

ANNUAL REPORT
of the
Colorado River Commission
of Arizona

Phoenix, Arizona



November 1, 1943 to November 1, 1944



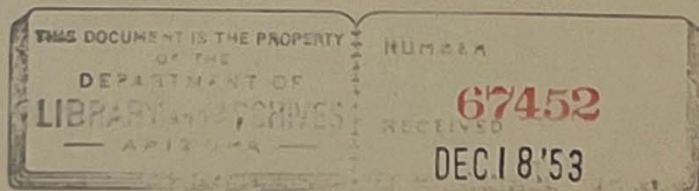
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ANNUAL REPORT
COLORADO RIVER COMMISSION
of
ARIZONA

November 1, 1943

to

November 1, 1944



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PERSONNEL OF THE COLORADO RIVER COMMISSION
OF ARIZONA

The present Colorado River Commission consists of the following:

Henry S. Wright, Member-Chairman, term
expires January 31, 1947

Nellie T. Bush, Member-Secretary, term
expires January 31, 1949

Alma M. Lavis, Member--term expires
January 31, 1945

Honorable Sidney P. Osborn, Governor
Member ex officio

W. M. Cox, Assistant Secretary

Colorado River Commission Expenditures
from November 1, 1943 to November 1, 1944

SALARIES AND FEES

Assistant Secretary	\$ 3,000.00
Commissioners Per Diem	960.00
Attorney for the Commission	5,202.50
Engineer for the Commission	1,747.65
Clerical (Office)	975.00
	<hr/>
	\$ 11,885.15

OPERATION

Office Repairs	\$ 40.50
Office Supplies	76.29
Printing	541.84
Postage	60.00
Telephone & Telegraph	262.22
Office Rent	428.40
Bond Premiums	25.00
Subscriptions	14.48
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	\$ 1,443.73

TRAVEL

Commission Members Travel	\$ 664.49
Attorney for the Commission	817.14
Engineer for the Commission	241.90
	<hr/>
	\$ 1,723.53

Total-- \$ 15,057.41

\$2,846.26 of the appropriation for the Colorado River
Commission for 1944 reverted to The General Fund on July 1st.

BOULDER DAM REVENUE

The Boulder Dam Project Adjustment Act which became effective on June 1, 1941 has given the State of Arizona \$2,100,000.00 in revenue from the sale of power made at the Boulder Dam.

The Act provided for payment of \$300,000. annually, beginning June 1, 1937; the payments to continue for fifty years. Payments are being made by the United States when due.

It is the duty of the State Legislature to determine what disposal will be made of this fund.

On February 24, 1944 Governor Osborn signed Senate Bill No. 4 of the Special Session of the 16th Legislature, to appropriate \$200,000 to the State Land and Water Commission for the 32nd and 33rd fiscal years to cooperate with the U. S. Reclamation Bureau in surveys of water projects.

FOREWORD

Heretofore Colorado River Commission reports have carried a survey of projects that appear possible of developments in Arizona. This report is confined to such projects as have been initiated or those now being considered by the State of Arizona and the Bureau of Reclamation of the United States. This issue therefore offers to its readers, statements of the Colorado River problems by men who authoritatively present certain points of view. It is believed that the interests of the State of Arizona and the whole southwest will be furthered by sound plans for diversion of Colorado River Water to Arizona lands.

In the last analysis these discussions turn to the subject of the treaty between the United States of America and Mexico. The interests of the basin states and of the Federal Government are likewise involved. The treaty was recently signed by the President and is now in the hands of the Foreign Relations Committee for a recommendation to the United States Senate.

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 45 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 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.

(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 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.

(k) 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

Approved this 7th
day of February, 1944

STATE OF ARIZONA, acting by and through
its COLORADO RIVER COMMISSION

By (Signed) Henry S. Wright
Chairman

(Signed) Sidney P. Osborn
Governor of the
State of Arizona

By (Signed) Nellie T. Bush
Secretary

CERTIFICATE

STATE OF ARIZONA)
County of Maricopa) ss

I, Nellie T. Bush, secretary of the Arizona Colorado River Commission, hereby certify that at a meeting of the said Commission held at the office of the Governor of the State of Arizona, on the ____ day of February, 1944, the following resolution was adopted:

"RESOLVED: That the Colorado River Commission of Arizona does hereby approve, confirm and ratify the contract executed on its behalf and in its name by its chairman and secretary, in accordance with previous informal authorization, on behalf of the State of Arizona, between the United States, acting by Harold L. Ickes, Secretary of the Interior, and the State of Arizona, acting by this Commission, which contract was approved by the Governor of the State of Arizona on February 7, 1944, and bears date and was signed by Harold L. Ickes, Secretary of the Interior, on February 9, 1944."

And that the foregoing is a true and exact copy of said resolution as the same appears upon the minutes of said meeting of said Commission.

IN WITNESS WHEREOF, I have set my hand as Secretary of the Colorado River Commission of Arizona this ____ day of February, 1944.

Secretary

State of Arizona
House of Representatives
Sixteenth Legislature
First Special Session

S. B. 1

Introduced by Mr. Paul C. Keefe of Yavapai

RATIFYING THE COLORADO RIVER COMPACT

1 Be it enacted by the Legislature of the State of Arizona:

2 Section 1. Ratification. The Colorado River Compact
3 executed at Santa Fe, New Mexico, November 24, 1922, by
4 representatives of the States of Arizona, California, Colorado,
5 Nevada, New Mexico, Utah and Wyoming is ratified, approved
6 and confirmed.

7 Section 2. Emergency. To preserve the public peace,
8 health and safety it is necessary that this Act become im-
9 mediately operative. It is therefore declared to be an
10 emergency measure, to take effect as provided by law.

State of Arizona
House of Representatives
Sixteenth Legislature
First Special Session

H. B. 2

Introduced by Mr. McDaniel of Maricopa

RATIFYING THE CONTRACT BETWEEN THE UNITED STATES AND
THE STATE OF ARIZONA FOR STORAGE AND DELIVERY OF WATER
FROM LAKE MEAD AND DECLARING AN EMERGENCY

1 Be it enacted by the Legislature of the State of Arizona:

2 Section 1. Ratification. That certain contract for the
3 storage and delivery of water from Lake Mead executed on
4 behalf of the United States by the Honorable Harold L. Ickes,
5 Secretary of the Interior, and on behalf of the State of
6 Arizona by its Colorado River Commission, bearing date the
7 9th day of February, 1944, is unconditionally ratified, ap proved,
8 and confirmed.

9 Section 2. Emergency. To preserve the public peace,
10 health and safety, it is necessary that this Act become im-
11 mediately operative. It is therefore declared to be an
12 emergency measure, to take effect as provided by law.

State of Arizona
House of Representatives
Sixteenth Legislature
First Special Session

H. B. 3

Introduced by Mr. McDaniel of Maricopa

AN ACT

MAKING AN APPROPRIATION TO THE STATE LAND
DEPARTMENT TO MAKE SURVEYS OF WATER RESOURCES

1 Be it enacted by the Legislature of the State of Arizona:

2 Section 1. Appropriation. The sum of two hundred
3 thousand dollars is appropriated to the State Land Depart-
4 ment, one hundred thousand dollars to be available in the
5 thirty-second fiscal year and one hundred thousand dollars
6 in the thirty-third fiscal year. The appropriation is ex-
7 empt from the provisions of section 7, article 2, of the
8 budget and financial administration Act of 1943, and unex-
9 pended balances remaining at the end of the fiscal year for
10 which appropriated shall not lapse.

11 Section 2. Purpose. The purpose of the appropriation
12 made by this Act is to enable the State Land Commissioner to
13 perform the duties imposed upon him by section 74-104,
14 Arizona Code of 1939, to make surveys, investigations and
15 compilations of the water resources in the state, and their
16 potential development in cooperation with the United States.

17 Section 3. Emergency. To preserve the public peace,
18 health, and safety it is necessary that this Act become im-
19 mediately operative. It is therefore declared to be an
20 emergency measure, to take effect as provided by law.

ARIZONA PROSPECTS

Projects aggregating \$640,475,000 for development in Arizona under the Multi-purpose Program presented to Congress by the Bureau of Reclamation are part of a vast Post-War construction planned for the 17 far western states. With approximately two billion dollars as the cost, at 1940 prices, 236 projects have been mentioned.

Arizona is listed with the following projects as possible of development or actually being constructed:

Gila-Mesa	\$ 3,580,000
Davis Dam	41,200,000
Parker Dam Power	5,010,000
Welton-Mohawk	9,420,000
Bridge Canyon	207,432,000
Bill Williams River (Alamo Flood Control Dam)	3,200,000
Diversion for Central Arizona Chino, Snowflake, Winslow, Holbrook and Hassayampa	333,000,000
Coconino	16,633,000
Buttes	4,000,000
Sentinel (Flood Control Dam)	7,000,000
	10,000,000

AN INVENTORY OF POST WAR PROJECTS

H. W. Bashore, Commissioner of the Bureau of Reclamation in a memorandum prepared for the Special Committee of the United States Senate, on Post-War Economic Policy and Planning, in a hearing held June 6, 1944, states the results of the work of his department. It is an inventory of merit.

The memorandum is dated June 2, 1944, and is an inventory of irrigation and multiple-purpose projects in the 17 far Western States which could be included in a post-war public works program.

Included in the inventory are 236 individual projects and groups of miscellaneous projects listed by states. Forty of the projects listed are now authorized for construction under the reclamation law or supplemental statutes. Work on specified features of 30 of these is scheduled under the war food or war power programs of the Bureau of Reclamation. The remainder of the group is made up of projects that were halted by the war or on which the initiation of construction has been deferred because of war conditions. Uncompleted work on all these projects could be accelerated at the start of the post-war period, provided adequate funds are made available.

A report of the Bureau of Labor Statistics shows that of 14,570,000 persons to be demobilized from the services and war industries throughout the country 2,929,000 will be in the 17 Western States where water conservation for irrigation is most essential. Of immediate importance to the 17 States mentioned is employment for a substantial number of the 1,771,000 war veterans and for 1,158,000 emergency industrial workers who may be out of jobs there in the reconversion interval.

The total employment from the construction of all the projects in the inventory is estimated at 1,251,000 man-years. Only 553,000 or 44% of the men, would be employed at the construction sites in the 17 Western States. More than one half or 56% of the workers would be engaged principally in the 31 states in the mid-west, east, and south - in factories, mines and smelters in producing the materials for construction and for the transportation.

The population of the far Western States has increased four times as rapidly as any other section of country since the turn of the century. From 1920 to 1940 the population gain in the 11 states of the Mountain and Pacific group, which are dependent on irrigation, was 60%, while the increase in irrigated land was less than 10%. The Pacific Coast is the only one of the major regions of the country to show a gain from 1940 to 1943.

In the light of these facts, irrigation must be expanded in the West. The need will be accentuated when the veterans with farm background return to seek irrigated land on which they can find security, build homes, and raise families. Estimates are that 265,000 of these Westerners who will be demobilized from the Armed Forces will be farm boys. The completion of all of the projects in the inventory would create about 135,000 farms and assure security in their present locations for more than 150,000 additional farm families in Western areas with shortages of irrigation water. These developments would come about through construction of irrigation systems to serve 6,705,000 acres of new land, and to furnish supplemental water for 9,364,000 acres of land now without adequate irrigation supplies.

The power capacity in the multiple-purpose projects which are authorized would add 1,765,000 kilowatts to the existing installations at Bureau of Reclamation projects. The potential firm power in projects under study, is estimated at 2,579,000 kilowatts.

The expansion of irrigation that is indicated as possible from the inventory would enlarge the purchasing power of the West and provide an increased home market for the products of industries and farms of the Midwest, East and South not produced in irrigated areas. Conservative estimates are that the full development of the irrigation projects listed would add one and one quarter billion dollars to the annual purchasing power of the West for products not Western.

MEMORANDUM REPORT
on
INVESTIGATION OF VIRGIN RIVER
in
UTAH AND ARIZONA
by

Donald C. Scott
Consulting Engineer

February 15, 1944

Prepared under the instructions of
Governor Sidney P. Osborn and Arizona
Colorado River Commission as a prelimi-
nary investigation in connection with a
proposed tri-state compact among the
states of Arizona, Nevada, and Utah.

INTRODUCTION

On January 30, in company with Mr. O. C. Williams, Arizona State Land Commissioner and Mr. Ed. Watson, State Engineer of Utah, a trip was made over the proposed projects on the Virgin River. Mr. J. M. Cahoon, who is in immediate charge of the Virgin River investigation work for the Bureau of Reclamation, acted as our guide and supplied much of the factual information contained in this memorandum.

SCOPE OF INVESTIGATION

Three major projects are under active investigation at this time, namely the Hurricane Project, the Santa Clara Project, and the Littlefield Project. Other proposed projects have been investigated, but the above projects appear to be the most feasible of those investigated and a brief description of each is given herewith.

THE HURRICANE PROJECT

This project derives its water supply from the upper section of the Virgin River and contemplates the construction of a low diversion dam about 60 feet in height on the Virgin River approximately midway between the towns of LaVerkin and Virgin, Utah. This project.

would irrigate lands in and around Hurricane, Washington, and St. George, the majority of the lands being located in the state of Utah with approximately 3,100 acres in Arizona. These lands may be irrigated by diversion of the Virgin River by the low dam previously mentioned, thence through a tunnel about 2.7 miles in length which would deliver water into an off channel storage reservoir known as the Bench Lake Site; ~~xxxxxxxxxx~~.

In the event that investigation proves the Bench Lake Reservoir Site to be unsatisfactory, a high dam, 280 feet in height, may be constructed in place of the low diversion dam and channel storage of 160,000 acre feet may be provided for the project. The silt problem would be objectionable and the town of Virgin would be inundated if this plan is carried out. ~~xxxxxxxxxxxxxx~~

This project would furnish supplemental water to approximately 6,500 acres of land now in cultivation and would develop from 10,000 to 14,000 acres of new lands, 3,100 acres of which are located in Arizona. Preliminary estimates indicate that the project would cost approximately \$4,000,000.

SANTA CLARA PROJECT

This project derives its water from Santa Clara Creek and would irrigate lands in and around the town of Santa Clara, which is located approximately four miles west of the town of St. George on U. S. Highway 91.

This project will be developed by the construction of a dam on the Santa Clara Creek in the northwest corner of Section 28, Township 41 South, Range 17 West.

Preliminary investigations indicate that there is sufficient water supply to furnish a supplemental supply to approximately 1,700 acres of land now in cultivation and would bring in approximately 2,000 acres of new land located on what is known as Ivins Bench. (See the map above referred to). This is a rather small project and one which does not offer any great engineering or construction difficulties. Silt is not a serious problem on this project. The total annual silt deposit has been estimated to be about 100 acre feet. The preliminary estimate of the cost of this project is approximately \$1,200,000. Drilling operations are now being conducted at the dam site. It is proposed to construct an earth and rock fill dam 150 feet in height which will provide a reservoir with 18,500 acre feet storage capacity.

THE LITTLEFIELD PROJECT

This project contemplates the irrigation of approximately 16,000 acres located in and around the town of Littlefield, Arizona, with a portion of the acreage located over the state line in Nevada.

The plan of development is outlined on Bureau of Reclamation map entitled "Virgin River Basin Survey, Littlefield Project, Utah, Arizona Nevada Preliminary Map" attached hereto. This project would be developed by the construction of a dam 190 feet in height located at what is known as the Bloomington Reservoir site and would create a reservoir with 300,000 acre feet capacity.

The construction of this dam would inundate considerable valuable and highly developed lands south of St. George, Utah. The life of this reservoir would be greatly reduced due to the heavy silt disposition in the reservoir which has been estimated to be approximately 4,000 acre feet per year.

Respectfully submitted,

February 15, 1944

Donald C. Scott
Consulting Engineer

THE PROGRESS AND PLANNING OF
PROJECTS TO UTILIZE THE WATER
OF THE COLORADO RIVER SYSTEM
IN ARIZONA.

THE GILA PROJECT:

The Gila Valley Reclamation project in Southern Arizona as originally contemplated extended easterly from the Colorado River near Yuma for about 80 miles, and ultimately the project embraced 585,000 acres. The plan of reclamation is to divert Colorado River water at the east end of the Imperial Diversion Dam, convey it by gravity southeast across the Gila River to pumping plants, where it will be pumped to different contour elevations or units of the proposed project. The first pumping plant has been constructed with three pumping units with the following capacities: - 100 c.s.f., - 200 c.s.f., and one - 400 c.s.f., unit. This plant is designed to supply the water necessary to irrigate 32,000 acres of the Yuma Mesa. The main canals from the pumping plant have been constructed with sufficient capacity to deliver the necessary water to this acreage. The construction of a lateral system has been authorized for the delivery of water to 8,500 acres in and around the present Air Base located on the Yuma Mesa, and is now under construction. The full development of this project will be carried forward as soon as war-time conditions permit.

THE HORSESHOE DAM ON THE VERDE RIVER:

The Horseshoe Dam will be constructed under the terms of a tri-party contract between the Defense Plant Corporation, Phelps Dodge Corporation, and the Salt River Valley Water Users Association. This dam will be located on the Verde River approximately fifteen miles above the present Bartlett Dam. The plans, although prepared by a private engineering firm, have been approved by the U. S. Bureau of Reclamation. The dam will be of rock-filled construction, and will cost approximately \$2,000,000. Under the terms of the Tri-Party Contract the Phelps Dodge Corporation will pump not more than 14,000 acre feet of water a year from the Black River to be used in their copper milling operations at Morenci. The contract also provides that not over 40 acre feet may be diverted in any one day and the ultimate total use may not exceed 250,000 acre feet. In exchange for the right to divert water from the Black River, the Phelps Dodge Corporation will construct

the storage facilities on the Verde River which will become a part of the Salt River Valley project and be operated by the Salt River Valley Water Users Association. The Horseshoe Dam will provide storage capacity of 60,000 acre feet. It is anticipated that this capacity will regulate and control the flood waters of the Verde River to the end that there will be available for use on the project an average of 25,000 acre feet annually. By installing gates in the spillway the storage capacity can be increased to 150,000 acre feet and additional flood waters may be conserved. The foundations are to be so constructed that the dam can be raised in height to provide a total reservoir capacity of 300,000 acre feet. This project is under construction at this time.

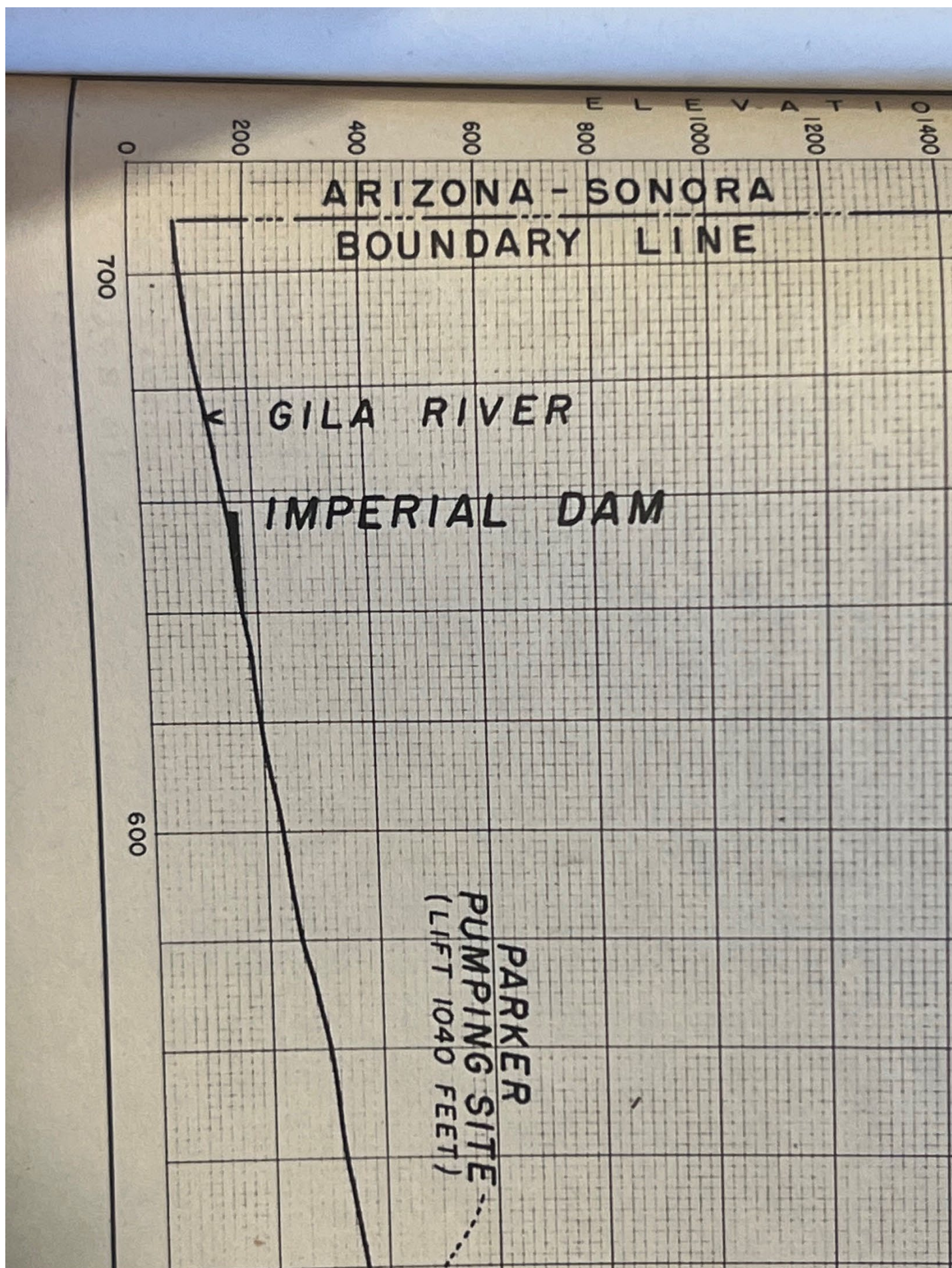
THE BILLIE CANYON PROJECT:

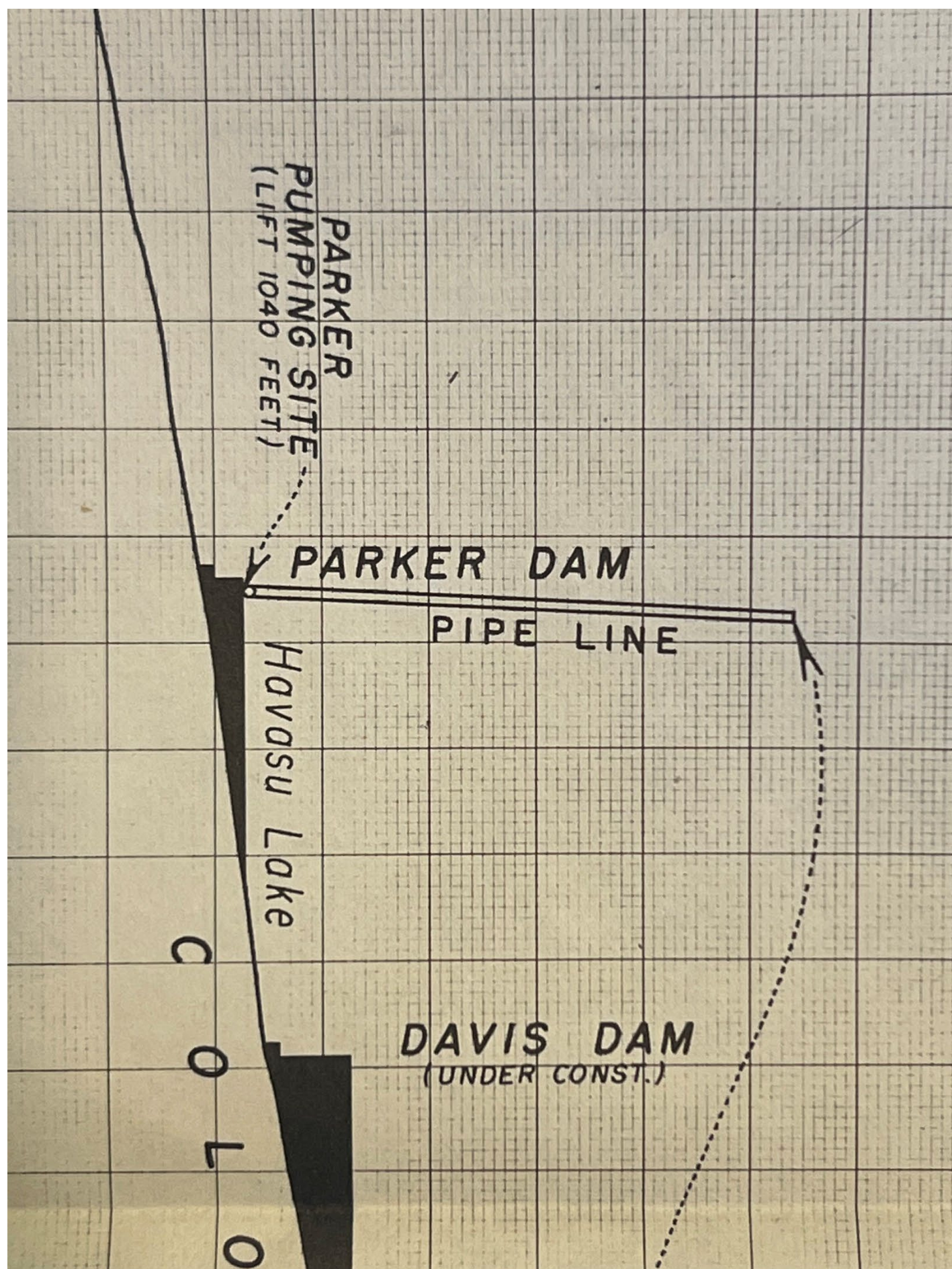
The Arizona Colorado River Commission filed an application with the Federal Power Commission for preliminary permit for the construction of this project on August 3, 1938. This dam site is located wholly within the State of Arizona on the Colorado River at the extreme upper end of Lake Mead. In 1937 preliminary geological surveys were made at the site and considerable preliminary investigations have been made. Prior to the issuance of a permit by the Federal Power Commission, a jurisdictional dispute arose between the Department of Interior and the Federal Power Commission in regard to the matter. A date of hearing was set, which was in turn postponed, and is now indefinitely postponed due to war-time conditions. Activities on this project will be resumed as soon as post war conditions permit.

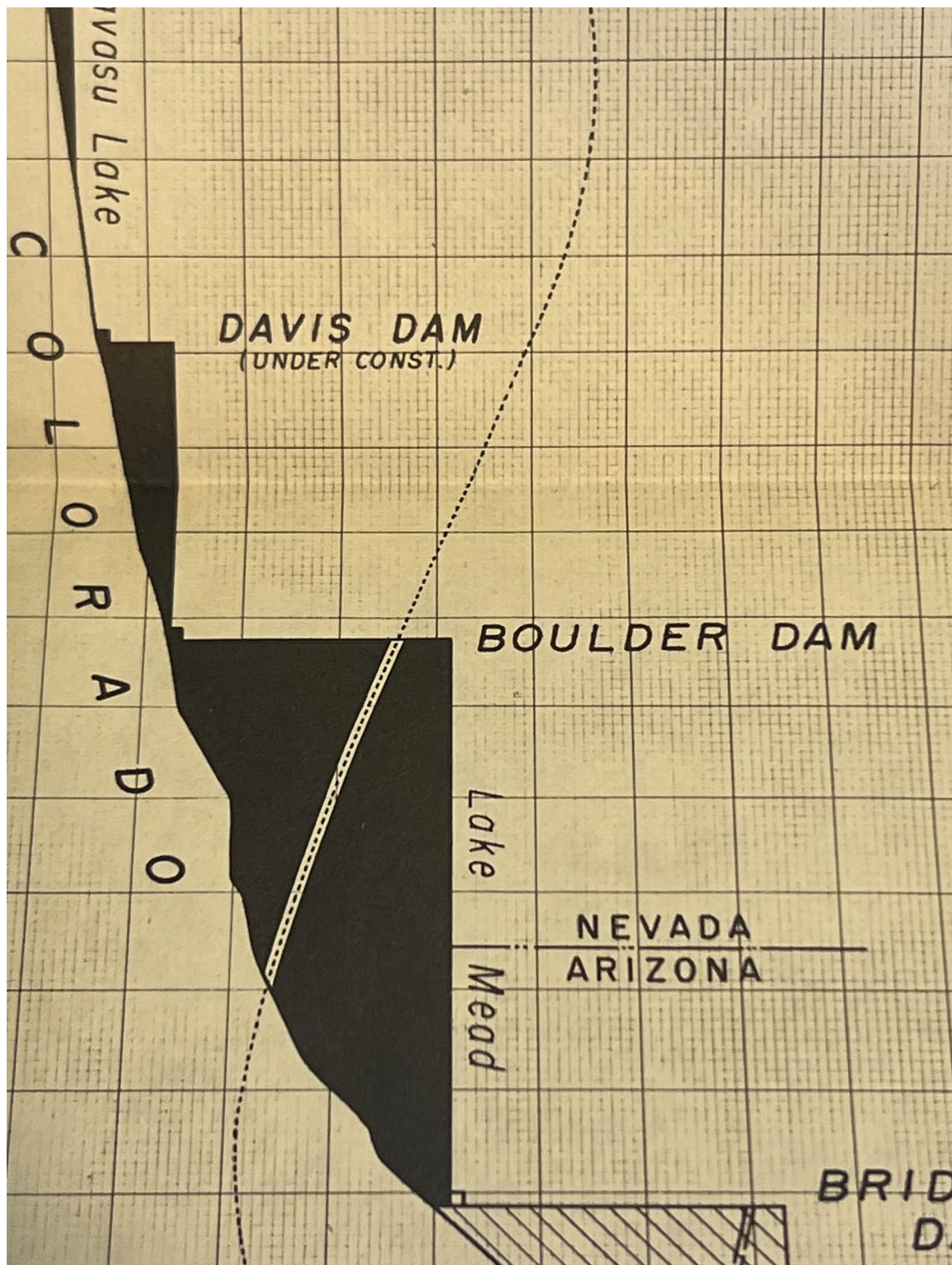
THE CENTRAL ARIZONA IRRIGATION DEVELOPMENT PLAN:

Several schemes and projects have been proposed for the utilization of Colorado River water in Central Arizona. In order that factual information may be gained by investigation and study the last special session of the Arizona State Legislature appropriated \$200,000 to be matched by a like amount of Federal Funds, and to be spent in cooperation with the U. S. Bureau of Reclamation on the investigation of Arizona projects. After the various projects have been studied and the most feasible selected, this project will be developed to bring a much needed supplemental water supply into Central Arizona and to develop additional new lands.

(Signed) DONALD C. SCOTT
Consulting Engineer
Colorado River Commission,
and Member of the
Committee of Fourteen







BOULDER DAM

Lake Mead

NEVADA
ARIZONA

BRIDGE CANYON
SACRAMENTO
WASH TUNNEL

BRIDGE CANYON
DAM SITE

RIVER

BOULDER DAM

Lake Mead

NEVADA
ARIZONA

BRIDGE CANYON
SACRAMENTO
WASH TUNNEL

BRIDGE CANYON
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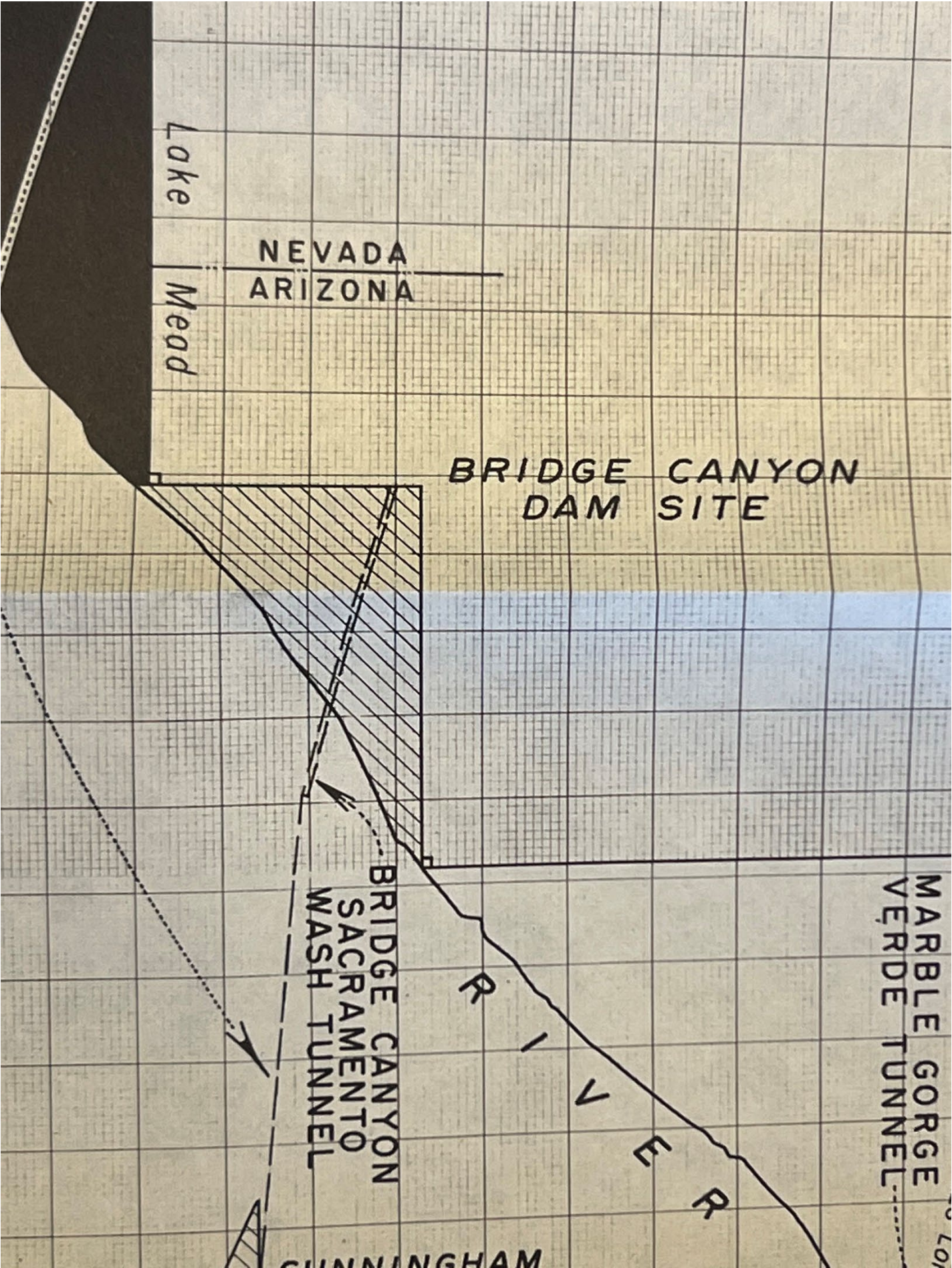
Lake Mead

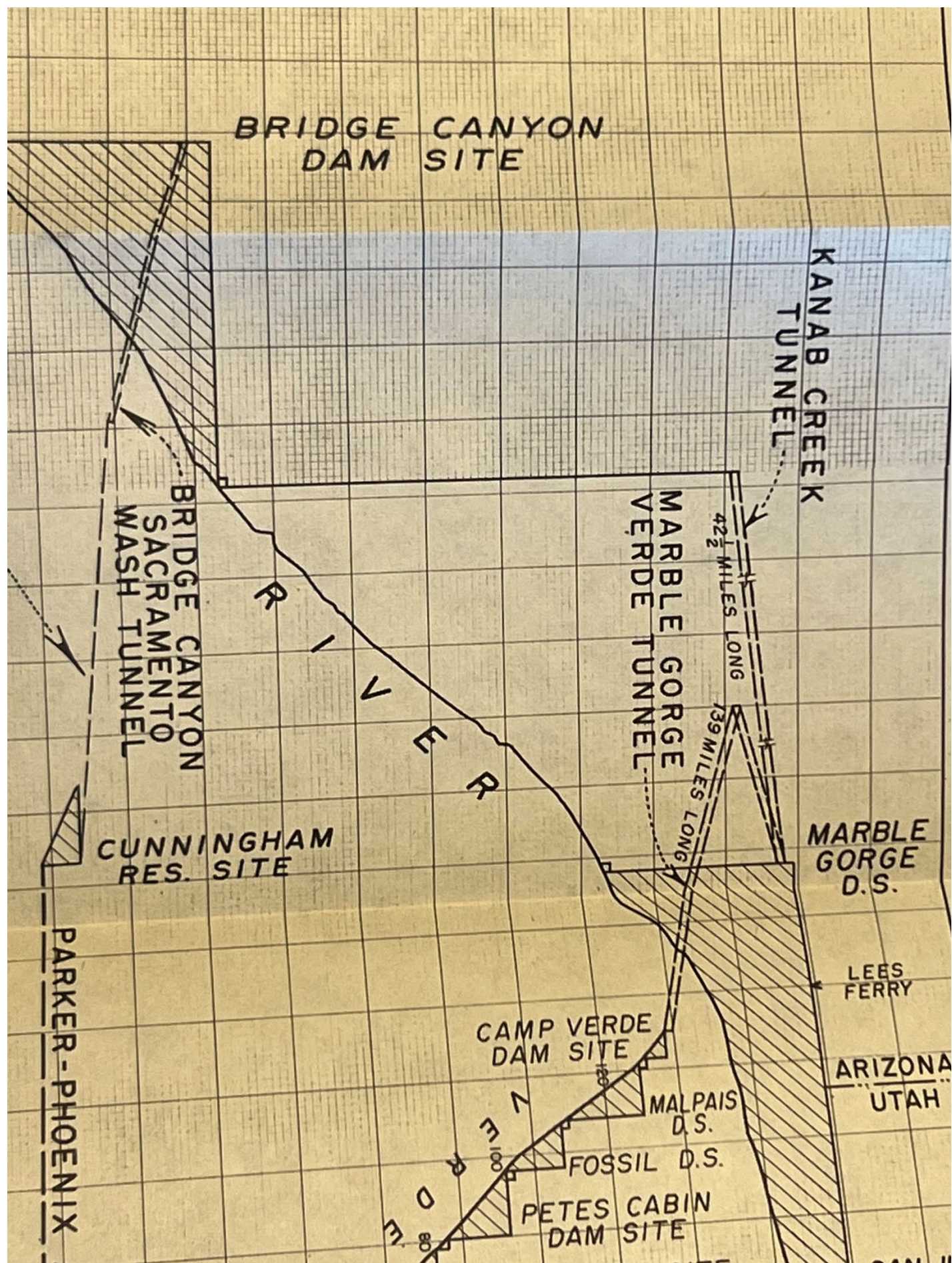
NEVADA
ARIZONA

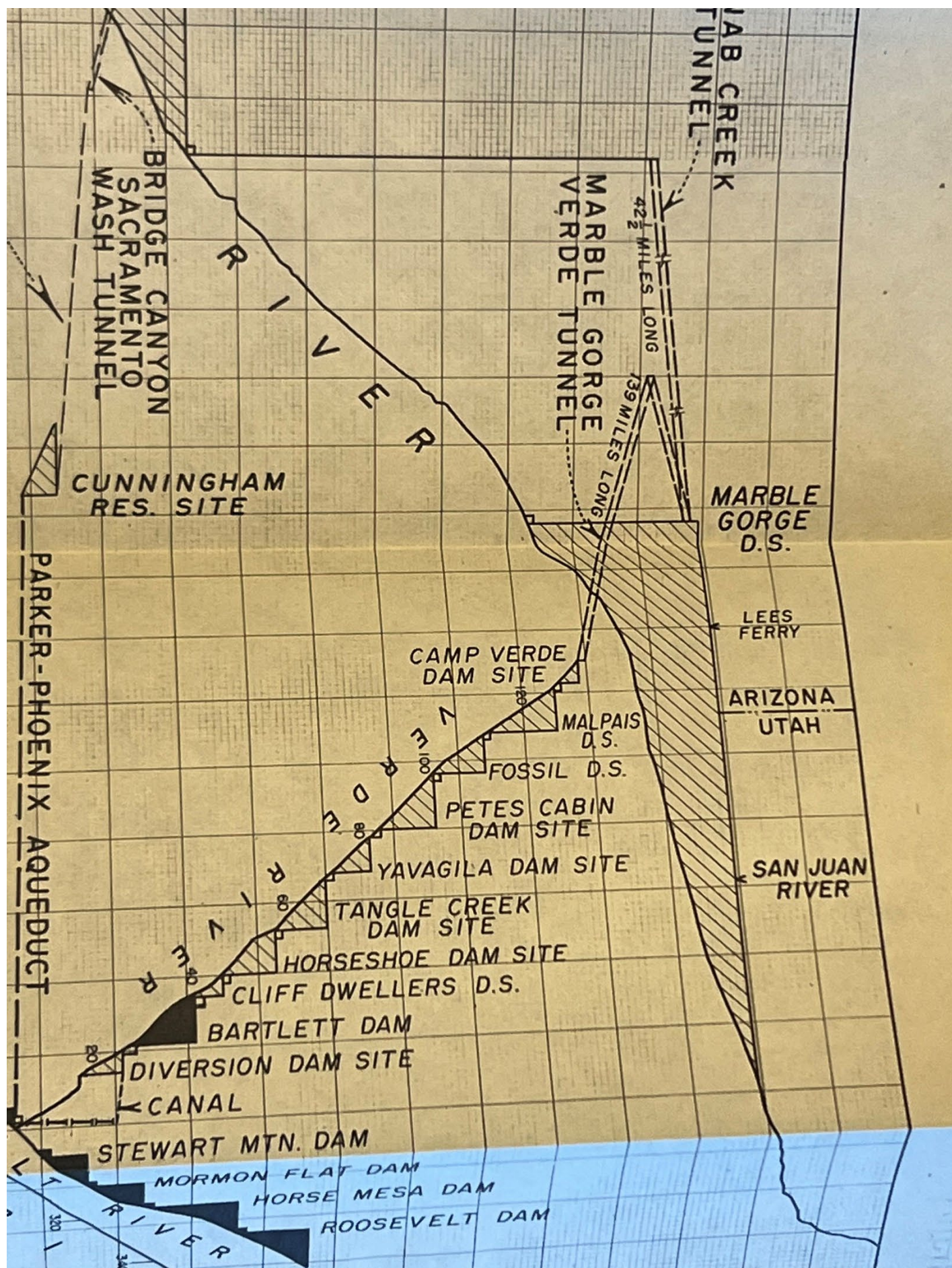
BRIDGE CANYON
SACRAMENTO
WASH TUNNEL

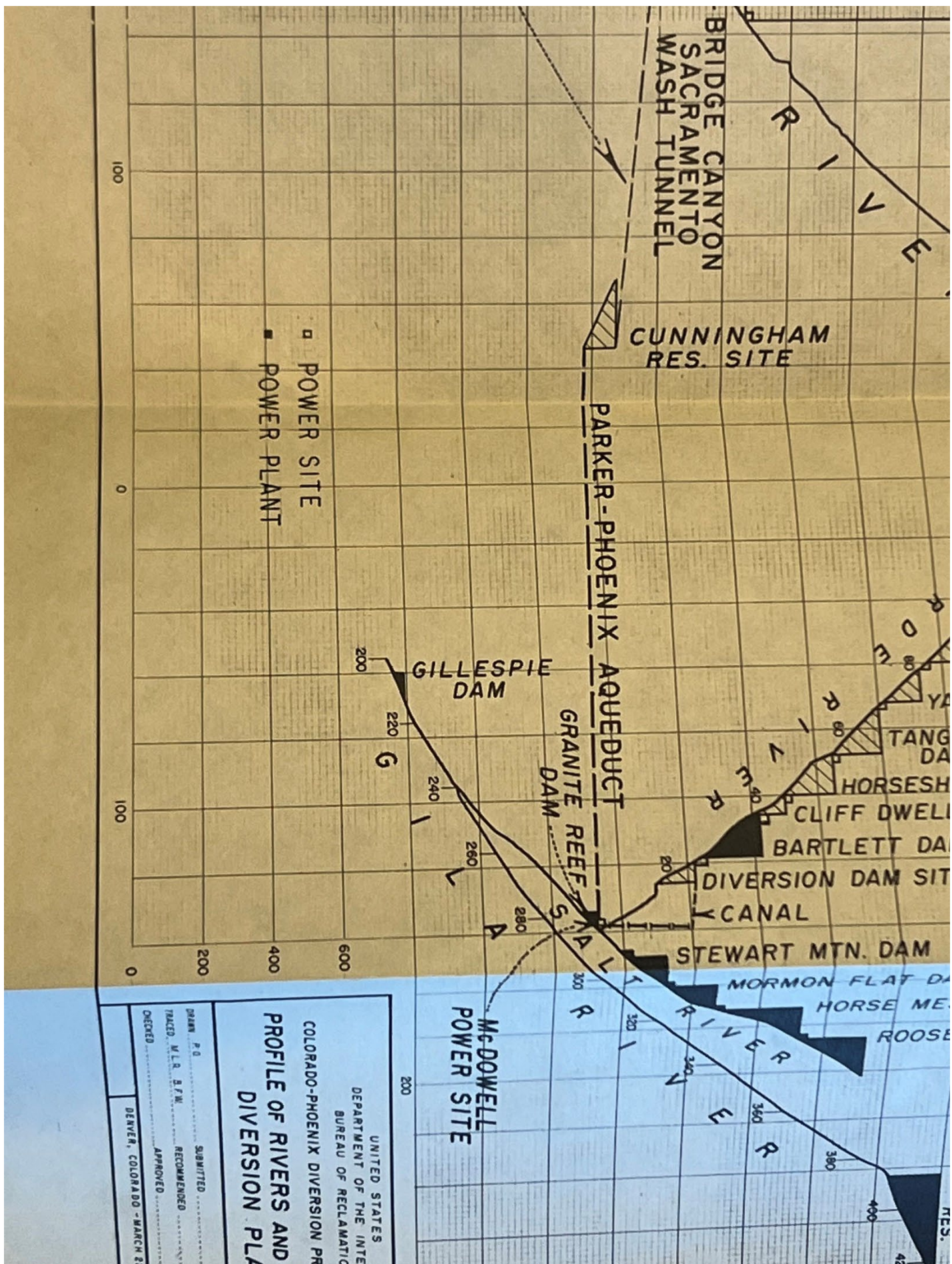
BRIDGE CANYON
DAM SITE

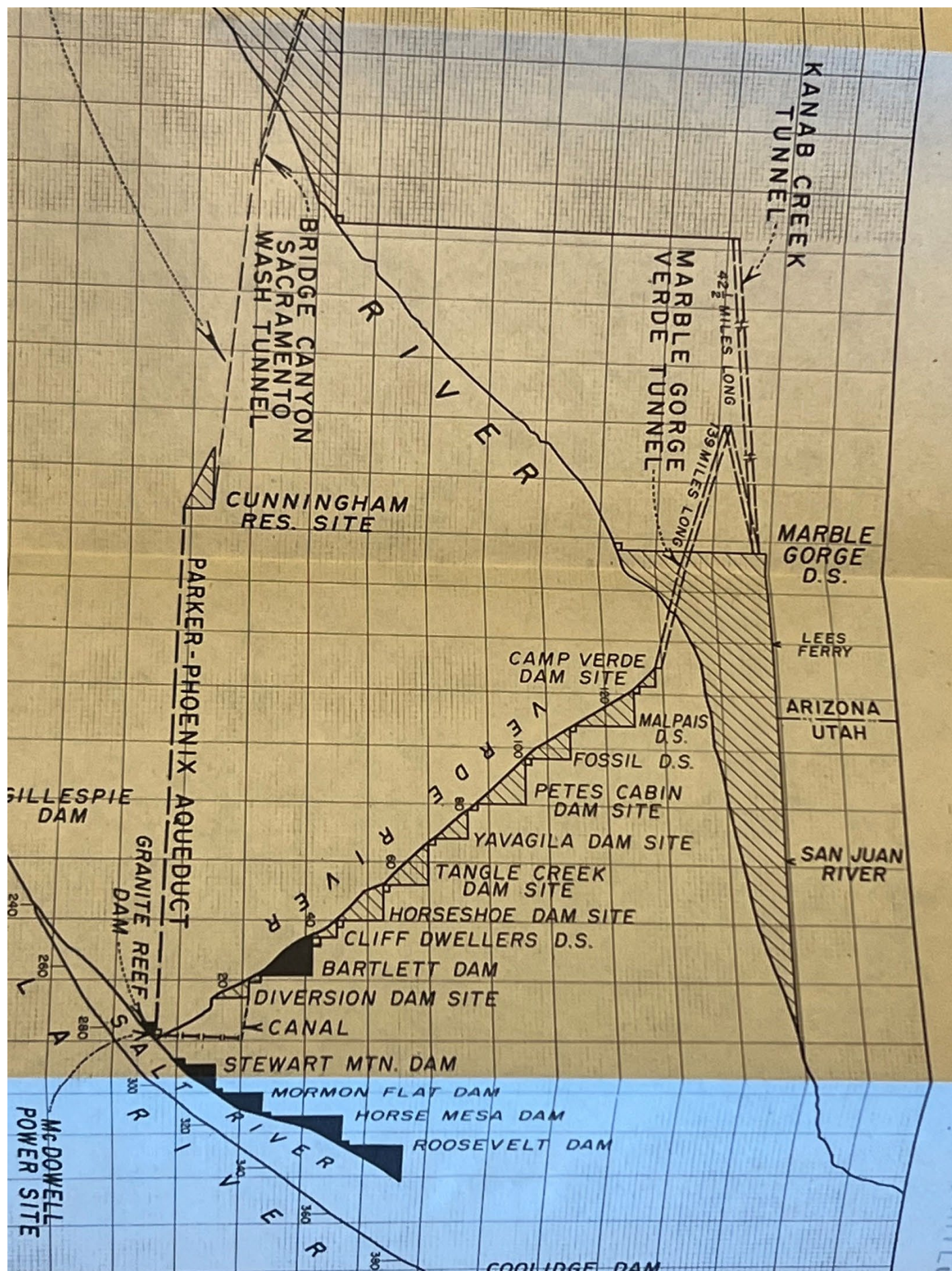
RIVER

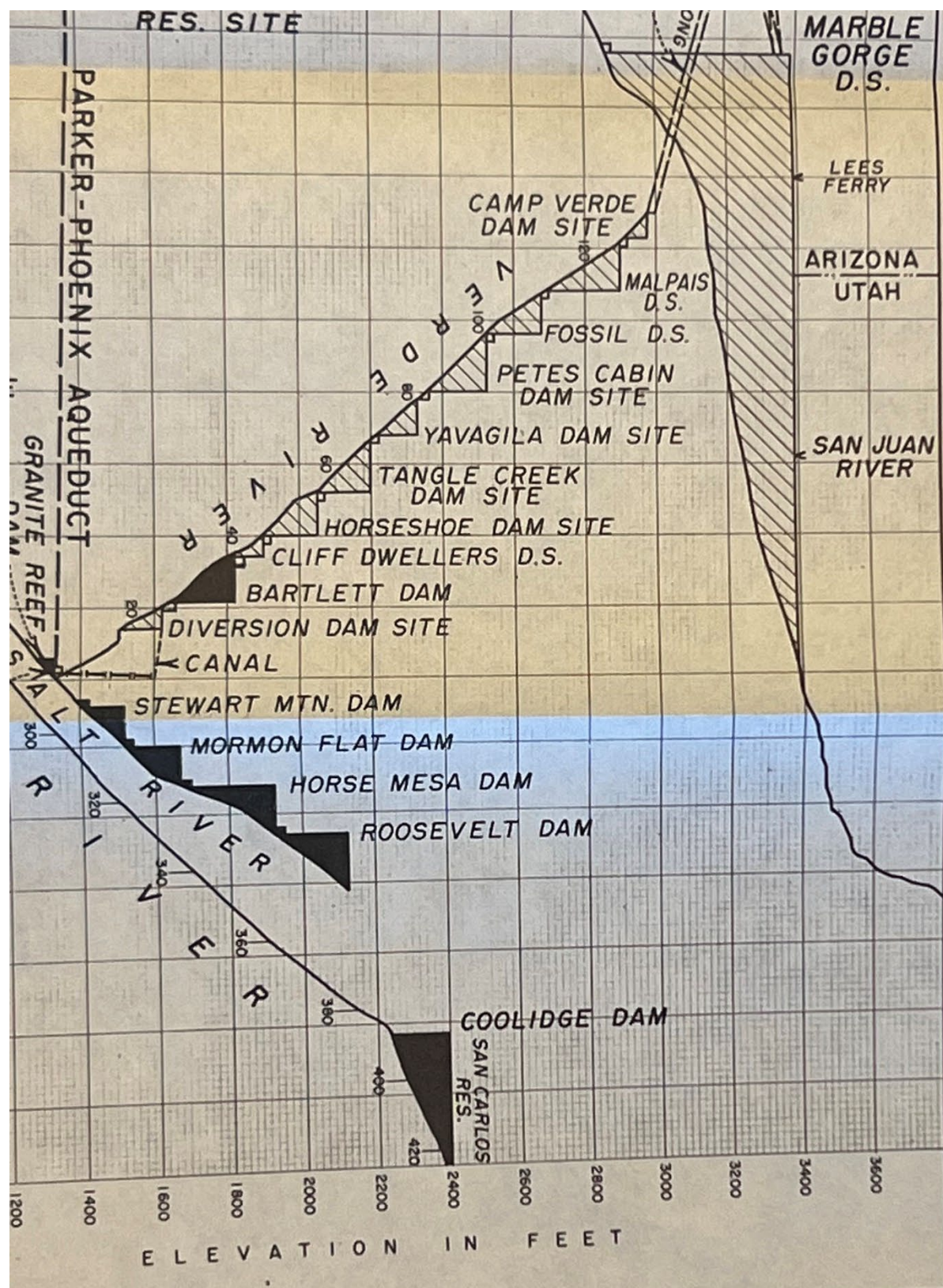


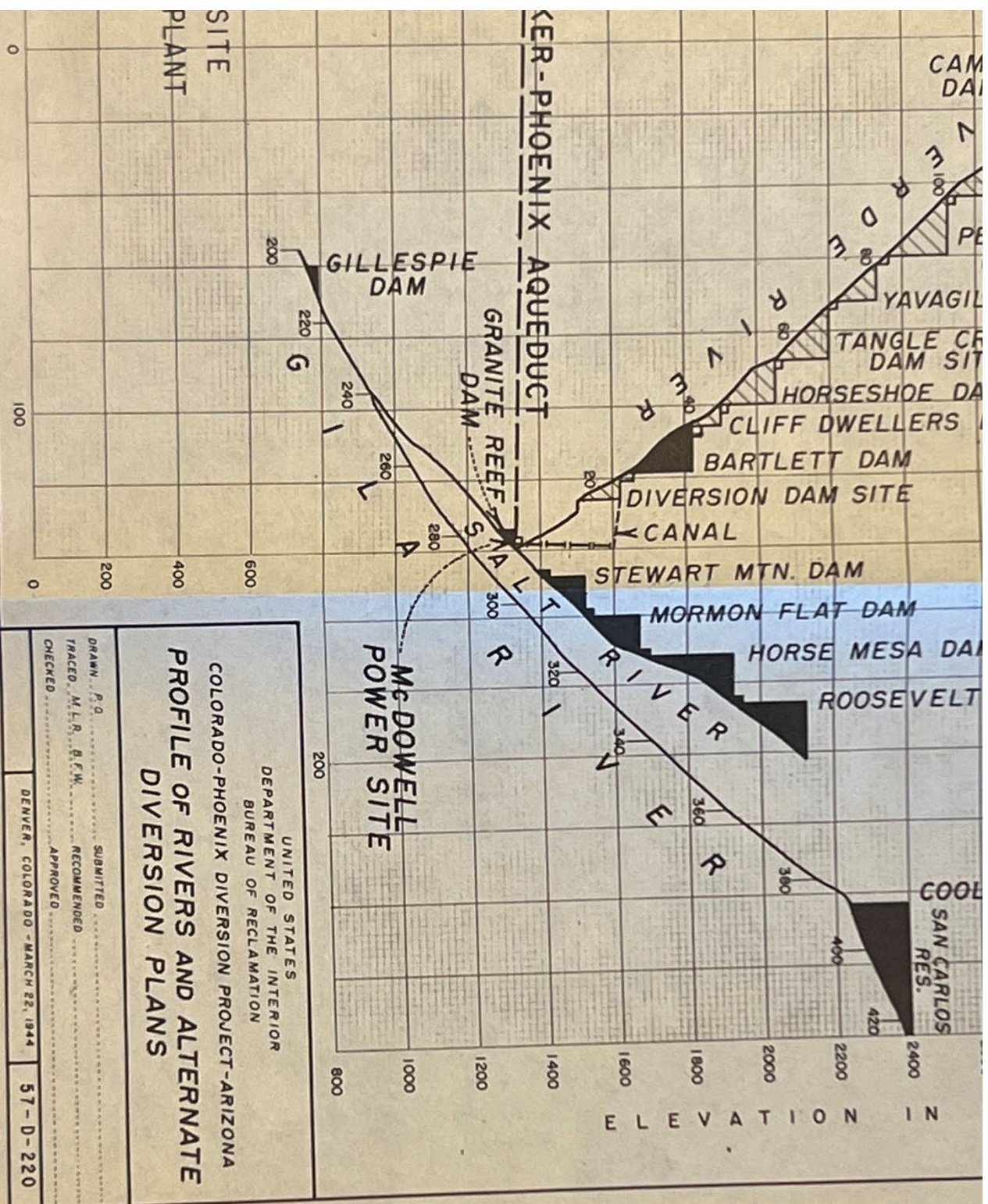












POWER DEVELOPMENT
COLORADO RIVER IN ARIZONA

Statement by E. E. Dobler
Director of Project Planning, Bureau of Reclamation

Colorado River drops 3,100 feet in the 735 miles along its course through Arizona and along its western border. Of this fall 395 feet lies above the Grand Canyon National Park, 1,015 feet within or bordering that park, and 1,690 feet below the park, of which 735 feet lies on boundaries common with Nevada and California. The completed Boulder and Parker Dams, together with the Davis Dam, on which work is now suspended, leave for further development only the stretch of river above the backwater of Boulder Dam. Closely associated with Colorado River power development will be the development of the Verde River, the only major Arizona stream without power development and with potentialities which will be developed in conjunction with the diversion of Colorado River waters to Arizona. If that diversion is made at Marble Gorge, the Verde River plants will become major power producers; with diversion at Parker or Bridge Canyon, Colorado River waters would be delivered to present irrigation users of Verde River waters, enabling Verde River waters to be used on higher lands and power development with the regulated waters of that stream. The Marble Gorge Dam site located 36½ miles downstream from Lees Ferry would back water a distance of 115 miles into Utah. To fully develop the power resources of Colorado River and yet avoid construction of dams or other works in the Grand Canyon National Park, it is planned to divert Colorado River waters not diverted to central Arizona nor needed for scenic purposes in the park, through a tunnel 42 miles long, past the north side of the park to the backwater of the Bridge Canyon Reservoir at Kanab Creek. The Bridge Canyon Dam at the head of Lake Mead would complete the power development. The accompanying profile shows graphically the power head of the present and prospective sites along the Colorado and Verde Rivers. Data pertaining to estimated power possibilities at the new sites are summarized in the following table:

Firm Power, Millions Kwhrs. Annually
Colorado River Plants

Marble Creek	310	310	310
Kanab Creek	6,670	8,490	8,490
Bridge Canyon	3,700	3,700	4,590
Subtotal	10,680	12,500	13,390
Verde River Plants	2,500	45	45
	13,180	12,545	13,435

Gross Production
Less

Loss of output at Boulder, Davis, and Parker plants	1,050	1,050	100
Pumping use with Parker Pumping Plant	1,050	1,050	2,600
Subtotal	12,130	11,495	10,335
Net increase in firm power	1,150	1,143	1,143
Secondary energy produced			
	2,038,000	1,672,000	1,312,000

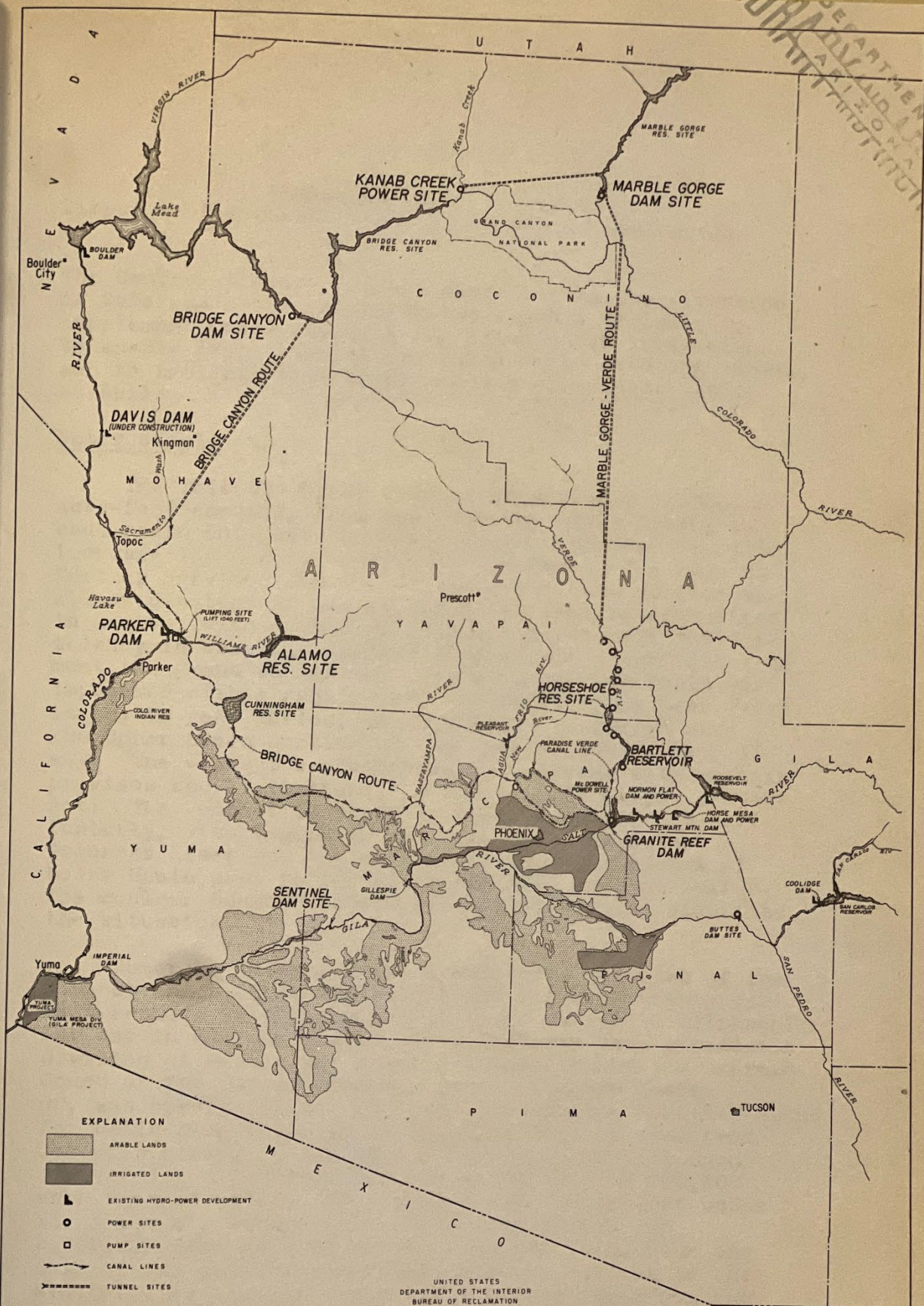
Aggregate power installation, kilowatt
Note: All amounts are for average conditions during amortization period, while upstream development reaches two-thirds of remaining development.

Marble Creek Plant	Bridge Canyon Plant	Parker Pumping Plant
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The compiled plant capacities at the Marble Gorge, Kanab, and Bridge Canyon power plants, and the construction costs for these power developments including dams, under the conditions that obtained in January 1940, considered representative of normal conditions are as follows for the three plans for Diversion to Central Arizona:

Diversion Point	: Installation : kw.	: Construction : Cost
Marble Gorge Dam	: 1,335,000	: \$491,000,000
Bridge Canyon Dam	: 1,662,000	: 556,000,000
Parker Dam	: 1,832,000	: 566,000,000

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THE CENTRAL ARIZONA PROJECT

Statement by E. B. Lebler
Director of Project Planning, Bureau of Reclamation

The Central Arizona Project contemplates the diversion of Colorado River Waters to the Phoenix vicinity to supplement water supplies for lands under irrigation, to enable irrigation of dry lands under existing canals, and to irrigate additional lands under canals yet to be built.

Water supply

The Colorado River Compact apportioned 7,500,000 acre-feet annually from the Colorado River System to each basin and gave the Lower Basin a further right to increase its use by 1,000,000 acre-feet. The compact further provided for the satisfaction from surplus unallotted waters of any rights that might be recognized in Mexico, with each basin making up one-half the deficiency in case the surplus waters were insufficient to meet the grant to Mexico. Use by the Upper Basin was impressed with a requirement for delivery at Lees Ferry, in any 10-year period, of 75,000,000 acre-feet plus the Upper Basin portion of the Mexican deficiency, if any. The Compact was approved by Congress with certain provisos and limitations, in the Boulder Canyon Project Act. The Compact is vague in many respects, and particularly, with regard to allocations as between the Colorado River and the Gila River, and the status of Lower Basin uses in the states of Utah and New Mexico. The Boulder Canyon Project Act only partially clarified the situation.

Numerous interpretations have been advanced of the Compact and Boulder Canyon Project Act with highly variant results in the amounts of water available ultimately for use in any one state. They indicate that a reliable division of waters may require a decision by the Supreme Court of the United States. In the absence thereof, and purely for the purpose of comparing possible plans for delivering water to the Central Arizona area from Colorado River, it has herein been assumed that such a diversion might reach an annual total of 2,000,000 acre feet of water. This water would be secured under the Arizona contract with the United States for 2,300,000 acre feet of water from Lake Mead, plus one-half of any surplus unallotted waters, subject to the availability thereof under the Colorado River Compact and the Boulder Canyon Project Act. The determination of the amount of water to be so diverted and the selection of new lands to be served will be made in cooperation with the State.

Liversion Plans

Preliminary studies have narrowed the plans to three as follows:

(1) Marble Gorge Plan, comprising - -

- (a) A high dam in Marble Gorge 36½ miles below Lees Ferry.
- (b) A tunnel 139 miles in length, capacity 3,000 second feet, from the Marble Gorge Dam to Verde River near Camp Verde.
- (c) A series of dams along Verde River for stream regulation and power development, down to Granite Reef dam.

(2) Bridge Canyon Plan, comprising - -

- (a) A high dam at Bridge Canyon.
- (b) A tunnel 72 miles in length, capacity 3,000 second feet, from Bridge Canyon Dam to Sacramento Wash.
- (c) A canal of 3,000 second feet capacity, 82 miles long to Cunningham reservoir.
- (d) Cunningham reservoir with a capacity of 400,000 acre feet for regulating purposes.
- (e) A canal of 4,000 second feet capacity, 180 miles long, from Cunningham reservoir to Granite Reef Dam.

(3) Parker Pump Plan, comprising - -

- (a) A pumping plant of 3,000 second feet capacity lifting water 1040 feet out of Lake Navasu.
- (b) A canal of 3,000 second feet capacity, 32 miles long to Cunningham reservoir; Cunningham reservoir and the canal to Granite Reef dam as in the Bridge Canyon Plan.

With each plan distribution systems would be needed to serve the new lands selected for development.

With the Bridge Canyon and Parker Pumping Plans, the use of more water above the level of the Granite Reef dam makes it desirable to exchange Colorado River for Salt and Gila River waters, to reduce avoidable pumping costs. Such an exchange can also be operated to release Gila River waters for increased uses in New Mexico and Arizona above the Coolidge Dam.

Project Costs

* Aside from the Colorado River dams that would be built in any event for power production, the additional investment for the various plans would be:

Marble Gorge Plan	\$487,000,000
Bridge Canyon Plan	\$325,000,000
Parker Pumping Plan	\$134,000,000

The indicated sums include Verde River dams and power plants for all plans; and for the Parker pumping plan, the transmission lines from Bridge Canyon to Parker for the operation of the pumps.

Comparison of plans.

A financial comparison of the plans by over-all construction costs alone would be misleading by reason of varying power outputs, varying operating costs, and intricate allocations of costs between interestbearing and non-interest bearing costs. A comparison of annual costs and returns upon full development is here presented as an equitable comparison.

	Marble Gorge Plan	Bridge Canyon Plan	Parker Pumping Plan
<u>Construction Costs (not including Marketing of Power)</u>			
Colorado River Development Irrigation, etc., away from Colorado River	\$491,000,000	\$556,000,000	\$566,000,000
Total	\$978,000,000	\$881,000,000	\$700,000,000
<u>Annual Costs</u>			
Operation, repairs, and replacements	\$2,952,000	\$2,671,000	\$3,776,000
Repayment in 40 years of interest-free investment	13,675,000	10,775,000	6,725,000
Amortization in 50 years interest at 3% on interest-bearing investment	16,753,000	17,490,000	16,753,000
Total annual costs	\$33,380,000	\$30,936,000	\$26,754,000
<u>Annual Returns</u>			
Irrigation at .8 per acre per year	4,000,000	4,000,000	4,000,000
Power	28,450,000	23,875,000	22,235,000
Total annual returns	\$32,450,000	\$27,875,000	\$26,235,000
Ratio income to cost	97%	90%	98%

Following repayment of construction costs, assuming that irrigation would pay only the cost of operation and maintenance of its distribution system, and with a reduction in power revenues of 50% because of stream depletion and lowered power rates, the plans would compare as follows:

	: Marble	: Bridge	: Parker
	: Gorge	: Canyon	: Pumping
	: Plan	: Plan	: Plan
Annual Cost for Power	: 2,352,000	: 2,071,000	: 3,176,000
Power Sales	: 14,225,000	: 11,938,000	: 11,118,000
Surplus Income	: 11,873,000	: 9,867,000	: 7,942,000
	:	:	:

The minimum construction period for the Marble Gorge Plan is fixed by the time required for the deepest section of the long tunnel, estimated at seven years, and for the Bridge Canyon plan by the Bridge Canyon Dam, requiring about six years. For the Parker Pumping plan the minimum time is dependent on necessary power for pumping; if the initial development is limited to the use of power which can be secured from Boulder Dam and Davis Dams, with possibly 500 second-feet of pumping capacity, the construction period would probably be about three years.

While present data indicate the Marble Gorge plan the more desirable in the long run by reason of its lower operating costs and increased power output, with the Parker pumping plan having the advantages of less uncertainty in construction problems and least time to secure an initial water supply, the net advantages of the various plans may change considerably upon completion of the detailed investigations now started.

Project Benefits.

The annual crop value for the 500,000 acres to be irrigated, is estimated at \$35,000,000. The value to Arizona of the power developments are difficult to estimate as present information on the probable uses of so much power is very limited. If Arizona should use all of the remaining power to be developed on the Colorado River, in that state, amounting under ultimate conditions to a minimum of 8 billion kw-hrs., the value to the state of this power would amount to \$40,000,000 per year at a rate of 5 mills per kw-hr., in itself a low value, considering the manifold indirect activities springing from its sale at much lower rates.

Contract for Cooperation with Arizona.

The contract of the United States and Arizona for cooperative investigations with \$200,000 to be provided by each, opens the way for detailed investigation of the diversion plan and other Arizona development possibilities to pave the way for post war construction. In the course of these investigations, the final diversion plan will be selected, considering the urgent need for an early delivery of supplemental water in Central Arizona, flexibility in construction, and costs of water and power during the repayment period and thereafter. The cooperation provided by the contract assures the adoption of plans with full consideration for the needs and desires of all Arizona interests. The contract is the result of such effort on the part of state officials, the state's representatives in Congress, and Bureau of Reclamation officials, to secure a united front in state development.

THE FOLLOWING IS A SUMMARY OF THE COLORADO RIVER WATER SITUATION AS DESCRIBED BY CHARLES A. CARSON, CONSULTANT ATTORNEY FOR THE COMMISSION, IN A LETTER ADDRESSED TO O. C. WILLIAMS, STATE LAND COMMISSIONER, AS OF SEPTEMBER 7TH, 1944.

"You requested that I give you an estimate of the quantity of water from the main stream of the Colorado River available for diversion for use in Arizona under ultimate conditions under the terms of the Arizona Contract, the California Limitation Act, the Boulder Canyon Project Act and the Colorado River Compact.

"The immediate necessity for such an estimate arises from the fact that you, in cooperation with the Bureau of Reclamation, are making investigations and engineering studies in preparation of plans for diversion and utilization of Arizona's share of the water of the main stream. It is of course apparent that the size of necessary structures and routes for diversion, as well as the points of use and the areas of lands to be irrigated are all dependent upon the quantity of water available.

"The works are necessarily expensive and should be of adequate capacity since it would be uneconomical to construct works of small capacity and later duplicate them in the event more water was later found to be available, and also construction of works of capacity substantially larger than adequate to divert quantities of water ultimately available, would likewise be uneconomical.

"At my request Don C. Scott, engineer of the Arizona Colorado River Commission, and R. Gail Baker, engineer of your department, cooperating with the Bureau of Reclamation, have prepared estimates based upon assumptions it is necessary to make, and based upon water flow records from the year 1897 to the year 1943 inclusive.

"It is necessary to assume that the anticipated allocation of water to Mexico will be some fixed quantity of water of the Colorado River. We have assumed it will be

1,500,000 acre-feet annually, the quantity fixed in the treaty between the United States and Mexico, signed February 3, 1944, and now before the United States Senate for ratification.

"Likewise, it is necessary to assume some quantity of water of the Colorado River as that to be ultimately consumed in the Upper Basin States of Wyoming, Colorado, Utah and New Mexico. Under the Compact they together have the right to use 7,500,000 acre-feet annually. Some engineers estimate they will use that full quantity; some estimate their ultimate annual use will not exceed 6 million acre-feet; other engineers estimate their ultimate use will not exceed 5 million acre-feet annually.

"Accordingly, this estimate is calculated to show quantities available for diversion in Arizona in three alternatives, based upon the above estimates of use in the Upper Basin.

"My own estimate is that the uses in the Upper Basin will not diminish the flow of the Colorado River at Lee's Ferry more than 5 million acre-feet annually, but I am not an engineer and this estimate is not put forth as authoritative. It is based upon the assumption that transmountain diversions from the Colorado River out of that drainage basin in the Upper Basin will not exceed 1,200,000 acre-feet annually and that the consumptive use of water in the drainage basin of the Colorado River in the Upper Basin is 1.4 acre-feet per acre per year, and that not more than 2,700,000 acres in that drainage basin will be irrigated. This indicates a maximum consumptive use in the Upper Basin of 5 million acre-feet annually.

"I think these estimates will not be exceeded because of the physical and economical conditions, although of course the Upper Basin has the legal right, which no one should attempt to dispute or obstruct, to consumptively use 7,500,000 acre-feet annually. The consumptive use in the Upper Basin at present approximates 2,600,000 acre-feet annually according to our estimates.

"It is likewise assumed that those portions of Utah and New Mexico which are in the Lower Basin will ultimately consume approximately 200,000 acre-feet of water annually, and that Nevada will ultimately consume 300,000 acre-feet annually. These estimates are believed to be high, and in the event their uses are less than these quanti-

ties, additional water would be available for diversion into Arizona.

"It is likewise assumed that ultimate consumptive use in Arizona of water of tributaries entering the Colorado River below Boulder Dam will not exceed 1,000,000 acre-feet per year. This may be low to the extent of estimated ultimate maximum of 200,000 acre-feet. If it is low to that extent, main stream water available for use in Arizona would be reduced from the amount shown in the tables by 100,000 acre-feet per year, but it is believed such possible reduction will be more than offset by the failure of Nevada and those portions of Utah and New Mexico in the Lower Basin to use the quantities of water estimated for them above.

"Under the contract the obligation of the United States to deliver water for use in Arizona from Lake Mead is to be diminished to the extent that use in Arizona above Lake Mead diminishes the flow into Lake Mead. This includes use on the Little Colorado River. This estimate, therefore, includes the uses along the Little Colorado River in the uses along the main stream of the River to be supplied out of 1,500,000 acre-feet suggested in the table for use upon lands along the Colorado River.

"It is assumed that return flow will not be charged against Arizona's share of the river, because the return flow is not beneficially consumed in Arizona.

"The contract provisions are for the delivery of,
"7(a). x x x 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.

"7(b). x x x for the uses set forth in subdivision (a) of this Article (referring to above) one-half of any excess or surplus waters unapportioned by the Colorado River Compact x x x."

It is, therefore, clear that the contract provisions contemplate that only water beneficially consumed in Arizona is to be counted in discharge of Arizona's contract rights.

"Also, the return flow pro tanto discharges the obligation to Mexico under the proposed treaty.

"Based upon the assumed variables for Upper Basin use, upon the assumed Mexican allocation, upon estimates of uses in Nevada and those parts of Utah and New Mexico which are in the Lower Basin, upon uses from Arizona tribu-

aries flowing into the Colorado River below Boulder Dam, set forth above, and assuming credit for return flow as set forth above, which is estimated at 1.1/4.5 of gross diversions, we estimate there will be available for diversion into Arizona under ultimate conditions of development, water from the main stream of the Colorado River in the quantity shown by the following tables:

	<u>1</u>	<u>2</u>	<u>3</u>
	<u>1,000</u>	<u>Acre-feet</u>	
Virgin flow at Lee's Ferry	16,400	16,400	16,400
Upper Basin use (assumed)	<u>7,500</u>	<u>6,000</u>	<u>5,000</u>
Inflow Lee's Ferry to Boulder Dam	8,900	10,400	11,400
	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
Evaporation from all reservoirs (Lower Basin)	9,900	11,400	12,400
	<u>- 800</u>	<u>- 800</u>	<u>- 800</u>
Net River losses Boulder to Laguna	9,100	10,600	11,600
Net usable from Boulder Dam	<u>- 200</u>	<u>- 200</u>	<u>- 200</u>
Mexico by Treaty (assumed)	8,900	10,400	11,400
	<u>1,500</u>	<u>1,500</u>	<u>1,500</u>
	7,400	8,900	9,900
California 4,400)(2,300 less uses			
Arizona 2,600) in Utah and New			
Nevada 300) Mexico-assumed to			
be 200,000)	7,300	7,300	7,300
Surplus water	<u>100</u>	<u>1,600</u>	<u>2,600</u>
One-half surplus to Arizona	50	800	1,300
Return flow from Arizona-gross			
estimated 1.1/4.5	900	1,100	1,300
Surplus plus return flow	<u>950</u>	<u>1,900</u>	<u>2,600</u>
Allotment water	2,600	2,600	2,600
Gross water for Arizona 4.5			
acre per annum (assumed)	3,550	4,500	5,200
Lands along the Colorado River			
(gross use)	<u>1,500</u>	<u>1,500</u>	<u>1,500</u>
Total diversion capacity to Central			
Arizona	2,050	3,000	3,700
Supplemental for existing projects			
(gross div.)	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
Available for new lands in Central			
Arizona	1,050	2,000	2,700

"It is my opinion that the water allocated to the Lower Basin by Article 3(b) of the Colorado River Compact is apportioned water and that the so-called California contention that it is unapportioned water, and hence part of

the surplus, one-half of which is usable in California under her limitation act, cannot prevail.

"If the California construction should prevail, the above estimated quantities for gross diversion in Arizona, in each instance, would be reduced by 500,000 acre-feet annually.

"For the purpose of illustration, we have also assumed that the highest and best use of Arizona's water will be attained by the utilization of 1,500,000 acre-feet annually along the main stream of the Colorado River and the Little Colorado River, including Snowflake, St. Johns, Winslow, Woodruff, Holbrook, Black Creek, Hurricane, North and South Gila, Yuma Mesa, Tulliton-Mohawk, Yuma and Parker areas. It is estimated that this quantity is sufficient to supply all existing uses and to supply an additional 295,000 acres and that the highest and best use for the balance of Arizona water is to divert it to central Arizona for supplemental supply of all existing projects and irrigation of new lands in central Arizona and along the Gila River, to the extent of the available supply of water.

"We have estimated that gross diversions of 4.5 acre-feet per acre per year is sufficient for new lands and, therefore, estimate that the quantity of water shown in the above table as available for new lands in central Arizona, after supplying all existing projects, would enable the irrigation under conditions assumed in column 1 of 250,000 acres; under the conditions assumed in column 2 455,000 acres and under the conditions assumed in column 3 600,000 acres.

"It is believed that it is highly desirable to supply Colorado River water to the Gila Valley in the Florence-Casa Grande-Coolidge area and thereby release sufficient water of the upper Gila River for use in the Safford and Duncan Valleys in Arizona and the Virden Valley in New Mexico to enable storage of water in the vicinity of Red Rock, New Mexico for later summer use upon presently irrigated lands in those valleys and by an exchange of water for like purposes to permit storage on the San Pedro River, the Santa Cruz River, the Agua Fria River and the Hassayampa River in their upper reaches, and perhaps, it may be found feasible by like exchange to permit a small transmountain diversion from the White River into the Little Colorado River for use in the Springerville-St. Johns-Holbrook-Winslow area, although it seems to me there is ample water in the Little Colorado River for those areas

If adequate storage can be provided, and that such storage would be cheaper than transmountain diversion, and also would permit the more nearly complete development of Arizona's water resources.

"As pointed out above, return flow from Arizona projects will be available for the discharge of any treaty allocation to Mexico. This return flow is calculated upon this basis:

Gross diversion of 4.5 acre-feet per acre per year;

Return flow 1.1 acre-feet per acre per year.

This of course contemplates new lands, but the same proportion it is believed will follow through where a supplemental supply of one acre-foot per acre per year, or more is utilized.

"In addition to the return flow shown in the foregoing table, we estimate there will be 175,000 acre-feet of return flow from the Blythe area in California, and that part of the Yuma project, which is in California.

"Eventually, as the ultimate use of water is approached, it will be found desirable to store all return and flood waters where necessary to perfectly synchronize them with Mexican schedules for delivery in order to get credit for all of them on the Mexican allocation.

"Eventually, then we estimate under conditions assumed in column 1, return flows at the option of the United States will supply 1,075,000 acre-feet of the allocation to Mexico; under conditions assumed in column 2, 1,275,000 acre-feet, and under conditions assumed in column 3, 1,475,000 acre-feet, unless additional uses are developed in the United States.

"It appears now that eventually it will be necessary to release from storage directly to Mexico, under the conditions assumed in column 1, only 425,000 acre-feet per year; under the conditions assumed in column 2, only 225,000 acre-feet per year, and under conditions assumed in column 3, only 25,000 acre-feet per year.

"We estimate that not less than 100,000 acre-feet annually will be required for desilting purposes at Imperial Dam, but return flow from the Blythe area of California and the Parker area of Arizona will supply that requirement.

"We estimate that California under conditions assumed in column 1 would be limited to gross diversions of 4,625,000 acre-feet per year; under the conditions assumed in column 2 to gross diversions of 5,375,000 acre-feet per year, and under the conditions assumed in column 3 to gross diversions of 5,875,000 acre-feet per year.

Suggestions

"It appears to me now that the Upper Basin will not for at least fifty years reach a total consumptive use of 5 million acre-feet per year. I do not think they will ever exceed that, but certainly it appears now that they will not for 100 years reach a total consumptive use of 6 million acre-feet.

"It is essential that in building agricultural communities we do not mislead ourselves, or anyone else, into believing that an adequate water supply is assured for all time, when there is a possibility that the supply might later be stopped partially or completely.

"I would suggest, therefore, that projects be planned and set up for utilization of main stream water upon the basis of four priorities, clearly understood and agreed by the users of the water. The first priority based on column 1 would be for 3,550,000 acre-feet per year; the second priority based on column 2 would be for the next 950,000 acre-feet per year; the third priority based on column 3 would be for the next 700,000 acre-feet per year, and the fourth priority would be for any additional water available.

"As to proposed priority numbered 1, it is in my opinion firm for all time, in so far as can now be foreseen.

"As to proposed priority numbered 2, it is firm for all time in so far as I can see now, but it should be clearly explained to the users of the water, and it might be well for them to consider whether or not provisions should

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be made for the eventual withdrawal from cultivation of lands utilizing water of this priority after 100 years, if necessitated by water shortage, and to provide a means of accumulating a fund to compensate the then owners of land in the event of their withdrawal at that time.

"As to proposed priority numbered 3, it runs a greater risk than priority 2 and it seems to me should contemplate a possible water shortage at the end of fifty years.

"As to proposed priority numbered 4, it seems to me that water under this priority should be used, if at all, on a temporary basis and in my opinion no expensive construction would be justified for its utilization, unless with the lapse of time it becomes clear that some water of this priority will be available for some foreseeable definite time.

"It seems to me, therefore, that the proper basis of planning for diversion structures to central Arizona is column 2, that is priorities 1 and 2, as suggested. I believe the quantity of water indicated by suggested priorities 1 and 2, 4,500,000 acre-feet, is sufficiently assuredly available to justify the necessary expenditures.

"I further believe that the water of the proposed priority 3 should be utilized where construction costs are not so high. I believe this water will be reasonably permanent, but that provision should be made for withdrawal of lands from cultivation if that should become necessary, as indicated above.

"I, therefore, estimate under the assumptions contained in column 1, that under ultimate conditions Arizona will have available for diversion from the main stream of the Colorado River and the Little Colorado River 3,550,000 acre-feet annually; under the assumptions in column 2, 4,500,000 acre-feet annually, and I believe this amount would be permanently assured; under column 3, 5,200,000 acre-feet annually of which 700,000 acre-feet may be withdrawn in fifty to 100 years, as indicated above.

Yours very truly,

CHAS. A. CARSON "

September 7, 1944

Mr. O. C. Williams,
State Land Commissioner,
Capitol Annex,
Phoenix, Arizona.

Dear Mr. Williams:

In addition to the matters set forth in my letter to you of even date herewith, I wish to call your attention to the following:

1. I am advised that normally hydraulic structures do not vary in cost in direct proportion to their carrying capacity, and that from an economical standpoint it is better to build for the probable ultimate water available for use, rather than for the minimum quantity.

2. In the letter of even date herewith for the present purposes, I have assumed that evaporation and channel losses in the lower basin would be deducted from the surplus. In the event that it should ever be deemed advisable, Arizona might very properly contend that evaporation and channel losses should be borne ratably by the users of allocated water in the lower basin, which would result in Arizona bearing 26/73, California 44/73 and Nevada 3/73. It does not appear to me that that point will ever be reached, but in case it should be, I do not believe that my letter of even date herewith forecloses Arizona, you or me from taking that position.

3. Lands along the Gila River between Phoenix and Yuma can be irrigated by gravity water from the central Arizona project rather than by pumping from the main stream of the Colorado River and this would be to the advantage of the owners of those lands because less expensive.

4. I think the proposed Sentinel dam and reservoir on the lower Gila River when built will control return flow from the central Arizona project, together with flood water now going down the Gila and thus enable re-use of these waters on the lower Gila Valley lands and at the same time provide a regulated supply to Mexico under the schedules

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in the proposed Mexican treaty.

Yours very truly,

CHAS. A. CARSON

CAC.r.

Arizona being a border state is vitally concerned in the ratification of the U. S. - Mexico Treaty, that each nation may know the amount of water to be allocated, in order to prepare diversion plans.

Jean S. Breitenstein, Attorney for the Water Conservation Board of the State of Colorado, states his views in a Brief, dated as of the 7th of September, 1944, as follows:

A CONSIDERATION OF THE COLORADO RIVER SITUATION, INCLUDING ALL ITS PHYSICAL FACTORS, REQUIRES THE CONCLUSION THAT MEXICO WOULD RECEIVE GREATER AMOUNTS OF WATER THROUGH ARBITRATION THAN IT WOULD RECEIVE UNDER THE PROPOSED TREATY.

The situation as existing at the present, and as it will exist for many years, is that water is released from Boulder Dam for generation of power in accordance with a more-or-less regular schedule. Such releases far exceed the amount of water which is now being used for irrigation and domestic purposes by the lower basin. Until additional works are constructed in the United States to utilize such releases, the waters will pass on into Mexico. This fact must not be ignored. It cannot be denied that the uses of water in Mexico have increased since Boulder Dam went into operation. In 1943 the Mexican diversions amounted to over 1,800,000 acre-feet. A fair appraisal of the situation requires the conclusion that the Mexican use of water will increase in the future. By expanding her irrigated acreage, Mexico is building up an economic development which is dependent upon Colorado River flow.

Reference has also been made that Mexico could not construct a dam within its territory because such a dam would have the effect of backing up water into territory of the United States, and it is asserted that Mexico has no right to do this for the reason that no nation may use its property to cause injury to the property of another nation. Conceding that the United States would have just cause of complaint if Mexico, by the construction of a dam within its country, flooded areas in the United States, nevertheless, it seems clear that the reason assigned applies to the United States as well as to Mexico. For the United States to cut off all Colorado River water from Mexico would be just as much an injury to Mexico as the flooding of the lands would be an injury to the United States. In other words, the very reason which the objectors to the treaty urge is a most persuasive reason for a prompt, fair, and equitable termination of the existing controversy with Mexico.

~~and~~ A delay in the definition of the Mexican right is unwise as through the regulated releases of water now being made from Boulder Dam Mexico receives a water supply which enables it to enlarge its irrigated acreage. Such development would be protected in any award that might in the future be made by a board set up under the 1929 treaty.

MEMORANDA OF SOME OF THE IMPORTANT ACTIVITIES
OF THE COLORADO RIVER COMMISSION, NOVEMBER 1,
1943 - NOVEMBER 1, 1944

Late in November of 1943, the Arizona Colorado River Commission directed Charles A. Carson, attorney for the Commission, to meet with Nevada representatives for a conference regarding the Arizona contract for water from Lake Meade. This was followed by a meeting of the Committee of Fourteen in Salt Lake City, Utah, on the 15th, 16th and 17th of December, 1943, to make plans for Arizona's contract with the Federal Government. Mr. Carson at this time secured the support of all the states concerned except California. Changes to be made in the contract provisions required another meeting of this Committee in Salt Lake, January 26th-29th, 1944. Mrs. Nellie T. Bush, member of the Commission, and Mr. Carson attended this conference, and at its conclusion, the Arizona representatives went to Washington, D. C.

On January 30th, 1944, Mr. Donald C. Scott, consulting engineer for the Arizona Colorado River Commission, made an investigation of proposed developments on the Virgin River. Details and results of this trip are found in Mr. Scott's report which begins on page 16.

On February 2nd, 1944, Secretary of the Interior Harold L. Ickes presided at a hearing of Arizona's petition for the contract. This petition was presented by Governor Sidney P. Osborn and Mrs. Bush, members of the Commission, and Mr. Carson, attorney for the Commission. Attorney Arvin B. Shaw, representing the California Commission, appeared in opposition, but Mr. Ickes approved the contract, which he signed February 9th, 1944.

A meeting of the Committees of Fourteen and Sixteen to consider the United States-Mexico water treaty now before the Foreign Relations Committee was called by Judge Clifford H. Stone, chairman. Donald C. Scott, consulting engineer for the Arizona Colorado River Commission, represented Arizona at this conference, which was held in Santa Fe, New Mexico, on February 23rd and 24th, 1944.

The United States-Mexico water treaty was the subject of a conference of representatives of the basin states and the International Boundary Committee. Mr. Carson and Mr. Scott represented Arizona at this meeting, which was held

in Santa Fe, New Mexico, July 6th-8th, 1944. Plans were made here for another meeting of this group after representatives of the basin states had reported to their various state commissions. This meeting, held in Reno, Nevada, on July 19th and 20th, 1944, was attended by Mrs. Bush and Mr. Carson.

Mr. Carson was instructed by the Arizona Colorado River Commission to attend a meeting of the Editing Committee of the Committees of Fourteen and Sixteen. The committee met in Los Angeles, August 10th and 11th, 1944.

Still another meeting on the United States-Mexico water treaty was held in Denver, Colorado, August 26th-29th, 1944. Here representatives of the basin states met with the Policy Committee which had been appointed to study the treaty. Mr. Carson was directed to represent Arizona at this meeting.

On September 12, 1944, the Arizona Commission telegraphed information relative to the treaty to the American Bar Association convention in Chicago. Mr. Carson prepared the memorandum.

As this report is being written, members of the Commission and Mr. Carson are preparing material to be presented at a conference of the Committee of Fourteen and Sixteen to be held in Denver, November 10th and 11th, 1944. This meeting will draw up and submit to the Bureau of Reclamation a plan for a comprehensive development of the Colorado River basin. Representatives have been directed to attend this meeting, as well as the annual convention of State Engineers on November 13th and 14th, and a National Reclamation meeting on the 15th and 16th, all to be held in Denver.

The Colorado River Commission has been advised that Gail Baker has been employed as engineer for the Land Commission, and that he is working in conjunction with Federal Bureau of Reclamation officials on specific projects that have been recommended for immediate and post-war development. The result of these continued studies will be of the greatest benefit to the development of power and irrigation in Arizona.