 1931-1940, 877,000 acre-feet.

Large flood flows that could not be completely regulated by reservoirs have continued, in part, to flow down to the mouth of the Gila River. Bureau of Reclamation records show an average depletion out of the natural 1,272,000 acre-feet of 1,135,000 acre-feet.

Senator MILLIKIN. How do you get a natural flow as of 1943?

Mr. BAKER. This is reconstructed flow.

Senator MILLIKIN. Reconstructed. All right.

Mr. BAKER. California states that 2,300,000 acre-feet is available from the Gila River, and that this amount of water is being used by Arizona. The Bureau of Reclamation records show that an average of 2,279,000 acre-feet per year flowed into the Phoenix area (1897-1943).

Since most of the regulating dams were completed, from 1928 to 1943, Bureau of Reclamation records show under natural conditions an average of 1,876,000 acre-feet would have entered the area. Actually, an average of 190,000 acre-feet passed out of the area over Gillespie Dam; 1,686,000 acre-feet was lost in the area by irrigation and stream losses.

Under natural conditions in this same period, Bureau records show 1,392,000 acre-feet would have passed over Gillespie Dam. Subtracting the 190,000 acre-feet of water actually passing over the dam, 1,202,000 acre-feet is indicated as increased depletions due to irrigation.

Actual diversions into all canals from the Gila River, 1930 to 1944, average 1,697,000 acre-feet. At least 200,000 acre-feet of this is measured as redirection of return flows, leaving less than 1,497,000 acre-feet of original river water diverted. Part of this diversion returns to the river, and is lost through the same channel growth as under natural conditions. Therefore, less than 1,497,000 acre-feet can be charged as beneficial consumptive use under California's interpretation.

It is concluded from these figures that California is in error, under her theory of beneficial consumptive use, in charging Arizona with 2,300,000 acre-feet from the Gila River, 1,202,000 acre-feet should have been used.

REPAYMENT PLANS

Mr. V. E. Larson, for the Bureau of Reclamation, has set up one plan of repayment for the proposed central Arizona project:

Power sold for an average of 4 mills per kilowatt-hour at load centers.

Irrigation water delivered at land for \$4.50 per acre-foot.

Municipal water delivered to city for \$50 per acre-foot.

Construction at 1940 prices plus 60 percent (estimated to be 1946 prices).

Using all revenue to repay investment (interest component used for repayment of irrigation investment).

Project will repay in 79 years.

Should the value of our dollar remain at the 1946-47 value, Bridge Canyon power can be sold at an average rate of 5 mills per kilowatt-

hour. Selling power at 5 mills would pay the investment out as follows:

Power sold for an average of 5 mills per kilowatt-hour at load centers.

Irrigation water delivered at land for \$4.50 per acre-foot.

Municipal water delivered to city for \$50 per acre-foot.

Construction at 1940 prices plus 60 percent.

Paying power investment in 50 years with 2-percent interest.

Project will repay in 68 years. (See table 1.)

Should the value of our dollar increase to where prices are 30 percent above 1940 prices (19 percent below 1946 prices), Bridge Canyon power could be sold at an average rate of at least 4.5 mills per kilowatt-hour. This pay-out plan would be:

Power sold for an average of 4.5 mills per kilowatt-hour at load centers.

Irrigation water delivered at land for \$4 per acre-foot.

Municipal water delivered to city for \$40 per acre-foot.

Construction at 1940 prices plus 30 percent (1946 prices less 19 percent.)

Paying power investment in 50 years with 2 percent interest.

Project will repay in 56 years. (See Table 1.)

Should the value of our dollar increase to where prices are 30 percent above 1940 prices (19 percent below 1946 prices), Bridge Canyon power could be sold at an average rate of 4 mills per kilowatt-hour resulting in the following plan:

Power sold for an average of 4 mills per kilowatt-hour at load centers.

Irrigation water delivered at land for \$4 per acre-foot.

Municipal water delivered to city for \$40 per acre-foot.

Construction at 1940 prices plus 30 percent (1946 prices less 19 percent).

Paying power investment in 50 years with 2-percent interest.

Project will repay in 69 years. (See Table 1.)

TABLE 1

LENGTH OF TIME REQUIRED TO PAY OUT THE CENTRAL ARIZONA PROJECT AS SET UP IN
§. 1175

Computing interest on power and municipal investments at 2 percent retired in 50 years.

Three cost estimates are listed for comparison:

(a) Estimate based on 1940 prices.

(b) Estimate based on 1940 prices plus 30 percent. These prices may prevail during construction period.

(c) Estimate based on 1940 prices plus 60 percent. These prices have been used by the Bureau of Reclamation (Mr. V. E. Larson) as 1946 average construction cost.

[All dollar figures are in \$1,000 units]

Revenue from power:

1. Rate 4 mills; average first 50 years, \$11,400 per year (BR).
2. Rate 4 mills; average next 30 years, \$9,500 per year (BR).
3. Rate 4.5 mills; average first 50 years, \$12,800 per year.
4. Rate 4.5 mills; average next 30 years, \$10,600 per year.
5. Rate 5 mills; average first 50 years, \$14,200 per year.
6. Rate 5 mills; average next 30 years, \$11,900 per year.
7. Rate 5.5 mills; average first 50 years, \$15,600 per year.
8. Rate 5.5 mills; average next 30 years, \$13,100 per year.
9. Rate 6 mills; average first 50 years, \$17,100 per year.
10. Rate 6 mills; average next 30 years, \$14,200 per year.

	1940 prices (a)	1940 plus 30 percent prices (b)	1946-1940 plus 60 per- cent prices (BR) (c)
Revenue from water:			
Irrigation water.....	¹ \$1,950	² \$2,600	³ \$2,900
Municipal water.....	4324	5432	6540
11. Total.....	2,274	3,032	3,440
Cost—operation, maintenance, and replacement:			
12.....	4,450	5,800	7,100
Cost—construction:			
Power.....} Interest-bearing.....	143,000	186,000	230,000 ⁴
13. Municipal.....}			
14. Irrigation interest free.....	196,000	255,000	312,000 ⁵
Flood control.....			
Silt control.....			
Recreation.....} Nonreimbursable.....	38,000	49,000	63,000 ⁶
Fish and wildlife.....			
Total.....	377,000	490,000	605,000 ⁷
Cost, amortization power and municipal investment, at 2 per- cent in 50 years:			
15. (0.0318 x 13a), \$4,550; (x 13b), \$5,900; (x 13c), \$7,300.			
Power, at 4 mills:			
Average revenue, first 50 years (1+11a).....	13,674	⁷ 14,432	⁸ 14,840
Power and operation, maintenance, and repair (15a+12a).....	9,000	⁹ 11,700	¹⁰ 14,400
Revenue for irrigation repayment.....	4,674	2,732	440
Irrigation investment (14a).....	196,000	¹¹ 255,000	¹² 312,000
50 years or less.....	43	136,000	22,000
Average revenue next 30 years.....		¹³ 129,000	¹⁴ 290,000
Operation, maintenance, and repair.....		¹⁵ 12,532	¹⁶ 12,940
Years to pay out.....	43	¹⁷ 6,732	¹⁸ 5,840
19+50=69		50+50=100	
Power, at 4.5 mills:			
Average revenue first 50 years.....		¹⁷ 15,832	¹⁸ 16,240
Power and operation, maintenance, and repair.....		¹⁹ 11,700	²⁰ 14,400
Revenue for irrigation repayment.....		4,132	1,840
Irrigation investment.....		¹¹ 255,000	¹² 312,000
50 years.....		209,000	92,000
Average revenue next 30 years.....		²¹ 46,000	²² 220,000
Operation, maintenance, and repair.....		¹⁵ 13,632	¹⁶ 14,040
Years to pay out.....		¹⁷ 5,800	¹⁸ 7,100
6+50=56		32+50=82	
Power, at 5 mills:			
Average revenue first 50 years.....		²³ 17,232	²⁴ 17,640
Power and operation, maintenance, and repair.....	(25)	²⁵ 11,700	²⁶ 14,400
Revenue for irrigation repayment.....		5,532	3,240
Irrigation investment.....		¹¹ 255,000	¹² 312,000
50 years or less.....		46	162,000
Average revenue next 30 years.....			^{150,000}
Operation, maintenance, and repair.....			²⁷ 15,340
Years to pay out.....			¹⁶ 7,100
8,240			
18+50=68			
Power, at 5.5 mills:			
Average revenue first 50 years.....		²⁸ 18,632	²⁹ 19,040
Power and operation, maintenance and repair.....		²³ 11,700	²⁶ 14,400
Revenue for irrigation repayment.....		6,932	4,460
Irrigation investment.....		¹¹ 255,000	¹² 312,000
50 years or less.....		37	232,000
Average revenue next 30 years.....			^{80,000}
Operation, maintenance, and repair.....			³⁰ 16,540
Years to pay out.....			¹⁶ 7,100
9,440			
9+50=59			

See footnotes at end of table.

	1940 prices (a)	1940 plus 30 percent prices (b)	1946—1940 plus 60 per- cent prices (BR) (c)
Power at 6 mills:			
Average revenue first 50 years.....			³¹ 20,540
Power and operation, maintenance, and repair.....			²⁸ 14,400
Revenue for irrigation repayment.....			6,140
Irrigation investment.....			¹² 312,000
50 years.....			307,000
Average revenue next 30 years.....			5,000
Operation, maintenance, and repair.....			²² 17,640
			¹⁶ 7,100
Years to pay out.....			10,540
			1+50=51
¹ 650,000 acre-feet at \$3.	⁹ 15b+12b.	¹⁷ 3+11b.	²⁵ 15b+12b.
² At \$4.	¹⁰ 15c+12c.	¹⁸ 3+11c.	²⁶ 15c+12c.
³ At \$4.50.	¹¹ 14b.	¹⁹ 15b+12b.	²⁷ 6+11c.
⁴ 10,800 acre-feet at \$30.	¹² 14c.	²⁰ 15c+12c.	²⁸ 7+11b.
⁵ At \$40.	¹³ 2+11b.	²¹ 4+11b.	²⁹ 7+11c.
⁶ At \$50.	¹⁴ 2+11c.	²² 4+11c.	³⁰ 8+11c.
⁷ 1+11b.	¹⁵ 12b.	²³ 5+11b.	³¹ 9+11c.
⁸ 1+11c.	¹⁶ 12c.	²⁴ 5+11c.	³² 10+11c.

Senator MILLIKIN. Any questions?

(No questions.)

Thank you, Mr. Baker.

Senator McFARLAND. Our next witness is Mr. Wingfield.

STATEMENT OF K. S. WINGFIELD, CONSULTING ENGINEER, WASHINGTON, D. C.

Senator MILLIKIN. Please state your name, your residence and your business to the reporter.

Mr. WINGFIELD. My name is K. S. Wingfield. I am a graduate in electrical and mechanical engineering, and I have had 25 years' experience in the electric power field. For the past 6 years, I have been head of the consulting engineering firm of Wingfield & Henkel, Inc., with its principal office at Washington, D. C. During the course of my experience, I have had occasion to make numerous economic studies of power generation, both steam and hydro, together with market analyses, rate studies and investigations of proposed transmission line interconnections. For a period of 18 months, I acted as Chief of the Branch of Marketing and Operations of the Power Division of the Department of the Interior and in such capacity became familiar with the operations of the Bureau of Reclamation and the program of development for the Colorado River Basin. For the past 2 years, I have been acting as consultant on electric power matters for several of the irrigation and electrical districts in central Arizona.

Obviously, the development of the Colorado River in the lower basin contemplates the sale of a considerable block of electricity in southern California. This is true, not only because southern California constitutes the large nearby market but also because electricity generated at Bridge Canyon and other Colorado River developments will probably represent the cheapest source for large blocks of power which will be available to the southern California market, if considered over the long-term future.

In analyzing various 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 in competing for the available southern California power markets, the estimated costs of power from the Bridge Canyon hydro plant should indicate delivery of power at the principal load center—namely, Los Angeles—at costs no greater than the probable outlook for generation of such power at or near that city. The Bureau of Reclamation has stated that it estimates that Bridge Canyon power can be delivered at the load centers, including Los Angeles, at costs ranging from 4 to 5.5 mills per kilowatt-hour, depending upon whether or not the project is constructed under the provisions of S. 1175 or under the existing reclamation law. I have no study of these estimates of the Bureau, but have only attempted, in the following statement, to present estimates of probable costs of generation in the Los Angeles area which might be used in lieu of purchasing Bridge Canyon power.

While no one, at this stage of the development of atomic energy, can predict the cost or the date of its successful and economic application to the generation of electric power, it is safe to assume that considerable time will elapse before such application is likely to be perfected and that an additional period would be consumed before the necessary machinery and equipment could be made available. Congressman Horan, in his remarks relative to the Columbia River projects, as printed in the Congressional Record of June 25, 1947, states:

One of the most important men concerned with the study and application of atomic energy has stated that atomically generated electric power probably never will become feasibly anything more than a supplement to present methods of generation.

It is therefore my opinion that the present outlook for atomic energy development does not justify its consideration at this time as a replacement for hydroelectric energy developed at multipurpose projects having a long-term useful life. This leaves steam power generation as the real criterion of market price for delivered hydroelectric power generated at Bridge Canyon.

In estimating the probable cost of steam electric generation, the principal cost factor will be the price of fuel delivered at Los Angeles. As the outlook for continued output of natural gas and oil from the southern California fields appears doubtful and the price of oil will undoubtedly be high if it is subjected to costs of long pipe-line transmission or importation from foreign fields, a large steam electric generating plant should be designed to burn oil initially, but be changeable to coal for the longer term. The present price of oil at Los Angeles is stated to be \$1.80 per barrel and indications are that coal would be higher on an equivalent heat-unit basis, as it would have to be shipped in either by rail or boat from fields outside of California.

Under the present outlook for cost of labor and materials, a large steam electric generating plant consisting of 100,000 kilowatt units, using 1,250 pounds per square inch steam pressure, with boilers and building designed for oil as fuel changeable to coal, condensing water without cooling towers, simple architecture and finish, and including step-up transformers and switches, but no transmission and feeder

switching or transmission feed-back could probably not be constructed for less than an average cost of about \$120 per kilowatt of capacity. Change-over to coal would add about \$10 per kilowatt to this cost, making the total investment \$130 per kilowatt after the change-over.

This investment would be subject to fixed charges of interest, amortization or depreciation, taxes, insurance, and administration. As interest rates and taxes, or tax equivalent, would vary as between private and municipal financing, the following shows rates for fixed charges estimated at 5-percent interest for private financing and 3 percent for municipal:

Fixed charge rates	Private financing, 5 percent interest	Municipal financing, 3 percent interest
Interest and amortization:	<i>Percent</i>	<i>Percent</i>
5 percent of plant nondepreciable.....	5.000	3.000
75 percent of plant, 40-year life.....	5.828	4.326
15 percent of plant, 20-year life.....	8.024	6.722
5 percent of plant, 10-year life.....	12.950	11.723
Weighted average.....	6.472	4.989
Taxes:		
Local taxes.....	1.500	
Contributions in lieu of taxes.....		2.500
Federal income tax (32 percent) equivalent.....	1.640	
Insurance and administration.....	.500	.500
Total fixed charge rate.....	10.112	7.989

Assuming operation of the steam plant at 5,000 hours annual use, burning oil for fuel having 6.2 million B. t. u. per barrel costing \$1.80 and a plant efficiency of 10,800 B. t. u. per kilowatt-hour produced, fuel cost would be 3.14 mills per kilowatt-hour and annual costs would be estimated as follows:

Annual costs	Private		Municipal	
	Per kilowatt	Per kilowatt-hour	Per kilowatt	Per kilowatt-hour
	<i>Dollars</i>	<i>Mills</i>	<i>Dollars</i>	<i>Mills</i>
Fixed charges.....	12.13	0	9.59	0
Fuel oil (plant use 7.5 million B. t. u.).....	2.18	3.14	2.18	3.14
Supervision, engineering, labor, water, supplies and maintenance.....	3.00	.20	3.30	.22
	17.31	3.34	15.07	3.36
Kilowatt costs at 5,000 hours use.....		3.46		3.01
Total.....		6.80		6.37

After conversion of the plant to use of coal for fuel, assuming 12,500 B. t. u. per pound and a plant efficiency at 5,000 hours annual use of 11,000 B. t. u. per kilowatt hour produced, the cost per kilowatt hour generated would be the same for coal at about \$6.50 per ton as for oil at \$1.80 per barrel.

These estimates indicate that even under municipal operation, with 3 percent money, no taxes and using oil at its present price of \$1.80 per barrel, steam electric generation would cost 6.37 per kilowatt hour and, if the 2.5 percent contribution in lieu of taxes is eliminated,

the cost would still be 5.88 mills per kilowatt hour under the assumed conditions.

The Federal Power Commission reports show that during 1945, with a low annual plant use factor, the Southern California Edison Co. generated 580,268,000 kilowatt hours by steam plants having a capacity of 366,000 kilowatts at a production cost without fixed charges of 4.37 mills. During 1946, the report shows that it generated 1,309,086,000 kilowatt hours by steam at a production cost without fixed charges of 3.48 mills per kilowatt hour. The addition of fixed charges, estimated on the same basis as used above but for 3,570 hours use, would increase this figure to 6.88 mills.

From the available data, it would seem reasonable to assume that the southern California market will be able to absorb large blocks of firm power from Bridge Canyon, if delivered at 5.5 mills or less, which power would be free of the continuing threat of increasing prices for fuel.

Senator MILLIKIN. Any questions?

(No questions.)

Senator McFARLAND. Our next witness is Mr. Abbott.

STATEMENT OF H. S. CASEY ABBOTT, FARMER; DIRECTOR, ARIZONA FARM BUREAU FEDERATION

Senator MILLIKIN. Please give your name, your residence, and your business to the reporter.

Mr. ABBOTT. My name is H. S. Casey Abbott, of Avondale, Ariz., where I am engaged in farming and cattle feeding operations. I am a director of the Arizona Farm Bureau Federation.

I have been familiar with the Colorado River and attendant problems since 1913, when I first started farming operations in Baja, California, Mexico, 22 miles southeast of Calexico, Calif. At that time water was secured from the Compania de Terrenos y Aguas in wholesale quantities out of the Alamo canal, the revenue therefrom accruing for the benefit of the Imperial Valley of California. This practice and condition still holds.

For the committee's information, Imperial Valley in California, came into being because of a contract entered into with the Mexican Government in the 1904's by the Colorado Development Co. (which preceded the Imperial irrigation district) which permitted that company to bring water through the ancient Alamo River channel around the southern end of the sandhills in Mexico and deliver it back into the Imperial Valley of California, the consideration being that Mexican lands were entitled to 50 percent of the water which flowed through the canal. In no other way because of economic reasons at that time could water have been brought into that valley and because of physical conditions there existent it is conceivable that the Colorado River would have long ago refilled that valley had it not been for the canal deal with Mexico and the fact that all of the defensive works against the river were permitted in Mexico.

We have looked upon the Colorado River compact, the Boulder Canyon Project Act, the California Limitation Act and other pertaining contracts as being documents and agreements honestly arrived at and capable of literal and easy interpretation. We could see no situa-

tion which would disturb our rights under these documents, and it was and is not now understandable to us how a great State like California can deliberately forget and ignore her written word and attempt to solve her internal water problems at the expense of a neighboring State.

Anyone can twist figures to suit the case, but some of the testimony I have been listening to certainly bears questioning. Mr. Peterson gave the value of the Arizona Central Valley as 247 or 287 million dollars. This was unquestionably the assessed valuation which in this case is based on percentage values. The actual cash value of that area actually is well above two billion and closer to three. But is that the only measure used in California? We have a habit in Arizona of measuring these matters on a basis of human value also, and we know that the Government uses this same basis and it has paid tremendous dividends. We value our homes, our associates, our daily lives with one another and the future of our State and its citizens and their part and destiny in this Nation.

Again, Mr. Matthew testified that there are 500,000 acres of land in cultivation in Imperial Valley for which there was diverted 2,700,000 acre-feet out of 3,800,000 of its claimed priority. In April of this year, I was informed by the conservation office at Imperial, Calif., that the area in cultivation in the valley was 375,000 acres. That certainly is at variance with the 500,000-acre figure. On the same day, I went to the north end of the valley and checked the wastage into Salton Sea and found both rivers, the Alamo on the east side of the valley, and New River on the west, carrying a large amount of water into that sea.

The truth is that the Imperial Valley has always wasted a large amount of water into Salton Sea. This wastage has been consistent down through the years in an attempt to show diversion and beneficial use in large amount for two reasons. In the early days the reason was given me by men interested in the land on the Mexican side and later by Charlie Perry, chief engineer of the Imperial irrigation district, was because Texas would be attempting a trade of Colorado River water for Rio Grande water and they wanted to have sufficient usage to block it.

Apparently, the last few years the same tactics are being applied to Arizona. In 1939 the diversion for Imperial Valley use was 3,000,000 acre-feet. The delivery to farmers that year was 2.8 feet per acre or 1,040,000 acre-feet. Allowing liberally for delivery loss and ditch seepage and evaporation—it can be seen that upward of 1,500,000 acre-feet went into Salton Sea. That sea has been rising steadily of late years in spite of tremendous evaporation losses and only because the valley lands have absorbed about all the excess water absorbable and more waste and return water is going into the sea. This is borne out by the fact that tile drainage has become a necessity to keep their lands in tillable condition.

The water being wasted at present is definitely usable and recoverable water. The Alamo showed 1,749 parts of solids to the million and the New River, 1,921. Our State men hold that anything under 2,000 parts is usable water. Thus, it can be seen that from 1,000,000 acre-feet up of usable water is being dissipated which could be caught before it reaches the sea and becomes contaminated by

using recovery basins in the rivers and lifted by pumps east and west to where it can be used again. Certainly, it is inconceivable that the irrigation of 375,000 acres would give a return surface flow of a million acre-feet. Incidentally, very little of this showed in New River at Calexico where it would come from the Mexican irrigated area draining to the north. That stream was almost dry. The area of Salton Sea, probably 250,000 acres, with its 6 feet and over of evaporation annually, can dissipate a tremendous amount of water. This, regardless of rights, is not and never has been, beneficial use.

It is apparent to those of us who have lived with the situation that there is ample water within the 4,400,000 acre-feet for California if she will properly conserve and use it to take care of the metropolitan water district, Palo Verde Valley, San Diego County, Coachella Valley and lands now irrigated in Imperial Valley. Conceivably, they cannot bring under cultivation all of the desert land in that area any more than we can bring under cultivation the more than 2,000,000 acres of fertile desert land which are susceptible of irrigation in central Arizona but for which we never can have water. These areas must remain desert by California's own admission.

We can only ask for water which is ours, to maintain our developed and existing farms and cities. We ask for no water for new developments. California opposes us with the bold statement that her usage is not for the present but for future growth and development. Thus, she proposes to destroy an existing civilization, fully functioning and supporting over 400,000 people, and a State government in order to irrigate 500,000 acres of desert land for which no distribution systems are built, practically all of which is public land, and in so doing repudiate the solemn agreement which she has made with other basin States and the United States Government to limit herself to 4,400,000 acre-feet of apportioned water—this without regard for basic human rights. Such selfishness and greed is of ill import to the future of this country and is not understandable by us, nor do we believe that such a plan would be supported by Congress even in the absence of the Colorado River compact, the Boulder Dam Act, and the California Limitation Act.

Certainly we have the right to believe that Congress will not aid California to breach its solemn contract required by an earlier Congress, from which California has received tremendous benefits and upon the sanctity of which limitation act we have been led and have a right to rely.

This is a matter of common honesty and fair dealing and reverts to the simple proposition of whether the civilization as built in central Arizona by the men and women of that State is worth saving for posterity.

Senator MILLIKIN. Thank you, Mr. Abbott.

Senator McFARLAND. I wish to submit a supplementary statement of George W. Barr, prepared on the request of Senator Downey, and ask that it be printed in the record.

Senator MILLIKIN. That will be done.

Senator McFARLAND. That is all.

(Statement of George W. Barr follows:)

The accompanying table follows the form suggested by Senator Downey. The figures on farm and ranch income are approximately the same as those furnished by Herbert S. Leggett on S. 1175, exhibit 4, and probably represent later revisions by the Bureau of Agricultural Economics. Income per acre has been furnished in terms of April 1947, dollars, which was the base used by this witness in direct testimony.

Cash farm income in Arizona

	Land receiving water, thou- sands of acres ¹	Cash receipts from farm marketing ² (not includ- ing Govern- ment pay- ments)	Arizona cash farm income per acre land receiving water	Index wholesale prices ³ 1910-14=100	Income per acre in terms of April 1947 dollars ⁴
(1)	(2)	(3)	(4)	(5)	(6)
1929.....	574	\$69,461,000	\$121	139	\$188
1930.....	607	50,264,000	83	126	143
1931.....	587	32,704,000	56	107	113
1932.....	571	25,065,000	44	95	100
1933.....	568	25,767,000	45	96	102
1934.....	547	35,820,000	65	109	130
1935.....	560	48,611,000	87	117	160
1936.....	619	47,409,000	77	118	141
1937.....	671	58,125,000	87	126	149
1938.....	653	54,554,000	84	115	158
1939.....	665	52,178,000	78	113	149
1940.....	681	53,114,000	78	115	147
1941.....	731	75,145,000	103	127	175
1942.....	750	97,187,000	130	144	195
1943.....	753	131,450,000	175	151	251
1944.....	765	125,265,000	164	152	234
April 1947.....				⁵ 216.6	
Average income per acre for 16 years 1929-42 from Cash Receipts From Farming by States and by Counties, Bureau of Agricultural Economics, January 1946; 1943, 1944 from July 1946 issue, Farm Income Situation, Bureau of Agricultural Economics.			92		158
Average income per acre for the years 1939 to 1944, inclusive.....			121		192
Average income per acre for the years 1929 to 1938, inclusive.....			75		138

¹ From table 1, statement of Dr. George W. Barr on S. 1175.

² 1929-42 from Cash Receipts From Farming by States and by Counties, Bureau of Agricultural Economics, January 1946; 1943, 1944 from July 1946 issue, Farm Income Situation, Bureau of Agricultural Economics.

³ Agricultural Statistics 1946, USDA, p. 553.

⁴ Cash income (column 4)
column 5 $\times 216.6$

⁵ Supplied June 30, 1947, by Carl Randall, BAE, USDA, Re. 4142, Ext. 5021.

Senator MILLIKIN. Senator McCarran.

Senator McCARRAN. I desire to present a statement with reference to the bill before you at this time when, as, and if you will allow me. I can only remain a few moments.

Senator MILLIKIN. Whenever you wish, we will put it in the record.

Senator McCARRAN. I would like it to follow the statements made by the witnesses.

Senator MILLIKIN. The statement will be placed in the record. I suggest, immediately following Judge Stone's testimony, the testimony of Mr. Tipton and that of the other witnesses on behalf of Arizona.

Senator McCARRAN. Yes. I desire to file this statement with the committee.

Senator MILLIKIN. Thank you for coming, Senator.

(The statement of Senator Pat McCarran follows:)

STATEMENT OF SENATOR PAT MCCARRAN, OF NEVADA

The Senate Committee on Public Lands has under consideration S. 1175, 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 transport 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 a junction point part way to the Phoenix area, and using about a third of the Bridge Canyon power. 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. The initial part of it, involving the Parker pumping route, will cost over \$600,000,000. This latter figure is about the same as the estimated cost of the St. Lawrence seaway, and 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.

SUBSIDIES REQUIRED

The power users or the Federal taxpayers will have to provide not only the 600 million to one billion of capital costs, but also over \$3,000,000 per year in operating expense.

The scheme does not contemplate that the Treasury will get any interest on its power investment. The amortization period is estimated at over 80 years. 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 have to carry the burden of over a quarter billion dollars of operating expense that the water users cannot pay.

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 with over \$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.

RELATION TO NATIONAL DEBT

Coming on the heels of an effort to reduce Federal income taxes 4 billions, and to reduce the current budget by a comparable figure, any project that adds over a billion to the interest burden on the taxpayers deserves mature consideration.

EFFORTS AT HASTE

The bill has not been reported upon by the Interior Department. The Reclamation Bureau has not completed its investigations and hence is not yet ready to submit its proposed plans to the seven affected States for their comment, as is required by the O'Mahoney-Millikin amendments to the Flood Control Act of 1944; furthermore, it will not be ready to do so for another year. The procedure used here would make a dead letter of the O'Mahoney-Millikin amendments. The project has not cleared the Bureau of the Budget. The Boulder Canyon Project Act involved only a fifth as much money, but Arizona opposed it and kept it before Congress for many years. In spite of all this, the project's sponsors are pressing the Arizona delegation to get it reported out and passed. The Congress is being deluged with publicity and propaganda in its favor.

WATER

The enormous investment proposed in S. 1175 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-basin States, and by most of the water users in Arizona, but which was supported by the sponsors of S. 1175, 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, Arizona's expert, Mr. Debler, has 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 Lees Ferry and reduce its own uses for periods as long as 20 years at a time.

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, have 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.

To put this matter at rest, the Senators from Nevada and California are joining in introducing a bill 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.

Senator MILLIKIN. The further hearings will go over until we get the official report from the Bureau of Reclamation and the reports of the States and other interested parties as provided by the O'Mahoney-Millikin amendment.

And I would like to say, Mr. Larson, I hope that you will get ahead with your work. Both States are entitled to an early official statement of the Bureau's position on this and the statement of the interested parties. I hope you will pursue the matter with utmost expedition and get your reports in here as rapidly as possible. When we have these reports, we will then decide the further procedures.

Senator McFARLAND. At that time, in accordance with the wish of the chairman and after California files her statement, I will file my

rebuttal to the matters raised by California and the matters raised here.

Senator MILLIKIN. That is all right. Thank you very much.

(Whereupon, at 4:45 p. m., Thursday, July 3, 1947, the meeting of the subcommittee was adjourned.)

ANSWER OF SENATOR ERNEST W. MCFARLAND TO THE REBUTTAL TESTIMONY
SUBMITTED BY CALIFORNIA

As suggested by Senator Millikin, the chairman of the subcommittee, I submit a summary of the principal issues and a statement in answer to the testimony offered by California by way of rebuttal. In doing so, it is expressly recognized that much, if not all, of such rebuttal is repetitious of matters and views previously expounded by the witnesses produced by that State.

However, such rebuttal emphasized issues which are best formulated in the testimony earlier given by Judge Clifford H. Stone, an impartial witness from Colorado, who stated (p. 513):

"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?"

A third issue is the California assertion that it needs Colorado River waters (in excess of 4,400,000 acre-feet) to satisfy an existing need. Even if this were true, which it is not, California would not thereby acquire a right to the water in controversy, a point which I will elaborate more fully below after a discussion of the issues first above noted.

These particular issues can best be understood if approached with the perspective afforded by a review of the steps leading to the introduction of S. 1175.

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.

Although the delegates signed the compact November 24, 1922, the people of Arizona refused to ratify it for the reason that we were unable to get California to agree with us upon a fair division of the waters allocated to the lower basin by the compact.

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.

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, for the benefit of Arizona and the five other States, of a statute which should provide: "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."

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 energy, California's alacrity in adopting 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. 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, plus not more than one-half of the water in excess of or surplus to the water apportioned by the compact. 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 and Arizona not less than 2,800,000. 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 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.

Arizona, relying on the protection thus afforded her, eventually adopted the Colorado River compact. This action was not taken promptly, because a large number of the people of Arizona believed that Congress had not required California sufficiently to limit herself to a small enough quantity of the waters of the Colorado. As a matter of final fact, however, Arizona had little choice, as the rights of the States were pretty 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, less one twenty-fifth of such surplus water, to be used by Nevada.

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 (i. e., 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 call 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, wherein he points out that the wording of the compact clearly and convincingly shows that article III (b) water is apportioned water (pp. 513-519). I further call attention to page 517 of the record of this hearing, at which place Judge Stone quotes 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."

Immediately following a brief discussion of this quotation, Judge Stone points out (p. 517) that the Supreme Court supports Arizona's contention upon this point.

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. Howard in his testimony tried to explain this reply away by suggesting that it was an erroneous reference or a typographical error (pp. 330-331).

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 advisor for the State of Colorado. He was present at the compact sessions and is familiar with the background of the compact. His testimony is found from page 473 to page 481 of the record of this hearing. I call particular attention to pages 475 through 476, 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, special attorney for the State of Arizona on Colorado River matters, wherein he incorporates testimony of Hon. Thomas E. Campbell, former Governor of Arizona, of Mr. W. S. Norviel, Arizona's commissioner at the compact sessions, and of Mr. C. C. Lewis, another of Arizona's representatives at such sessions (pages 370 to 377 of the hearings before the Committee on Irrigation and Reclamation of the House of Representatives on H. R. 5434). This testimony was introduced and made a part of the record in this case (note pp. 221, 481, 483).

Also, direct and compelling testimony to this fact was given by Mr. E. B. Deblor, who was from 1921 to 1943 in charge of most of the project planning for the Bureau of Reclamation (p. 292 et seq.). In 1943 and 1944 he was Director of Project Planning, and from 1944 to April 1947 was regional director of region 7.

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; its value from the point of confluence onward is to help supply water to Mexico under the Mexican Treaty. The virgin flow of the Gila at such confluence is now estimated at approximately 1,270,000 acre-feet per annum, 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, with a consequent depletion of the Colorado. 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 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.

The history of these and correlative details is shown by the testimony of Mr. Meeker (pp. 474-475, 477-481), in which he defines the meaning of "consumptive use" from his personal view as an engineer expert and from the standpoint of lawyers and other engineers.

The propriety of Arizona's definition of beneficial consumptive use, as above set forth, is also made plain by the testimony of Mr. E. B. Debler, found on pages 292 to 307 of the record of this hearing. I call particular attention to page 296, where Mr. Debler explains how Congress imposed this interpretation of beneficial consumptive use by the very terms of the Boulder Canyon Project Act itself.

I would also call attention to the testimony of Mr. Charles A. Carson, given upon this topic (pages 481 to 490).

Particularly, I desire to reemphasize the testimony of the Honorable Clifford H. Stone on this subject (pages 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 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 further call attention to the testimony of Mr. R. J. Tipton (pages 522 to 548), in which are quoted, in the form of minutes, excerpts from the discussions held by the framers of the compact, and quotations of the views of eminent engineers and lawyers, sustaining the position of Arizona and making plain that the proper definition of "beneficial consumptive use" is as above stated. Mr. Tipton himself unequivocally espouses the same opinion.

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.

The third of the presently relevant contentions raised by California in her rebuttal is that contained in the statement of Mr. Arvin B. Shaw, Jr., on page 2 of the supplemental statement submitted by him, as follows:

"If Arizona is right in all its contentions, the water supply for the central Arizona project would be drawn away from constructed projects in California and these constructed projects would, to that extent, be rendered useless. These California projects have been planned for more than 25 years, have been constructed to substantial completion under Federal authority and in part by the Government and are in operation."

This statement is not supported by the evidence or facts.

California admits that her annual use of Colorado River water at present is "something like 3,000,000 acre-feet." (See Mr. Raymond Matthew's testimony, p. 377.)

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. (See Mr. Matthew's testimony, pp. 386-388.)

Arizona does not admit that California's claim that she needs this water has any proper place in this hearing. Even if she did need the water, such need alone would not give her any right to water which justly belongs to Arizona. However, inasmuch as California has raised the question, I feel justified in calling attention to the fact that recent investigations of the type and feasibility of use of the new lands which California proposes to develop with this water, show the water will not be needed for the reason that the majority of these lands are not irrigable. This subject is treated in 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. I would call your attention to the fact that the soil survey upon which this report was based, was conducted cooperatively by the University of California and the United States Department of Agriculture: so the data contained therein should be beyond question, and certainly beyond attack by California.

The report upon the Imperial West Mesa has not yet been completed. This may be due to the circumstance that the lands of the West Mesa at best are no more than equal to those of the East Mesa, and probably are inferior; yet, notwithstanding this factor, most of the West Mesa may be irrigated only by pumping the 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 land, defined as follows: "Lands that appear to be permanently nonagricultural under the practices of irrigation farming" (p. 49 of the noted report).

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 want to make is, that even with the same percentage of irrigable lands on the West Mesa as are on the East Mesa (and, as I stated above,

the lands of the West Mesa are probably not nearly as good as those of the East Mesa), there would be only about 12,000 irrigable acres on the West Mesa. The result is that there are only a total of 47,000 or 48,000 acres of irrigable land on both mesas. Subtracting these from the total area of 300,000 acres leaves more than 250,000 acres of nonirrigable lands. The amount of water estimated by the report as required to irrigate the irrigable areas is 12 to 15 acre-feet per acre. (See question E, p. IV of report.)

So it is understandable why California cannot and does not deny that if this 300,000 acres were not put into cultivation, there would be plenty of water for that State. Even if only the 48,000 acres classified as irrigable were placed into cultivation, the exclusion of the 252,000 nonirrigable acres which undoubtedly never will be developed, would eliminate all questions of sufficiency of the water supply to meet California's needs.

I also call your attention to the fact that practically all of this land of the East and West Mesas is owned by the Federal Government and that no individual has any rights to such federally owned lands. Therefore, no private individuals will be injured by the failure to place into cultivation these federally owned lands which are classified as nonirrigable. As a matter of fact, if any private individuals did own these lands, they would be injured in trying to cultivate them if such lands were to be irrigated.

I respectfully refer to this report on the Imperial East Mesa as giving valuable information in answer to many of the statements made by the California witnesses.

I also invite your attention to the fact that there is no return flow of waters taken into the Imperial areas, and that all waste waters go into the Salton Sea, at which time and place they cease to be useable for irrigation or consumption, and in due course evaporate into the air. Any increase in the waters in the Salton Sea merely water-logs other lands.

I submit herewith, marked as "Exhibit A," a table furnished to me by the Bureau of Reclamation at Yuma, showing the number of acre-feet of water flowing into the Salton Sea from the Imperial irrigation district, and the number of acre-feet of water flowing into the Salton Sea from the Imperial Valley in Mexico. From such table, it will be noted that in the year 1946 there were 405,646 acres irrigated with 2,717,530 acre-feet of water, and that the total return to the Salton Sea was 1,116,200 acre-feet, of which 42,050 acre-feet was from Mexico, leaving a balance of 1,074,150 acre-feet of water returning from operations in California, which water is as good as much of that being used by many cities for drinking purposes. *The amount of water which is presently being wasted in the Salton Sea is approximately the amount needed for the Central Arizona project.*

I also submit exhibit B, which is a picture of New River carrying the waste water of the Imperial Valley into the Salton Sea, taken in April of 1947; and exhibit C, which is a picture of the Alamo River in Imperial Valley near Holtville, also taken in April of 1947, showing the Alamo River carrying waste water into the Salton Sea from the Imperial irrigation district. If the committee could take a trip over this Salton Sea area, the members would find lands being water-logged by the increased water in the Salton Sea. The continuance of this situation would be a big problem; it is treated in the report above mentioned.

I do not contend that what California does with her water is any of Arizona's business. I merely present these matters because of the arguments which are being made in newspapers, and even in this hearing, that the development of the central Arizona project would take water which could be more profitably used on California projects.

I feel that the rebuttal statement of Mr. Carson, and the testimony of Judge Stone, Mr. Tipton, and others have sufficiently answered the question of the desirability of any need for litigation of the water rights between Arizona and California. Arizona will of course make its position clear at any later hearing upon the resolution introduced by the Senators from California and Nevada for the purpose of postponing further consideration of S. 1175 and Arizona's welfare pending the outcome of litigation.

EXHIBIT A

Year	Imperial Irrigation district		Imperial Valley in Mexico				Return flow to Salton Sea	
	Land irrigated	Water delivered	Land irrigated	Water delivered			From Mexico at boundary	Total including that from Mexico
				Pilot Knob	Hanlon Heading	Total		
	<i>Acres</i>	<i>Acre-feet</i>	<i>Acres</i>	<i>Acre-feet</i>	<i>Acre-feet</i>	<i>Acre-feet</i>		
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, 550 179, 200	131, 808	-----	856, 397	856, 397	-----	-----
1941.....	399, 287	1, 491, 041 1, 095, 958	159, 668	-----	768, 737	768, 737	-----	875, 563
1942.....	382, 179	255, 019 2, 394, 503	175, 706	-----	734, 381	744, 381	64, 102	709, 740
1943.....	379, 947	2, 345, 900	200, 000	-----	1, 152, 106	1, 152, 106	58, 022	1, 073, 004
1944.....	384, 256	2, 451, 860	205, 716	393, 044	710, 213	1, 108, 257	40, 298	1, 085, 102
1945.....	393, 699	2, 494, 860	221, 068	681, 658	383, 483	1, 065, 141	37, 902	1, 068, 424
1946.....	405, 646	2, 717, 530	242, 059	1, 022, 444	232, 858	1, 255, 302	42, 050	1, 116, 200

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

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

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

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