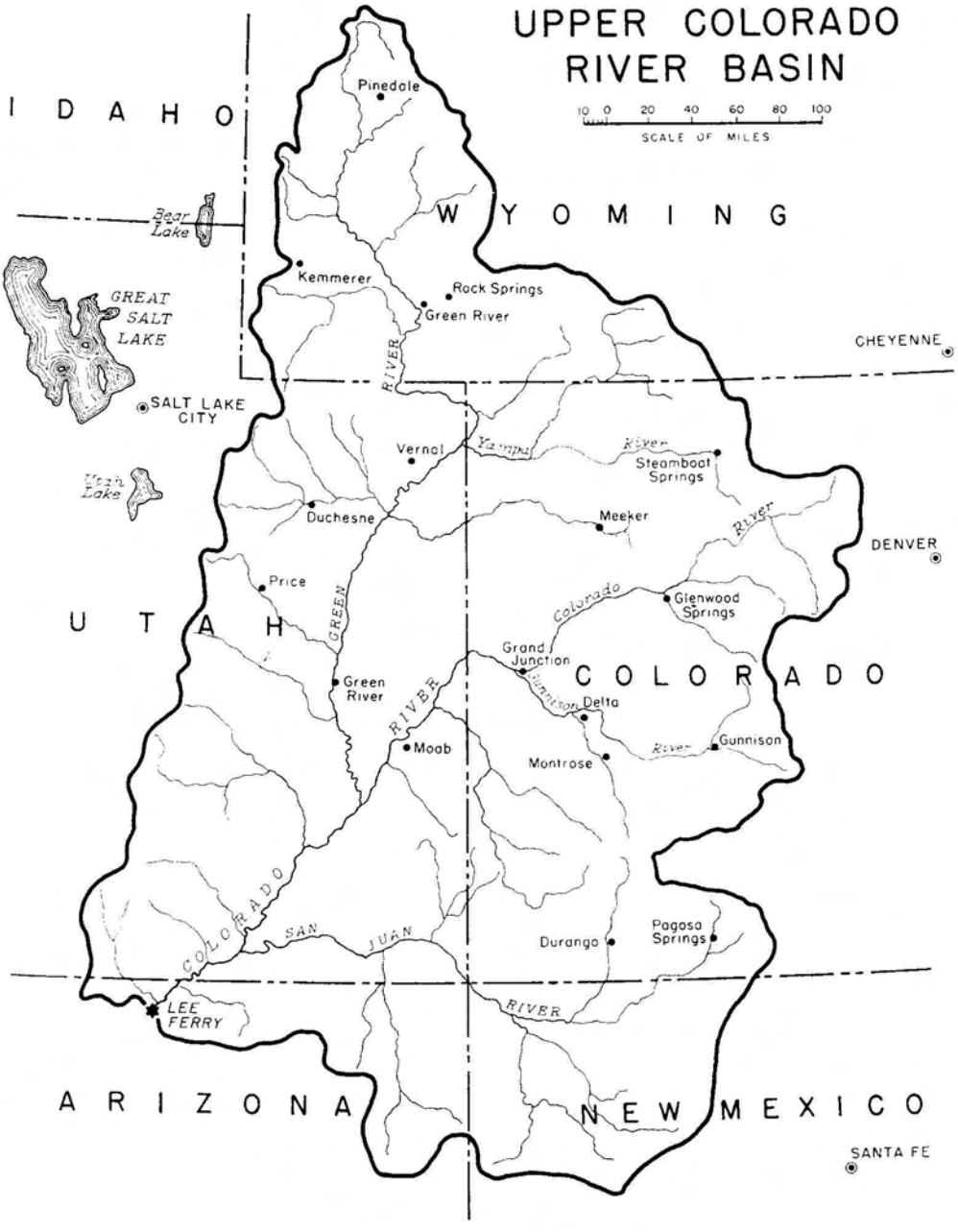
UPPER COLORADO RIVER COMMISSION

FIRST ANNUAL REPORT

MARCH 20, 1950


UPPER COLORADO
RIVER BASIN
10 0 20 40 60 80 100
SCALE OF MILES
IDAHO
WYOMING
Pinedale
Bear Lake
Kemmerer
Rock Springs
Green River
GREAT SALT LAKE
SALT LAKE CITY
CHEYENNE
Vernal
Yampa River
Steamboat Springs
Utah Lake
Duchesne
Meeker
White River
DENVER
Price
GREEN RIVER
Colorado River
Glenwood Springs
UTAH
Grand Junction
COLORADO
Green River
Gunnison River
Delta
Moab
Montrose
Gunnison
COLORADO
SAN JUAN
Durango
Pagosa Springs
LEE FERRY
RIVER
ARIZONA
NEW MEXICO
SANTA FE

UPPER COLORADO RIVER COMMISSION

Grand Junction, Colorado

City Administration Building

March 23, 1950

My dear Mr. President:

Article VIII (d) (13) of the Upper Colorado River Basin Compact provides that the Upper Colorado River Commission shall make and transmit annually to the Governors of the signatory States and the President of the United States, with the estimated budget, a report covering the activities of the Commission for the preceding water year.

A copy of the Commission's Annual Report is enclosed. The budget is attached as Appendix K.

Time has not as yet permitted the printing of our Annual Report. The report has, however, been placed in the hands of the printer and a printed copy will be made available to you at the earliest possible date.

Sincerely yours,

/s/ John Geoffrey Will

John Geoffrey Will
Secretary
Upper Colorado River Commission

Honorable Harry S. Truman
President of the United States
The White House
Washington, D. C.

Enclosure

This report was, on the same date, transmitted to the Governor of each Upper Basin State.

FRONTISPIECE

LETTER OF TRANSMITTAL

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FIRST ANNUAL REPORT
OF THE
UPPER COLORADO RIVER COMMISSION

March 20, 1950

I. INTRODUCTION

Negotiations leading to the execution of the Upper Colorado River Basin Compact were begun on the 31st day of July, 1946. These negotiations culminated in the formal execution of the Upper Colorado River Basin Compact, at the Palace of Governors, Santa Fe, New Mexico, on the 11th day of October, 1948. The Compact was duly ratified as follows:

By Arizona on the 21st day of January, 1949
By Colorado on the 2nd day of February, 1949
By New Mexico on the 2nd day of February, 1949
By Wyoming on the 25th day of January, 1949
By Utah on the 31st day of January, 1949

It was consented to by the Congress by a bill approved by the President of the United States of America on the 6th day of April, 1949.

The Upper Colorado River Commission was duly organized on the 5th day of August, 1949.

The powers and duties of the Upper Colorado River Commission are laid down in Article VIII of the Upper Colorado River Basin Compact (Appendix B). These powers and duties constitute a framework upon which the Commission builds a living organization which seeks to reach out among the compacting states, their legislatures and their peoples, and foster further development of the spirit which made the Compact itself possible. The Commission seeks also to maintain close contacts with the Executive and Legislative branches of the Federal Government to the end, among others, that whatever plan is finally evolved will be adequate and sound, will be fair and, therefore, acceptable to the States concerned. The Commission looks toward the day when it may, by agreement with the Federal Government designed to assure protection of the broad national interests to be served thereby, take over the administration, care, operation and maintenance of works that are authorized and constructed.

Article VIII (d) (13) of the Upper Colorado River Basin Compact (see Appendix B) provides that the Upper Colorado River Commission shall "make and transmit annually to the Governors of the signatory States and the President of the United States of America, with the estimated budget, a report covering the activities of the Commission for the preceding water year." Article VIII of the By-Laws of the Upper Colorado River Commission provides as follows:

"1. The Commission shall make and transmit annually on or before April 1 to the Governors of the states signatory to the Upper Colorado River Basin Compact and to the President of the United States a report covering the activities of the Commission for the water year ending the preceding September 30.

"2. The annual report shall include among other things the following:

(a) The estimated budget;
(b) All hydrologic data which the Commission deems pertinent;
(c) Estimates, if any, of the Commission forecasting water run-off;
(d) Statements as to cooperative studies of water supplies made during the preceding water year;
(e) All findings of fact made by the Commission during the preceding water year;
(f) Such other pertinent matters as the Commission may require."

Notwithstanding that the foregoing provisions of its By-Laws require that the report shall cover the activities of the Commission for the "water year ending the preceding September 30", the Commission has determined to include in its report an account of the activities of the Commission through March 15, 1950, in order that a fuller understanding may be gained of the progress that has been made by the Upper Colorado River Commission.

II. ORGANIZATION OF THE UPPER COLORADO RIVER COMMISSION

Article VIII (h) of the Upper Colorado River Basin Compact, which creates the Upper Colorado River Commission, provides that "The organization meeting of the Commission shall be held within four months from the effective date of (the) Compact." The Upper Colorado River Basin Compact became effective on April 6, 1949. The organization meeting of the Upper Colorado River Commission was duly held and the Commission was duly organized on August 5, 1949, that is to say, within the time provided by the Compact. At such meeting, the following were duly accredited as members of the Commission:

Harry W. Bashore, Commissioner for the United States of America
Clifford H. Stone, Commissioner for the State of Colorado
John H. Bliss, Commissioner for the State of New Mexico
Harold A. Linke, Commissioner for the State of Utah
L. C. Bishop, Commissioner for the State of Wyoming

The Commission selected Grand Junction, Colorado, as the site of its headquarters.

III. ACTIVITIES OF THE UPPER COLORADO RIVER COMMISSION

The Upper Colorado River Commission met on the following occasions after the organization meeting referred to under II above: On September 19 and 20, 1949, at Grand Junction, Colorado; on October 29 and 30, 1949, at Salt Lake City, Utah; and on December 12, 1949, at Denver, Colorado.

At the meeting first described above (September 19 and 20, 1949) the Commission considered a report by its By-Laws Committee; a lump sum budget in the amount of $30,000 for the fiscal year ending June 30, 1950, was adopted; the amount of the bond of the Treasurer pro tem was determined; and a temporary depository of the Commission's funds was selected. At the meeting of October 29, 1949, the Commission heard Mr. Mills E. Bunger, a consulting engineer for Ford, Bacon and Davis, Inc., discuss the purpose and scope of the synthetic liquid fuel survey; it heard an address by Senator Arthur V. Watkins, of Utah; it adopted By-Laws (See Appendix C); it elected Clifford H. Stone, Commissioner for the State of Colorado, as Vice-Chairman of the Commission; it elected Barney L. Whatley as Treasurer; it selected Engineering, Legal, and Budget Committees (for the membership of these committees, see Appendix D); it determined that its Treasurer should

furnish bond to the amount of $40,000 (see Appendix E); it referred the tentative report of Messrs. Ford, Bacon and Davis to its Engineering Committee; it selected the First National Bank in Grand Junction, Colorado, as its depository; it directed that the Treasurer make suitable arrangements to protect the Commission's funds; and that the Treasurer be authorized to draw checks on such funds. At the meeting of December 12, 1949, the Commission adopted a resolution recommending to the President, the Secretary of the Interior, and the Congress the prosecution of a broad and comprehensive program for the establishment and maintenance of gaging stations in the Colorado River Basin (see Appendixes F and G); it heard and approved a report of its Engineering Committee in regard to the tentative report of Messrs. Ford, Bacon and Davis, Inc., entitled "Water Supply in Upper Colorado River Basin Available for Synthetic Liquid Fuel Plants—Upper Basin States, Colorado, New Mexico, Utah, Wyoming, portion of Arizona, dated October 6, 1949 by Ford, Bacon and Davis"; it concurred in its Engineering Committee's conclusions and recommendations with respect thereto; it directed that the United States Army Engineers should be advised of its position thereon; it selected Mr. J. G. Will as Secretary; and it selected Mrs. Lois P. Crowder as Secretary pro tem.

The Commission considered a preliminary draft, prepared by the Bureau of Reclamation, of a report on the Colorado River Storage Project and Participating Projects and furnished the Bureau of Reclamation comments designed to assist it in preparing the final report for consideration by the Secretary of the Interior.

The Project Plan provides for the construction of holdover storage reservoirs in the Upper Colorado River Basin to regulate the erratic streamflows thus permitting the Upper Basin to make the consumptive use of water allocated to it by the Colorado River Compact and meet the obligation to the Lower Basin imposed by such compact; the development of hydroelectric power to meet the rapidly growing needs in the power market area; and for the construction of projects for the use of water for domestic, irrigation and other purposes.

The Project is of vital concern to the Upper Colorado River Basin.

Through its Secretary, the Commission has followed a policy of establishing close and cordial relations with the Executive and Legislative Branches of the State and Federal governments and of

keeping all appropriate persons informed, from time to time, of the Commission's work.

Headquarters offices of the Commission were opened in temporary quarters provided by the Grand Junction Chamber of Commerce on January 24, 1950. The Commission's offices have since been moved to the City Administration Building, Grand Junction, Colorado.

The Upper Colorado River Commission has been held, by the Bureau of Internal Revenue, United States Treasury Department, to be exempt from the taxes imposed by Sections 3465, 3469, and 3475, respectively, of the Internal Revenue Code, as amended, on payment of telephone, telegraph, radio or cable facilities, in the case of official travel on the Commission's behalf, and on amounts paid for the transportation of property. (See Appendix H) The question whether the Commission is exempt also from tax under the Federal Insurance Contributions Act is pending before the Bureau of Internal Revenue.

IV. FISCAL

Under the provisions of Article VIII (b) of the Upper Colorado River Basin Compact, expenses incurred by the Commission incident to the administration of the Compact, "and which are not paid by the United States of America," are borne by the four States (Colorado, New Mexico, Utah, and Wyoming) "according to the percentage of consumptive use apportioned to each." Accordingly, the following sums have been received from the following States:

Colorado	$12,937.50
New Mexico	2,812.50
Utah	5,750.00
Wyoming	3,500.00
Total	$ 25,000.00

There had been expended through March 15, 1950, the sum of: $8,263.06.

The reports of the Treasurer Pro Tem and of the Treasurer of the Commission are attached as Appendix I and Appendix J.

The First National Bank in Grand Junction has been designated as depository of the Commission's funds.

The Treasurer of the Commission is bonded to the amount of $40,000 and the Commission's depository has deposited securities with the Federal Reserve Bank of Denver to the amount of $50,000 to secure the Commission's funds.

The Commission's budget for the fiscal year ending June 30, 1951 is attached as Appendix K.

V. HYDROLOGY

Refinement of hydrologic data hereinafter contained can be expected as a result of detailed investigations now known to be underway.

(a) Inflow-Outflow Manual.

One of the assignments carried out by the Engineering Advisory Committee was the preparation of the Inflow-Outflow Manual which is included in full as Appendix L of this report.

The Inflow-Outflow Method of determining stream depletions was adopted by the Upper Colorado River Commission as stated in Article VI of the Compact. The Manual was submitted at the meeting of the Compact Commission held at Salt Lake City, Utah, on August 5, 1949. It was adopted by that Commission and was recommended to and adopted by the Upper Colorado River Commission as "the basis for the commencement of administrative calculations on the Upper Colorado River."

The Engineering Advisory Committee, in its Final Report to the Upper Colorado River Compact Commission, stated the most important factors influencing depletion to be (1) "the areas using water as a result of a man-made irrigation"; (2) "the unit rates of consumptive use of irrigation water"; (3) "stream depletion at sites of use"; (4) "channel losses between sites of use and Lee Ferry"; and (5) "stream depletions above certain key gages, at state boundaries, and at Lee Ferry."

The effects of all these numerous factors are automatically integrated as additional development, by irrigation, industrial, or other enterprises, takes place in the Upper Basin causing man-made depletion of stream flow. The net effect of such depletion can be determined by the application of the inflow-outflow method and the Manual presents examples and procedures for the determination of results.

(b) Water Supply Forecasts.

It is contemplated that forecasts of streamflow and water supply conditions will be made by the Secretary's office as frequently as necessary to provide information for administration of the Compact. At the present time several agencies publish forecasts of streamflow for the Colorado River and its tributaries above Lake Mead. These agencies are the United States Weather Bureau, Soil Conservation Service, Colorado River Water Conservation District, and the Bureau of Reclamation. Forecasts are usually made by these agencies as of the first of each month January through May for the subsequent run-off season. These forecasts are made for periods of time, and points on the Colorado River or its tributaries specific to the needs or functions of the agency forecasting.

The techniques and hydrologic data used in the forecasts by other agencies, and their forecasts, are of interest to the Commission and will continue to be. However, it is believed that forecasting techniques and procedures must be developed to provide information specific to the administrative needs of the Commission. It is planned that the engineering staff of the Secretary's office will initiate the study of streamflow forecasting problems during Fiscal Year 1951.

(c) Average Annual Flows at State Lines.

Average annual flows at State Lines were found, for the period 1914 to 1945, to be as follows:

AVERAGE ANNUAL HISTORIC FLOWS
AT STATE LINES (1914-1945, incl.)

	(1000 A.F.)
Arizona	
Ungaged area tributary to San Juan River	86.5
Ungaged area tributary to Colorado River	46.8
Arizona share of main stem channel losses within State	-0.1
Net flow at State Line	133.2
Colorado	
Little Snake River (at mouth)	226.9
Yampa River (exclusive of Little Snake River)	1,172.5

Colorado (continued)	(1000 A.F.)
White River	576.2
Ungaged area tributary to Green River	27.4
Colorado River including Gunnison River	5,469.9
Dolores River	762.3
San Juan River above Rosa	929.9
Pine River	294.7
Animas River	807.2
LaPlata River	30.9
Mancos River	48.2
McElmo Creek	51.1
Ungaged area tributary to San Juan River	13.5
Colorado share of main stem channel losses within State	-2.3
Net Flow at State Line	10,408.4
New Mexico	
Ungaged area tributary to San Juan River	192.1
New Mexico share of main stem channel losses within State	-6.0
Net Flow at State Line	186.1
Utah	
Tributaries of Green River above Linwood	158.8
Henry's Fork	66.8
Brush Creek near Jensen	36.0
Ashley Creek near Vernal	78.0
Duchesne River near Randlett	653.3
Price River at Mouth	87.6
Ungaged area tributary to Green River	127.4
Dolores River	23.2
Ungaged area tributary to Colorado River above Cisco	17.7

Utah (continued)	(1000 A.F.)
Paria River	18.1
Ungaged area tributary to Colorado River below Green River, Bluff and Cisco	777.3
Ungaged area tributary to San Juan River at Bluff	29.3
Utah share of main stem channel losses within State	-50.6
Net Flow at State Line	2,022.8
Wyoming	
Green River above Linwood	1,364.4
Little Snake River (at State Line)	249.8
Ungaged area tributary to Green River below Linwood	15.1
Wyoming share of main stem channel losses within State	-18.7
Net Flow at State Line	1,610.6
Sum of Flows at State Lines	14,361.1

(d) Historic Contributions at Lee Ferry. (Average 1914-1945, incl.)

State	Historic Flow at State Lines Acre-Feet	Out of State Losses Acre-Feet	Historic Contribution to Flow at Lee Ferry Acre-Feet	% of Total
Arizona	133,200	1,000	132,200	0.96
Colorado	10,408,400	455,600	9,952,800	72.18
New Mexico	186,100	7,700	178,400	1.29
Utah	2,022,800	6,000	2,016,800	14.63
Wyoming	1,610,600	102,200	1,508,400	10.94
Total	14,361,100	572,500	13,788,600	100.00

(e) Irrigated Areas.

The following tabulations show the average irrigated areas for the study period, 1914-1945, inclusive, and the present irrigated areas adopted by the Engineering Committee.

IRRIGATED AREAS

State	Average	Present
Arizona	3,770	9,840
Colorado	790,606	790,600*
New Mexico	39,000	43,620
Utah	288,520	303,977
Wyoming	228,700	236,675
Total	1,350,596	1,384,712

*Assumed to be same as average for period, 1914-1945.

(f) Incidental Areas.

The areas of non-cropped land adjacent to and consuming irrigation water incidental to the irrigation of the crop lands were estimated by inspection of the Bureau of Reclamation land classication sheets, field inspection, available aerial surveys and other detail and general maps of the irrigated areas. The incidental areas adopted by the Committee are as follows:

(Average for Study Period, 1914-1945, Incl.)

Arizona	Negligible
Colorado	106,812 Acres
New Mexico	6,482 "
Utah	48,625 "
Wyoming	28,600 "
Total	190,519 Acres

(g) Man-Made Depletions at State Lines and at Lee Ferry Averages for 1914-1945, Incl.
(Acre feet)

State	At Sites of Use	At State Lines	At Lee Ferry
Arizona	4,000	4,000	4,000
Colorado	1,062,800	1,042,800	1,016,100
New Mexico	72,200	71,300	69,500
Utah	556,500	544,800	544,300
Wyoming	227,700	226,400	216,000
Total	1,923,200	1,889,300	1,849,900

(h) Virgin Flow at Lee Ferry.

Virgin stream flow contributions at State Lines and at Lee Ferry were obtained by adding to the historic contributions the man-made stream depletions estimated at these sites. The following tabulation shows the virgin contributions at State Lines and Lee Ferry and also the out-of-state channel losses which were estimated for average undepleted flow conditions.

VIRGIN FLOW AT LEE FERRY

State	Virgin Flow at State Lines Acre-Feet	Out of State Losses Acre-Feet	Contribution to Virgin Flow at Lee Ferry Acre-Feet	% of Total
Arizona	137,200	1,000	136,200	0.87
Colorado	11,451,200	482,300	10,968,900	70.14
New Mexico	257,400	9,500	247,900	1.58
Utah	2,567,600	6,500	2,561,100	16.38
Wyoming	1,837,000	112,600	1,724,400	11.03
Total	16,250,400	611,900	15,638,500	100.00

(i) Historic flows at Key Gaging Stations.

The average annual discharges for the years 1914-1945 and the annual discharges for the water years 1946, 1947, 1948, and 1949 at selected stream flow stations are as shown in the table following this page.

(j) Main Stem Reservoir Operations.

The flow of the Colorado River is not uniform but varies from year to year. At Lee Ferry the historic flow has ranged between a minimum of about 4,400,000 acre-feet in 1934 to a maximum of about 21,900,000 acre-feet in 1917. The average historic flow for 1914-1945, inclusive, was 13,788,600 acre-feet. In the 10-year period of lowest historic flow, 1931-1940, inclusive, the average annual flow at Lee Ferry was 10,151,000 acre-feet.

Reservoir operation studies were made to determine the extent to which the Upper Basin can make its apportioned water uses during drought cycles and still meet its compact obligations at Lee Ferry, as it is quite evident that holdover reservoirs must be constructed in the Upper Colorado River Basin to impound waters in years of high runoff, and to release such stored water in critical periods of low runoff, such as 1931-1940, to help meet the Upper Division obligation at Lee Ferry.

Such reservoirs will deplete the flow at Lee Ferry by reason of evaporation losses in excess of present stream channel losses. However, such losses, and the holdover storage capacity required

UPPER COLORADO RIVER BASIN KEY GAGING STATIONS

Streamflow Station	Drainage Area Square Miles	Mean Historic Flow—Water Years 1914-45 1000 Acre Feet	Runoff In Water Year 1946 1000 Acre Feet	Runoff in Water Year 1947 1000 Acre Feet	Runoff In Water Year 1948 1000 Acre Feet Provisional	Runoff In Water Year 1949 1000 Acre Feet Provisional
1. Green River at Green River, Wyoming	7670	1260.5	1190.0*	1841.1*	‡	‡
2. Blacks Fork near Millburne, Wyoming	156	113.2	102.7	130.9	104.3	104.9
3. East Fork of Smith Fork near Robertson, Wyoming	53	32.5	29.6	36.4	26.9	§
4. West Fork of Smith Fork near Robertson, Wyoming	37	16.3	13.9	18.5	12.2	14.8
5. Green River near Linwood, Utah	14300	1501.6	1425.0	2235.0	1447.0	1358.0
6. Burnt Fork near Burnt Fork, Wyoming	53	25.1	14.3	27.6	21.8	28.1
7. Henrys Fork near Lonetree, Wyoming	55	32.4	20.2	34.3	25.0	31.7
8. Henrys Fork at Linwood, Utah	530	66.8	43.8	87.5	52.0	64.4
9. Little Snake River near Dixon, Wyoming	1028	423.5	288.3	383.6	297.7	461.2
10. Little Snake River near Lily, Colorado	3680	472.4	323.8	467.0	284.8	536.4
11. Yampa River at Steamboat Springs, Colorado	604	345.1	274.8	382.3	343.8	391.2
12. Yampa River near Maybell, Colorado	3410	1189.5	855.6	1310.0	1183.0	1322.0
13. Brush Creek near Jensen, Utah#	255	36.0	5.7	30.1	12.0	18.9
14. Ashley Creek near Vernal, Utah	101	78.0	47.3	92.2	67.8	80.4
15. Whiterocks River near Whiterocks, Utah	115	94.1	55.2	111.1	69.4	93.8
16. Duchesne River at Myton, Utah	2705	439.5	255.3	382.8	234.9	456.2
17. Duchesne River near Randlett, Utah	3820	653.3	316.1	570.0	330.7	603.3
18. White River near Meeker, Colorado	762	461.7	363.6	553.8	459.3	522.8
19. White River near Watson, Utah	4020	582.0	394.3	569.1	528.0	573.4
20. Price River near Heiner, Utah	430	92.6	53.9	64.8	62.7	85.6
21. Green River at Green River, Utah	40920	4658.4	3469.0	5484.0	4148.0	4897.0
22. Colorado River at Hot Sulphur Springs, Colorado	782	476.7	306.3	498.2	372.8	478.0
23. Colorado River at Glenwood Springs, Colorado	4560	2080.4	1556.0	2261.0	1939.0	2048.0
24. Roaring Fork at Glenwood Springs, Colorado	**1460**	**1028.0**	**798.3**	**1156.0**	**1087.0**	**958.6**
25. Colorado River near Cameo, Colorado	**8055**	**3505.0**	**2576.0**	**3747.0**	**3325.0**	**3341.0**
26. Plateau Creek near Cameo, Colorado	**604**	**186.3**	**111.7**	**163.0**	**182.4**	**160.6**
27. Gunnison River near Grand Junction, Colorado	8020	2054.9	1278.0	1849.0	2445.0	2119.0
28. Dolores River at Gateway, Colorado	4350	788.1	299.6	510.2	847.8	818.7
29. Colorado River near Cisco, Utah	24100	6186.0	4062.0	6051.0	6587.0	6290.0
30. Sum of San Juan, Rio Blanco and Rito Blanco Rivers at Pagosa Springs, Colorado	379	399.5	157.9	269.0	428.5	459.9
31. Navajo River at Edith, Colorado	165	131.8	54.3	77.5	103.2	120.4
32. Piedra River at Arboles, Colorado	650	380.6	136.9*	218.9*	‡	‡
33. San Juan River at Rosa, New Mexico	1990	956.6	342.2	545.9	925.8	§
34. Pine River at Ignacio, Colorado	448	256.4	42.1	95.5	297.7	§
35. San Juan River near Blanco, New Mexico	3558	1260.2	392.5	667.2	1267.0	§
36. Animas River at Durango, Colorado	692	654.7	421.8	625.8	769.0	771.0
37. Animas River near Cedar Hill, New Mexico	1092	806.7	438.6	668.5	865.5	§
38. Animas River at Farmington, New Mexico	1360	753.8	382.3	608.3	829.0	§
39. San Juan River at Farmington, New Mexico	7245	2111.4	790.4	1299.0	2133.0	2216.0
40. La Plata River at Colorado-New Mexico State Line	331	30.9	9.7	11.7	22.4	35.0
41. San Juan River at Shiprock, New Mexico	12876	**	811.7	1382.0	2211.0	§
42. Mancos River near Towaoc, Colorado	550	52.0	15.0*	‡	‡	‡
43. McElmo Creek near Cortez, Colorado	233	41.0	28.4D	‡	‡	‡
44. San Juan River near Bluff, Utah	23010	2275.6	864.6	1488.0	2319.0	2523.0
45. Paria River at Lees Ferry, Arizona	1550	25.3	22.9	23.2	19.1	19.6
46. Colorado River at Lees Ferry, Arizona	108335	13763.3	8722.0	13491.0	13670.0	14340.0
47. Colorado River at Lee Ferry, Arizona	109889	13788.6	8744.9	13514.2	13689.1	14359.6

*Estimated.
**Mean for Water Years 1914-45 not computed.
#Represents flow at head of irrigation.
D Provided by the Durango Office of the U. S. B. R.
‡Station not operating and estimates not made.
§Provisional Records being computed as of 3-17-50.

to regulate the stream flow at Lee Ferry can only be approximated at this time until all storage sites have been studied in detail. It is recognized also, that upstream development of future irrigation projects and storage reservoirs will furnish some equation of streamflows, and will to some extent reduce the capacity needed in holdover reservoirs as herein reported.

Operation studies were made for the 32-year period, 1914 through 1945. These studies indicate a required live holdover storage capacity of not to exceed 30,000,000 acre-feet and stream depletions due to reservoir losses of approximately 500,000 acre-feet annually.

The actual amount of such holdover storage capacity will be influenced by the extent to which the streamflow will be equated by the operation of upstream holdover storage capacity needed to regulate streamflows at the sites of diversions and the equating effect of upstream irrigation developments.

VI. FINDINGS OF FACT

No findings of fact had been made by the Commission to the date of this report.

VII. THE COLORADO RIVER COMPACT OF 1922 AND THE MEXICAN TREATY OF 1945

The Upper Colorado River Basin Compact must be in conformity with, and may not violate, the Colorado River Basin Compact of 1922. That Compact was negotiated and signed by Commissioners representing all seven States of the Colorado River Basin. It was later ratified by the signatory States and approved by the Congress. For this reason any consideration of the Upper Colorado River Basin Compact should be approached with the understanding of the salient terms of the first Compact. (See Appendix A)

The Colorado River Compact was signed at Santa Fe, New Mexico, on November 24, 1922. More than six years passed before it was finally approved by the Congress on December 21, 1928, through provisions contained in the Boulder Canyon Project Act (45 Stat. 1057-1068). During the intervening period much controversy arose over its ratification and Congressional approval, resulting to a considerable degree from opposition in Arizona.

Section 4 (a) of the Boulder Canyon Project Act gave consent to the Compact if ratified by only six of the signatory States, including the State of California, provided 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 to 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 (1) 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 California Legislature passed this self-limitation statute and the respective Legislatures of California, Colorado, Nevada, New Mexico, Utah and Wyoming completed state ratification by March 4, 1929. The President of the United States proclaimed the Compact effective on June 25, 1929. Arizona did not ratify until 1944.

The Colorado River Compact of 1922 accomplishes these things:

1. It divides the Colorado River Basin into an Upper and Lower Basin. The dividing point is at Lee Ferry which is on the river approximately thirty miles (river distance) below the Utah-Arizona boundary line and one mile below the mouth of the Paria River. Colorado and Wyoming are entirely within the Upper Basin. California and Nevada are entirely within the Lower Basin. Arizona, Utah and New Mexico include territory within each of the two Basins.

2. It makes no apportionment of water among the seven States of the Colorado River Basin but it divides the beneficial consumptive use of water between the Upper and Lower Basins. The beneficial consumptive use of 8,500,000 acre-feet annually is ap-

portioned to the Lower Basin and the beneficial consumptive use of 7,500,000 acre-feet annually, to the Upper Basin.

3. It also creates two classes of Colorado River Basin States, namely "States of the Lower Division" and "States of the Upper Division." The States of the Lower Division are Arizona, California and Nevada, and the States of the Upper Division are Colorado, New Mexico, Utah and Wyoming. The Compact provides that 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 should be noted that this provision constitutes a joint and several obligation of the States of the Upper Division to deliver at Lee Ferry the 75,000,000 acre-feet of water during each consecutive ten-year period for use of the States of the Lower Division.

4. It treats any water over and above the total 16,000,000 acre-feet apportionment for beneficial consumptive use in the two Basins as "surplus"; and it specifies that if the United States—"shall recognize in Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from"—such surplus. If such surplus proves insufficient to meet recognized rights to the use of water in Mexico, then

> "* * * the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized * * *"

In 1945 a treaty between the United States and Mexico was consummated. This treaty guarantees to Mexico the right to use annually 1,500,000 acre-feet of water. (See Appendix M)

5. It provides that the surplus over and above the 16,000,000 acre-feet total beneficial consumptive use apportionment to the two basins and the water required to meet Mexico treaty demands, shall be subject to—"further equitable apportionment at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use"—as set out in the Compact.

APPENDIX A

COLORADO RIVER COMPACT SIGNED AT SANTA FE, NEW MEXICO, NOVEMBER 24, 1922

The States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, having resolved to enter into a compact under the act of the Congress of the United States of America approved August 19, 1921, (42 Stat. L., p. 171), and the acts of the legislatures of the said States, have through their governors appointed as their commissioners: W. S. Norviel for the State of Arizona, W. F. McClure for the State of California, Delph E. Carpenter for the State of Colorado, J. G. Scrugham for the State of Nevada, Stephen B. Davis, Jr., for the State of New Mexico, R. E. Caldwell for the State of Utah, Frank C. Emerson for the State of Wyoming, who, after negotiations participated in by Herbert Hoover, appointed by the President as the representative of the United States of America, have agreed upon the following articles.

Article I

The major purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River system; to establish the relative importance of different beneficial uses of water; to promote interstate comity; to remove causes of present and future controversies and to secure the expeditious agricultural and industrial development of the Colorado River Basin, the storage of its waters, and the protection of life and property from floods. To these ends the Colorado River Basin is divided into two basins, and an apportionment of the use of part of the water of the Colorado River system is made to each of them with the provision that further equitable apportionment may be made.

Article II

As used in the compact:

(a) The term "Colorado River system" means that portion of the Colorado River and its tributaries within the United States of America.

(b) The term "Colorado River Basin" means all of the drainage area of the Colorado River system and all other territory within the United States of America to which the waters of the Colorado River system shall be beneficially applied.

(c) The term "States of the upper division" means the States of Colorado, New Mexico, Utah, and Wyoming.

(d) The term "States of the lower division" means the States of Arizona, California, and Nevada.

(e) 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.

(h) The term "domestic use" shall include the use of water for household stock, municipal, mining, milling, industrial, and other like purposes, but shall exclude the generation of electrical power.

Article 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 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 1st 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 can not reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for further apportionment as provided in paragraph (f) any two signatory States, acting through their governors, may give joint notice of such desire to the governors of the other signatory States and to the President of the United States of America, and it shall be the duty of the governors of the signatory States and of the President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the upper basin and lower basin the beneficial use of the unapportioned water of the Colorado River system as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

Article IV

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for nagivation would seriously limit the development of its basin, the use of its

waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nevertheless remain binding.

(b) Subject to the provisions of this compact, water of the Colorado River system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(c) The provisions of this article shall not apply to or interfere with the regulation and control by any State within its boundaries of the appropriation, use, and distribution of water.

Article V

The chief official of each signatory State charged with the administration of water rights, together with the Director of the United States Reclamation Service and the Director of the United States Geological Survey, shall cooperate, ex officio—

(a) To promote the systematic determination and coordination of the facts as to flow, appropriation, consumption, and use of water in the Colorado River Basin, and the interchange of available information in such matters.

(b) To secure the ascertainment and publication of the annual flow of the Colorado River at Lee Ferry.

(c) To perform such other duties as may be assigned by mutual consent of the signatories from time to time.

Article 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.

Article VII

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.

Article 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 water that may be stored not in conflict with Article III.

All other rights to beneficial use of waters of the Colorado River system shall be satisfied solely from the water apportioned to that basin in which they are situate.

Article IX

Nothing in this compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under this compact or the enforcement of any of its provisions.

Article X

This compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination, all rights established under it shall continue unimpaired.

Article XI

This compact shall become binding and obligatory when it shall have been approved by the legislatures of each of the signatory States and by the Congress of the United States. Notice of approval by the legislatures shall be given by the governor of each signatory State to the governors of the other signatory States and to the President of the United States, and the President of the United States is requested to give notice to the governors of the signatory States of approval by the Congress of the United States.

In witness whereof the commissioners have signed this compact in a single original, which shall be deposited in the archives of the Department of State of the United States of America and of which a duly certified copy shall be forwarded to the governor of each of the signatory States.

Done at the city of Santa Fe, N. Mex., this 24th day of November, A. D. 1922.

W. S. Norviel
W. F. McClure
Delph E. Carpenter
J. G. Scrugham
Stephen B. Davis, Jr.
R. E. Caldwell
Frank C. Emerson

Approved:
Herbert Hoover

APPENDIX B

UPPER COLORADO RIVER BASIN COMPACT

Entered Into By The States of

ARIZONA

COLORADO

NEW MEXICO

UTAH

WYOMING

Santa Fe, New Mexico **October 11, 1948**

UPPER COLORADO RIVER BASIN COMPACT

The State of Arizona, the State of Colorado, the State of New Mexico, the State of Utah and the State of Wyoming, acting through their commissioners,

Charles A. Carson for the State of Arizona,
Clifford H. Stone for the State of Colorado,
Fred E. Wilson for the State of New Mexico,
Edward H. Watson for the State of Utah and
L. C. Bishop for the State of Wyoming,

after negotiations participated in by Harry W. Bashore, appointed by the President as the representative of the United States of America, have agreed, subject to the provisions of the Colorado River Compact, to determine the rights and obligations of each signatory State respecting the uses and deliveries of the water of the Upper Basin of the Colorado River, as follows:

Article I

(a) The major purposes of this Compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River System, the use of which was apportioned in perpetuity to the Upper Basin by the Colorado River Compact; to establish the obligations of each State of the Upper Division with respect to the deliveries of water required to be made at Lee Ferry by the Colorado River Compact; to promote interstate comity; to remove causes of present and future controversies; to secure the expeditious agricultural and industrial development of the Upper Basin, the storage of water and to protect life and property from floods.

(b) It is recognized that the Colorado River Compact is in full force and effect and all of the provisions hereof are subject thereto.

Article 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.

(b) The term "Colorado River Basin" means all of the drainage area of the Colorado River System and all other territory within the United States of America to which the waters of the Colorado River System shall be beneficially applied.

(c) The term "States of the Upper Division" means the States of Colorado, New Mexico, Utah and Wyoming.

(d) The term "States of the Lower Division" means the States of Arizona, California and Nevada.

(e) The term "Lee Ferry" means a point in the main stream of the Colorado River one 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 Colorado River 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 Colorado River System below Lee Ferry.

(h) The term "Colorado River Compact" means the agreement concerning the apportionment of the use of the waters of the Colorado River System dated November 24, 1922, executed by Commissioners for the States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, approved by Herbert Hoover, representative of the United States of America, and proclaimed effective by the President of the United States of America, June 25, 1929.

(i) The term "Upper Colorado River System" means that portion of the Colorado River System above Lee Ferry.

(j) The term "Commission" means the administrative agency created by Article VIII of this Compact.

(k) The term "water year" means that period of twelve months ending September 30 of each year.

(l) The term "acre-foot" means the quantity of water required to cover an acre to the depth of one foot and is the equivalent to 43,560 cubic feet.

(m) The term "domestic use" shall include the use of water for household, stock, municipal, mining, milling, industrial and other like purposes, but shall exclude the generation of electrical power.

(n) The term "virgin flow" means the flow of any stream undepleted by the activities of man.

Article III

(a) Subject to the provisions and limitations contained in the Colorado River Compact and in this Compact, there is hereby apportioned from the Upper Colorado River System in perpetuity to the States of Arizona, Colorado, New Mexico, Utah and Wyoming, respectively, the consumptive use of water as follows:

(1) To the State of Arizona the consumptive use of 50,000 acre-feet of water per annum.

(2) To the States of Colorado, New Mexico, Utah and Wyoming, respectively, the consumptive use per annum of the quantities resulting from the application of the following percentages to the total quantity of consumptive use per annum apportioned in perpetuity to and available for use each year by Upper Basin under the Colorado River Compact and remaining after the deduction of the use, not to exceed 50,000 acre-feet per annum, made in the State of Arizona.

State of Colorado	51.75 per cent,
State of New Mexico	11.25 per cent,
State of Utah	23.00 per cent,
State of Wyoming	14.00 per cent.

(b) The apportionment made to the respective States by paragraph (a) of this Article is based upon, and shall be applied in conformity with, the following principles and each of them:

(1) The apportionment is of any and all man-made depletions;

(2) Beneficial use is the basis, the measure and the limit of the right to use;

(3) No State shall exceed its apportioned use in any water year when the effect of such excess use, as determined by the Commission, is to deprive another signatory State of its apportioned use during that water year; provided, that this sub-paragraph (b) (3) shall not be construed as:

(i) Altering the apportionment of use, or obligations to make deliveries as provided in Article XI, XII, XIII or XIV of this Compact;

(ii) Purporting to apportion among the signatory States such uses of water as the Upper Basin may be entitled to under paragraphs (f) and (g) of Article III of the Colorado River Compact; or

(iii) Countenancing average uses by any signatory State in excess of its apportionment.

(4) The apportionment to each State includes all water necessary for the supply of any rights which now exist.

(c) No apportionment is hereby made, or intended to be made, of such uses of water as the Upper Basin may be entitled to under paragraphs (f) and (g) of Article III of the Colorado River Compact.

(d) The apportionment made by this Article shall not be taken as any basis for the allocation among the signatory States of any benefits resulting from the generation of power.

Article IV

In the event curtailment of use of water by the States of the Upper Division at any time shall become necessary in order that the flow at Lee Ferry shall not be depleted below that required by Article III of the Colorado River Compact, the extent of curtailment by each State of the consumptive use of water apportioned to it by Article III of this Compact shall be in such quantities and at such times as shall be determined by the Commission upon the application of the following principles:

(a) The extent and times of curtailment shall be such as to assure full compliance with Article III of the Colorado River Compact;

(b) If any State or States of the Upper Division, in the ten years immediately preceding the water year in which curtailment is necessary, shall have consumptively used more water than it was or they were, as the case may be, entitled to use under the apportionment made by Article III of this Compact, such State or States shall be required to supply at Lee Ferry a quantity of water equal to its, or the aggregate of their, overdraft or the proportionate part of such overdraft, as may be necessary to assure compliance with Article III of the Colorado River Compact, before demand is made on any other State of the Upper Division;

(c) Except as provided in subparagraph (b) of this Article, the extent of curtailment by each State of the Upper Division of the consumptive use of water apportioned to it by Article III of this Compact shall be such as to result in the delivery at Lee Ferry of a quantity of water which bears the same relation to the total required curtailment of use by the States of the Upper Division as the consumptive use of Upper Colorado River System water which was made by each such State during the water year immediately preceding the year in which the curtailment becomes necessary bears to the total consumptive use of such water in the States of the Upper Division during the same water year; provided, that in determining such relation the uses of water under rights perfected prior to November 24, 1922, shall be excluded.

Article V

(a) All losses of water occurring from or as the result of the storage of water in reservoirs constructed prior to the signing of this Compact shall be charged to the State in which such reservoir or reservoirs are located. Water stored in reservoirs covered by this paragraph (a) shall be for the exclusive use of and shall be charged to the State in which the reservoir or reservoirs are located.

(b) All losses of water occurring from or as the result of the storage of water in reservoirs constructed after the signing of this Compact shall be charged as follows:

(1) If the Commission finds that the reservoir is used, in whole or in part, to assist the States of the Upper Division in meeting their obligations to deliver water at Lee Ferry imposed by Article III of the Colorado River Compact, the Commission shall make findings, which in no event shall be contrary to the laws of the United States

of America under which any reservoir is constructed, as to the reservoir capacity allocated for that purpose. The whole or that proportion, as the case may be, of reservoir losses as found by the Commission to be reasonably and properly chargeable to the reservoir or reservoir capacity utilized to assure deliveries at Lee Ferry shall be charged to the States of the Upper Division in the proportion which the consumptive use of water in each State of the Upper Division during the water year in which the charge is made bears to the total consumptive use of water in all States of the Upper Division during the same water year. Water stored in reservoirs or in reservoir capacity covered by this subparagraph (b) (1) shall be for the common benefit of all of the States of the Upper Division.

(2) If the Commission finds that the reservoir is used, in whole or in part, to supply water for use in a State of the Upper Division, the Commission shall make findings, which in no event shall be contrary to the laws of the United States of America under which any reservoir is constructed, as to the reservoir or reservoir capacity utilized to supply water for use and the State in which such water will be used. The whole or that proportion, as the case may be, of reservoir losses as found by the Commission to be reasonably and properly chargeable to the State in which such water will be used shall be borne by that State. As determined by the Commission, water stored in reservoirs covered by this subparagraph (b) (2) shall be earmarked for and charged to the State in which the water will be used.

(c) In the event the Commission finds that a reservoir site is available both to assure deliveries at Lee Ferry and to store water for consumptive use in a State of the Upper Division, the storage of water for consumptive use shall be given preference. Any reservoir or reservoir capacity hereafter used to assure deliveries at Lee Ferry shall by order of the Commission be used to store water for consumptive use in a State, provided the Commission finds that such storage is reasonably necessary to permit such State to make the use of the water apportioned to it by this Compact.

Article VI

The Commission shall determine the quantity of the consumptive use of water, which use is apportioned by Article III hereof,

for the Upper Basin and for each State of the Upper Basin by the inflow-outflow method in terms of man-made depletions of the virgin flow at Lee Ferry, unless the Commission, by unanimous action, shall adopt a different method of determination.

Article VII

The consumptive use of water by the United States of America or any of its agencies, instrumentalities or wards shall be charged as a use by the State in which the use is made; provided, that such consumptive use incident to the diversion, impounding, or conveyance of water in one State for use in another shall be charged to such latter State.

Article VIII

(a) There is hereby created an interstate administrative agency to be known as the "Upper Colorado River Commission." The Commission shall be composed of one Commissioner representing each of the States of the Upper Division, namely, the States of Colorado, New Mexico, Utah and Wyoming, designated or appointed in accordance with the laws of each such State and, if designated by the President, one Commissioner representing the United States of America. The President is hereby requested to designate a Commissioner. If so designated the Commissioner representing the United States of America shall be the presiding officer of the Commission and shall be entitled to the same powers and rights as the Commissioner of any State. Any four members of the Commission shall constitute a quorum.

(b) The salaries and personal expenses of each Commissioner shall be paid by the Government which he represents. All other expenses which are incurred by the Commission incident to the administration of this Compact, and which are not paid by the United States of America, shall be borne by the four States according to the percentage of consumptive use apportioned to each. On or before December 1 of each year, the Commission shall adopt and transmit to the Governors of the four States and to the President a budget covering an estimate of its expenses for the following year, and of the amount payable by each State. Each State shall pay the amount due by it to the Commission on or before April 1 of the year following. The payment of the expenses of the Commission and of its employees shall not be subject to the audit and accounting procedures of any of the four States; however, all receipts and disbursement of funds handled by the Commission shall be audited yearly by a qualified independent public accountant and the report of the audit shall be included in and become a part of the annual report of the Commission.

(c) The Commission shall appoint a Secretary, who shall not be a member of the Commission, or an employee of any signatory State or of the United States of America while so acting. He shall serve for such term and receive such salary and perform such duties as the Commission may direct. The Commission may employ such engineering, legal, clerical and other personnel as, in its judgment, may be necessary for the performance of its functions under this Compact. In the hiring of employees, the Commission shall not be bound by the civil service laws of any State.

(d) The Commission, so far as consistent with this Compact, shall have power to:

(1) Adopt rules and regulations;

(2) Locate, establish, construct, abandon, operate and maintain water gaging stations;

(3) Make estimates to forecast water run-off on the Colorado River and any of its tributaries;

(4) Engage in cooperative studies of water supplies of the Colorado River and its tributaries;

(5) Collect, analyze, correlate, preserve and report on data as to the stream flows, storage, diversions and use of the waters of the Colorado River, and any of its tributaries;

(6) Make findings as to the quantity of water of the Upper Colorado River System used each year in the Upper Colorado River Basin and in each State thereof;

(7) Make findings as to the quantity of water deliveries at Lee Ferry during each water year;

(8) Make findings as to the necessity for and the extent of the curtailment of use, required, if any, pursuant to Article IV hereof;

(9) Make findings as to the quantity of reservoir losses and as to the share thereof chargeable under Article V hereof to each of the States;

(10) Make findings of fact in the event of the occurrence of extraordinary drought or serious accident to the irrigation system in the Upper Basin, whereby deliveries by the Upper Basin of water which it may be required to deliver in order to aid in fulfilling obligations of the United States of America to the United Mexican States arising under the Treaty between the United States of America and the United Mexican States, dated February 3, 1944 (Treaty Series 994) becomes difficult, and report such findings to the Governors of the Upper Basin States, the President of the United States of America, the United States Section of the International Boundary and Water Commission, and such other Federal officials and agencies as it may deem appropriate to the end that the water allotted to Mexico under Division III of such treaty may be reduced in accordance with the terms of such Treaty;

(11) Acquire and hold such personal and real property as may be necessary for the performance of its duties hereunder and to dispose of the same when no longer required;

(12) Perform all functions required of it by this Compact and do all things necessary, proper or convenient in the performance of its duties hereunder, either independently or in cooperation with any state or federal agency;

(13) Make and transmit annually to the Governors of the signatory States and the President of the United States of America, with the estimated budget, a report covering the activities of the Commission for the preceding water year.

(e) Except as otherwise provided in this Compact the concurrence of four members of the Commission shall be required in any action taken by it.

(f) The Commission and its Secretary shall make available to the Governor of each of the signatory States any information within its possession at any time, and shall always provide free

access to its records by the Governors of each of the States, or their representatives, or authorized representatives of the United States of America.

(g) Findings of fact made by the Commission shall not be conclusive in any court, or before any agency or tribunal, but shall constitute prima facie evidence of the facts found.

(h) The organization meeting of the Commission shall be held within four months from the effective date of this Compact.

Article IX

(a) No State shall deny the right of the United States of America and, subject to the conditions hereinafter contained, no State shall deny the right of another signatory State, any person, or entity of any signatory State to acquire rights to the use of water, or to construct or participate in the construction and use of diversion works and storage reservoirs with appurtenant works, canals and conduits in one State for the purpose of diverting, conveying, storing, regulating and releasing water to satisfy the provisions of the Colorado River Compact relating to the obligation of the States of the Upper Division to make deliveries of water at Lee Ferry, or for the purpose of diverting, conveying, storing or regulating water in an upper signatory State for consumptive use in a lower signatory State, when such use is within the apportionment to such lower State made by this Compact. Such rights shall be subject to the rights of water users, in a State in which such reservoir or works are located, to receive and use water, the use of which is within the apportionment to such State by this Compact.

(b) Any signatory State, any person or any entity of any signatory State shall have the right to acquire such property rights as are necessary to the use of water in conformity with this Compact in any other signatory State by donation, purchase or through the exercise of the power of eminent domain. Any signatory State, upon the written request of the Governor or any other signatory State, for the benefit of whose water users property is to be acquired in the State to which such written request is made, shall proceed expeditiously to acquire the desired property either by purchase at a price satisfactory to the requesting State, or, if such purchase cannot be made, then through the exercise of its power of eminent domain and shall convey such property to the requesting State or such entity as may be designated by the requesting State;

provided, that all costs of acquisition and expenses of every kind and nature whatsoever incurred in obtaining the requested property shall be paid by the requesting State at the time and in the manner prescribed by the State requested to acquire the property.

(c) Should any facility be constructed in a signatory State by and for the benefit of another signatory State or States or the water users thereof, as above provided, the construction, repair, replacement, maintenance and operation of such facility shall be subject to the laws of the State in which the facility is located, except that, in the case of a reservoir constructed in one State for the benefit of another State or States, the water administration officials of the State in which the facility is located shall permit the storage and release of any water which, as determined by findings of the Commission, falls within the apportionment of the State or States for whose benefit the facility is constructed. In the case of a regulating reservoir for the joint benefit of all States in making Lee Ferry deliveries, the water administration officials of the State in which the facility is located, in permitting the storage and release of water, shall comply with the findings and orders of the Commission.

(d) In the event property is acquired by a signatory State in another signatory State for the use and benefit of the former, the users of water made available by such facilities, as a condition precedent to the use thereof, shall pay to the political subdivisions of the State in which such works are located, each and every year during which such rights are enjoyed for such purposes, a sum of money equivalent to the average annual amount of taxes levied and assessed against the land and improvements thereon during the ten years preceding the acquisition of such land. Said payments shall be in full reimbursement for the loss of taxes in such political subdivisions of the State, and in lieu of any and all taxes on said property, improvements and rights. The signatory States recommend to the President and the Congress that, in the event the United States of America shall acquire property in one of the signatory States for the benefit of another signatory State, or its water users, provision be made for like payment in reimbursement of loss of taxes.

Article X

(a) The signatory States recognize La Plata River Compact entered into between the States of Colorado and New Mexico, dated November 27, 1922, approved by the Congress on January 29, 1925

(43 Stat. 796), and this Compact shall not affect the apportionment therein made.

(b) All consumptive use of water of La Plata River and its tributaries shall be charged under the apportionment of Article III hereof to the State in which the use is made; provided, that consumptive use incident to the diversion, impounding or conveyance of water in one State for use in the other shall be charged to the latter State.

Article XI

Subject to the provisions of this Compact, the consumptive use of the water of the Little Snake River and its tributaries is hereby apportioned between the States of Colorado and Wyoming in such quantities as shall result from the application of the following principles and procedures:

(a) Water used under rights existing prior to the signing of this Compact.

(1) Water diverted from any tributary of the Little Snake River or from the main stem of the Little Snake River above a point one hundred feet below the confluence of Savery Creek and the Little Snake River shall be administered without regard to rights covering the diversion of water from any down-stream points.

(2) Water diverted from the main stem of the Little Snake River below a point one hundred feet below the confluence of Savery Creek and the Little Snake River shall be administered on the basis of an interstate priority schedule prepared by the Commission in conformity with priority dates established by the laws of the respective States.

(b) Water used under rights initiated subsequent to the signing of this Compact.

(1) Direct flow diversion shall be so administered that, in time of shortage, the curtailment of use on each acre of land irrigated thereunder shall be as nearly equal as may be possible in both of the States.

(2) The storage of water by projects located in either State, whether of supplemental supply or of water used to

irrigate land not irrigated at the date of the signing of this Compact, shall be so administered that in times of water shortage the curtailment of storage of water available for each acre of land irrigated thereunder shall be as nearly equal as may be possible in both States.

(c) Water uses under the apportionment made by this Article shall be in accordance with the principle that beneficial use shall be the basis, measure and limit of the right to use.

(d) The States of Colorado and Wyoming each assent to diversions and storage of water in one State for use in the other State, subject to compliance with Article IX of this Compact.

(e) In the event of the importation of water to the Little Snake River Basin from any other river basin, the State making the importation shall have the exclusive use of such imported water unless by written agreement, made by the representatives of the States of Colorado and Wyoming on the Commission, it is otherwise provided.

(f) Water use projects initiated after the signing of this Compact, to the greatest extent possible, shall permit the full use within the Basin in the most feasible manner of the waters of the Little Snake River and its tributaries, without regard to the state line; and, so far as is practicable, shall result in an equal division between the States of the use of water not used under rights existing prior to the signing of this Compact.

(g) All consumptive use of the waters of the Little Snake River and its tributaries shall be charged under the apportionment of Article III hereof to the State in which the use is made; provided, that consumptive use incident to the diversion, impounding or conveyance of water in one State for use in the other shall be charged to the latter State.

Article XII

Subject to the provisions of this Compact, the consumptive use of the waters of Henry's Fork, a tributary of Green River originating in the State of Utah and flowing into the State of Wyoming and thence into the Green River in the State of Utah; Beaver Creek, originating in the State of Utah and flowing into Henry's Fork in the State of Wyoming; Burnt Fork, a tributary of Henry's Fork, originating in the State of Utah and flowing into Henry's Fork in the State of Wyoming; Birch Creek, a tributary of Henry's Fork originating in the State of Utah and flowing into Henry's Fork in the State of Wyoming; and Sheep Creek, a tributary of Green River in the State of Utah, and their tributaries, are hereby apportioned between the States of Utah and Wyoming in such quantities as will result from the application of the following principles and procedures:

(a) Waters used under rights existing prior to the signing of this Compact.

Waters diverted from Henry's Fork, Beaver Creek, Burnt Fork, Birch Creek and their tributaries, shall be administered without regard to the state line on the basis of an interstate priority schedule to be prepared by the States affected and approved by the Commission in conformity with the actual priority of right of use, the water requirements of the land irrigated and the acreage irrigated in connection therewith.

(b) Waters used under rights from Henry's Fork, Beaver Creek, Burnt Fork, Birch Creek and their tributaries, initiated after the signing of this Compact shall be divided fifty percent to the State of Wyoming and fifty percent to the State of Utah and each State may use said waters as and where it deems advisable.

(c) The State of Wyoming assents to the exclusive use by the State of Utah of the water of Sheep Creek, except that the lands, if any, presently irrigated in the State of Wyoming from the water of Sheep Creek shall be supplied with water from Sheep Creek in order of priority and in such quantities as are in conformity with the laws of the State of Utah.

(d) In the event of the importation of water to Henry's Fork, or any of its tributaries, from any other river basin, the State making the importation shall have the exclusive use of such imported water unless by written agreement made by the representatives of the States of Utah and Wyoming on the Commission, it is otherwise provided.

(e) All consumptive use of waters of Henry's Fork, Beaver Creek, Burnt Fork, Birch Creek, Sheep Creek, and their tributaries shall be charged under the apportionment of Article III hereof to the State in which the use is made; provided, that consumptive use incident to the diversion, impounding or conveyance of water in one State for use in the other shall be charged to the latter State.

(f) The States of Utah and Wyoming each assent to the diversion and storage of water in one State for use in the other State, subject to compliance with Article IX of this Compact. It shall be the duty of the water administrative officials of the State where the water is stored to release said stored water to the other State upon demand. If either the State of Utah or the State of Wyoming shall construct a reservoir in the other State for use in its own State, the water users of the State in which said facilities are constructed may purchase at cost a portion of the capacity of said reservoir sufficient for the irrigation of their lands thereunder.

(g) In order to measure the flow of water diverted, each State shall cause suitable measuring devices to be constructed, maintained and operated at or near the point of diversion into each ditch.

(h) The State Engineers of the two States jointly shall appoint a Special Water Commissioner who shall have authority to administer the water in both States in accordance with the terms of this Article. The salary and expenses of such Special Water Commissioner shall be paid, thirty percent by the State of Utah and seventy percent by the State of Wyoming.

Article XIII

Subject to the provisions of this Compact, the rights to the consumptive use of the water of the Yampa River, a tributary entering the Green River in the State of Colorado, are hereby apportioned between the States of Colorado and Utah in accordance with the following principles:

(a) The State of Colorado will not cause the flow of the Yampa River at the Maybell Gaging Station to be depleted below an aggregate of 5,000,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification and approval of this Compact, In the event any diversion is made from the Yampa River or from tributaries entering the Yampa River above the Maybell Gaging Station for the benefit of any water use project in the State of Utah, then the gross amount of all such diversions for use in the State of Utah, less any returns from such diversions to the River above Maybell, shall be added to the actual flow at the Maybell Gaging Station to determine the total flow at the Maybell Gaging Station.

(b) All consumptive use of the waters of the Yampa River and its tributaries shall be charged under the apportionment of Article III hereof to the State in which the use is made; provided, that consumptive use incident to the diversion, impounding or conveyance of water in one State for use in the other shall be charged to the latter State.

Article XIV

Subject to the provisions of this Compact, the consumptive use of the waters of the San Juan River and its tributaries is hereby apportioned between the States of Colorado and New Mexico as follows:

The State of Colorado agrees to deliver to the State of New Mexico from the San Juan River and its tributaries which rise in the State of Colorado a quantity of water which shall be sufficient, together with water originating in the San Juan Basin in the State of New Mexico, to enable the State of New Mexico to make full use of the water apportioned to the State of New Mexico by Article III of this Compact, subject, however, to the following:

(a) A first and prior right shall be recognized as to:

(1) All uses of water made in either State at the time of the signing of this Compact; and

(2) All uses of water contemplated by projects authorized, at the time of the signing of this Compact, under the laws of the United States of America whether or not such projects are eventually constructed by the United States of America or by some other entity.

(b) The State of Colorado assents to diversions and storage of water in the State of Colorado for use in the State of New Mexico, subject to compliance with Article IX of this Compact.

(c) The uses of the waters of the San Juan River and any of its tributaries within either State which are dependent upon a common source of water and which are not covered by (a) hereof, shall in times of water shortages be reduced in such quantity that the resulting consumptive use in each State will bear the same proportionate relation to the consumptive use made in each State during times of average water supply as determined by the Commission; provided, that any preferential uses of water to which Indians are entitled under Article XIX shall be excluded in determining the amount of curtailment to be made under this paragraph.

(d) The curtailment of water use by either State in order to make deliveries at Lee Ferry as required by Article IV of this Compact shall be independent of any and all conditions imposed by this Article and shall be made by each State, as and when required, without regard to any provision of this Article.

(e) All consumptive use of the waters of the San Juan River and its tributaries shall be charged under the apportionment of Article III hereof to the State in which the use is made; provided, that consumptive use incident to the diversion, impounding or conveyance of water in one State for use in the other shall be charged to the latter State.

Article XV

(a) Subject to the provisions of the Colorado River Compact and of this Compact, water of the Upper Colorado River System may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(b) The provisions of this Compact shall not apply to or interfere with the right or power of any signatory State to regulate within its boundaries the appropriation, use and control of water, the consumptive use of which is apportioned and available to such State by this Compact.

Article XVI

The failure of any State to use the water, or any part thereof, the use of which is apportioned to it under the terms of this Compact, shall not constitute a relinquishment of the right to such use to the Lower Basin or to any other State, nor shall it constitute a forfeiture or abandonment of the right to such use.

Article XVII

The use of any water now or hereafter imported into the natural drainage basin of the Upper Colorado River System shall not be charged to any State under the apportionment of consumptive use made by this Compact.

Article XVIII

(a) The State of Arizona reserves its rights and interests under the Colorado River Compact as a State of the Lower Division and as a State of the Lower Basin.

(b) The State of New Mexico and the State of Utah reserve their respective rights and interests under the Colorado River Compact as States of the Lower Basin.

Article XIX

Nothing in this Compact shall be construed as:

(a) Affecting the obligations of the United States of America to Indian tribes;

(b) Affecting the obligations of the United States of America under the Treaty with the United Mexican States (Treaty Series 994);

(c) Affecting any rights or powers of the United States of America, its agencies or instrumentalities, in or to the waters of the Upper Colorado River System, or its capacity to acquire rights in and to the use of said waters;

(d) Subjecting any property of the United States of America, its agencies or instrumentalities, to taxation by any State or subdivision thereof, or creating any obligation on the part of the United States of America, its agencies or instrumentalities, by reason of the acquisition, construction or operation of any property or works of whatever kind, to make any payments to any State or political subdivision thereof, State agency, municipality or entity whatsoever, in reimbursement for the loss of taxes;

(e) Subjecting any property of the United States of America, its agencies or instrumentalities, to the laws of any State to an extent other than the extent to which such laws would apply without regard to this Compact.

Article XX

This Compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination, all rights established under it shall continue unimpaired.

Article XXI

This Compact shall become binding and obligatory when it shall have been ratified by the legislatures of each of the signatory States and approved by the Congress of the United States of America. Notice of ratification by the legislatures of the signatory States shall be given by the Governor of each signatory State to the Governor of each of the other signatory States and to the President of the United States of America, and the President is hereby requested to give notice to the Governor of each of the signatory States of approval by the Congress of the United States of America.

IN WITNESS WHEREOF, the Commissioners have executed six counterparts hereof each of which shall be and constitute an original, one of which shall be deposited in the archives of the Department of State of the United States of America, and one of which shall be forwarded to the Governor of each of the signatory States.

Done at the City of Santa Fe, State of New Mexico, this 11th day of October, 1948.

CHARLES A. CARSON
Commissioner for the State of Arizona

CLIFFORD H. STONE
Commissioner for the State of Colorado

FRED E. WILSON
Commissioner for the State of New Mexico

EDWARD H. WATSON
Commissioner for the State of Utah

L. C. BISHOP
Commissioner for the State of Wyoming

GROVER A. GILES, Secretary

Approved:

HARRY W. BASHORE
Representative of the United States of America

APPENDIX C

BY-LAWS
OF
UPPER COLORADO RIVER COMMISSION

ARTICLE I
THE COMMISSION

1. The Commission shall be composed of one Commissioner representing each of the States of Colorado, New Mexico, Utah and Wyoming, designated or appointed in accordance with the laws of each such State, and, if designated by the President, one Commissioner representing the United States of America.

2. The credentials of each Commissioner shall be filed with the Secretary of the Commission.

3. Each Commissioner shall advise in writing the Secretary of the Commission as to his address to which all official notices and other communications of the Commission shall be sent to him and shall further promptly advise in writing the Secretary of the Commission as to any change in such address.

ARTICLE II
OFFICERS

1. The officers of the Commission shall be:
   Chairman,
   Vice-Chairman,
   Secretary,
   Treasurer.

2. The Commissioner representing the United States of America shall be the Chairman of the Commission. The Chairman shall preside at meetings of the Commission. His duties shall be such as are usually imposed on such officers and such as may be assigned to him by these by-laws or by the Commission from time to time.

3. The Vice-Chairman shall be one of the Commissioners representing a State. He shall be elected at each annual meeting of the Commission and shall hold office until the next annual meeting

and until his successor is elected. In the case of a vacancy in the office of Vice-Chairman, the Commission shall at its next meeting, whether regular or special, elect a Vice-Chairman to serve for the unexpired term. The Vice-Chairman shall perform all the duties of the Chairman when the Chairman is unable for any reason to act or when for any reason there is a vacancy in the office of Chairman. In addition the Vice-Chairman shall perform such other duties as may be assigned to him by the by-laws or the Commission from time to time.

4. The Secretary shall not be a member of the Commission, or an employee of any State signatory to the Upper Colorado River Basin Compact or of the United States of America while acting as Secretary. The Secretary shall be selected by the Commission. He shall serve for such term and receive such salary and perform such duties as the Commission may direct. In the case of a vacancy in the office of Secretary the Commission shall proceed as expeditiously as possible to select a new Secretary. The Secretary shall furnish a bond for the faithful performance of his duties if the Commission shall so direct. The cost of such bond shall be paid by the Commission.

5. The Treasurer may or may not be a member of the Commission. He shall be elected at each annual meeting of the Commission and shall hold office until his successor is elected and shall have qualified. The treasurer shall receive, hold and disburse all funds of the Commission. The Treasurer shall furnish a bond for the faithful performance of his duties in such amount as the Commission may direct. The cost of such bond shall be paid by the Commission. In the case of a vacancy in the office of Treasurer the Chairman shall appoint a new Treasurer to serve for the unexpired term or until such time as the Commission shall elect a successor at a regular or special meeting and the person so elected shall have qualified.

6. The Commission may employ such engineering, legal, clerical and other personnel as, in its judgment, may be necessary. They shall receive such compensation and perform such duties as may be fixed by the Commission.

ARTICLE III

PRINCIPAL OFFICE

1. The principal office and place of business of the Commission shall be located in the City of Grand Junction, Colorado.

2. The principal office shall be open for business on such hours and days as the Commission may from time to time direct.

3. All books and records of the Commission shall be kept at the principal office of the Commission. Except as otherwise provided in the Compact or herein, all records of the Commission shall be open to inspection by the public during the hours the principal office is open for business. Whenever the Commission believes that the purposes and objects of the Compact will best be served by reserving certain of its records from public inspection, it may so order.

ARTICLE IV

MEETINGS

1. The annual meeting of the Commission shall be held on the third Monday of September of each year.

2. The Commission shall hold a regular meeting on the third Monday of March of each year.

3. Special meetings of the Commission may be called by the Chairman, or in case of vacancy in the office of the Chairman or inability of the Chairman to act, by the Vice-Chairman. Upon written request of two or more Commissioners it shall be the duty of the Chairman to call a special meeting.

4. Notice of all meetings of the Commission shall be sent by the Secretary, or in the case of a vacancy in the office of Secretary or the inability of the Secretary to act, by the Chairman, to all members of the Commission by ordinary mail at least ten days in advance of each such meeting. The notice here required may be waived by unanimous consent of all members of the Commission.

5. Unless otherwise agreed to in advance by not less than four members of the Commission, all annual and regular meetings of the Commission shall be held at the principal office of the Commission. Special meetings shall be held at the office of the Commission unless the notice of any such special meeting shall designate some other place for the meeting. No meeting of the Commission shall be held other than in an Upper Colorado River Basin state or in Washington, D. C., unless at least four members of the Commission have consented in writing to the place for the meeting in advance of the transmittal of notices of the meeting. The Commission shall hold no meetings outside of the United States of America.

6. The Commission shall employ a qualified Reporter to record and transcribe the proceedings of the meetings of the Commission. The transcript and the approved minutes of the Commission shall be preserved in a suitable manner. Minutes until approved by the Commission shall not be official and shall be furnished only to members of the Commission, its employees and committees.

7. Any four members of the Commission shall constitute a quorum: provided that, when a quorum is present, an absent member may be represented by his proxy and such proxy shall have all the powers of a member at such meeting.

8. Each member of the Commission shall have one vote.

9. Except as otherwise provided in the Upper Colorado River Basin Compact or herein, the concurrence of four members of the Commission shall be required in any action taken by it.

10. At each meeting of the Commission, the order of business, unless agreed otherwise, shall be as follows:

Call to order;
Reading of minutes of last meeting;
Approval of minutes of last meeting;
Report of Chairman;
Report of Secretary;
Report of Treasurer;
Report of Committees;
Unfinished business;
New business;
Adjournment.

11. All meetings of the Commission, except executive sessions, shall be open to the public. Executive sessions shall be open only to officers and members of the Commission and two advisers designated by each member; provided, however, that the Commission may call witnesses before it in such sessions.

12. Any meeting of the Commission may be adjourned or continued from time to time and from the place set for the meeting to another place: provided that, without the written consent of four members of the Commission no adjournment or continuance shall be for more than thirty days or to a place other than that set for the meeting so adjourned or continued.

ARTICLE V

COMMITTEES

1. There shall be the following standing committees:

Engineering Committee,
Legal Committee,
Budget Committee.

2. The standing committees shall have the following duties:

(a) The Engineering Committee shall advise the Commission on all engineering matters that may be referred to it.

(b) The Legal Committee shall advise the Commission on all legal matters that may be referred to it.

(c) The Budget Committee shall prepare the annual budget and shall advise the Commission on all fiscal matters that may be referred to it.

3. Members of committees may or may not be members of the Commission. The number of members of each committee shall be determined from time to time by the Commission. Each member of the Commission shall designate the member or members on each committee representing his government. In all committee action the vote shall be taken by governments with each government having one vote.

4. The Chairman and Secretary shall be ex-officio members of all committees.

5. The chairman of each Committee shall be designated by the Chairman of the Commission from the members of the Committee.

6. The Commission may from time to time create special committees, composed of such members and others and assigned such tasks as the Commission may determine.

7. Formal Committee reports shall be made in writing and filed with the Secretary of the Commission.

ARTICLE VI

RULES AND REGULATIONS

1. So far as consistent with the Upper Colorado River Basin Compact, the Commission may adopt Rules and Regulations.

2. All proposals for Rules and Regulations or for changes in Rules and Regulations must be presented to the Commission in writing and shall not be acted on at the meeting when first presented but shall go over for action at a designated subsequent meeting of the Commission.

3. Following presentation to the Commission, public notice of all proposed Rules and Regulations and changes in Rules and Regulations shall be given by two publications, at least one week apart, in some newspaper of general circulation in each of the member states. The Commission member from each state shall designate the newspaper in his state in which such publication shall be made. No Rule or Regulation and no change in any Rule or Regulation shall be effective until a date specifically stated in the published notice, which date shall be at least ten days after the last publication. It shall be the duty of the Secretary to see that the necessary notices are published as herein required.

4. The Secretary shall compile the Rules and Regulations of the Commission and shall prepare copies for distribution to the public under such terms and conditions as the Commission may prescribe.

ARTICLE VII

FISCAL

1. All funds of the Commission shall be received by the Treasurer and deposited by him in a depository or depositories designated by the Commission.

2. Disbursements of Commission funds shall be made by check by the Treasurer upon vouchers approved by the Chairman, the Vice-Chairman, or the Secretary.

3. On or before December 1 of each year, the Commission shall adopt and transmit to the Governors of the four states and to the President of the United States of America a budget covering an estimate of its expenses for the following year, and of the amount

payable by each state under the provisions of the Upper Colorado River Basin Compact.

4. The payment of the expenses of the Commission and of its employees shall not be subject ot the audit and accounting procedures of any of the four states.

5. All receipts and disbursements of the Commission shall be audited yearly by a qualified independent public accountant to be selected by the Commission and the report of the audit shall be included in and become a part of the annual report of the Commission.

6. The Secretary shall prepare and keep up to date an inventory of all of the property of the Commission.

7. The fiscal year of the Commission shall begin July 1 of each year and end June 30 of the next succeeding year.

ARTICLE VIII

ANNUAL REPORT

1. The Commission shall make and transmit annually on or before April 1 to the Governors of the states signatory to the Upper Colorado River Basin Compact and to the President of the United States a report covering the activities of the Commission for the water year ending the preceding September 30.

2. The annual report shall include among other things the following:

(a) The estimated budget;

(b) All hydrologic data which the Commission deems pertinent;

(c) Estimates, if any, of the Commission forecasting water run-off;

(d) Statements as to cooperative studies of water supplies made during the preceding water year;

(e) All findings of fact made by the Commission during the preceding water year;

(f) Such other pertinent matters as the Commission may require.

ARTICLE IX

SEAL

1. The seal of the Commission shall be a circular seal with the words "Upper Colorado River Commission" imprinted around the border and the word "Seal" in the center thereof.

2. The Secretary of the Commission shall have custody of the seal of the Commission.

ARTICLE X

MISCELLANEOUS

1. The Commission and its Secretary shall on request make available to the Governor of each of the states signatory to the Upper Colorado River Basin Compact any information within its possession at any time, and shall always provide free access to its records by the Governors of such states, or their representatives, or authorized representatives of the United States of America. The cost of making information available shall be borne by the person or government requesting such information.

2. All contracts or other instruments in writing to be signed for and on behalf of the Commission, except matters relating to the receipt of disbursement of funds, shall be signed by the Chairman or Vice-Chairman and the Secretary. When necessary the seal of the Commission shall be affixed thereto.

3. Except as otherwise provided by the Compact or herein, meetings of the Commission shall be in accordance with Robert's Rules of Order.

ARTICLE XI

AMENDMENTS TO BY-LAWS

1. Amendments to the By-Laws may be made at any meeting of the Commission provided notice of the proposed amendment shall have been given in the notice of the meeting.

2. Unless a proposed amendment to the By-Laws is unanimously agreed to by all five members of the Commission, action on the proposed amendment shall go over to a succeeding meeting of the Commission at which meeting the concurrence of four members of the Commission shall be necessary to the adoption of the amendment.

APPENDIX D

MEMBERS OF COMITTEES

ENGINEERING COMMITTEE—

J. R. Riter, Chairman, Federal
R. J. Tipton, Colorado
F. C. Merriell, Colorado
John R. Erickson, New Mexico
C. O. Roskelley, Utah
R. D. Goodrich, Wyoming
H. T. Person, Wyoming

BUDGET COMMITTEE—

C. O. Roskelley, Chairman, Utah
Clifford H. Stone, Colorado
John H. Bliss, New Mexico
John R. Riter, Federal
A. P. Russell (alternate for Norman Barlow), Wyoming

LEGAL COMMITTEE—

Fred Wilson, Chairman, New Mexico
Jean S. Breitenstein, Colorado
Clinton D. Vernon, Utah
Norman B. Gray, Wyoming

A STOCK COMPANY — ESTABLISHED 1890

Fidelity and Deposit Company

HOME OFFICE **OF MARYLAND** BALTIMORE

AMOUNT $ 40,000.00 No. 5042663

OFFICIAL BOND

KNOW ALL MEN BY THESE PRESENTS:

That BARNEY L. WHATLEY, Denver, Colorado

as Principal (hereinafter called Principal), and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, a corporation of the State of Maryland, having its principal office in the City of Baltimore, Maryland, as Surety (hereinafter called Surety), are held and firmly bound unto the Upper Colorado River Commission

in the penalty of ------FORTY THOUSAND AND NO/100---------- Dollars ($ 40,000.00), to the payment whereof, well and truly to be made and done, the Principal binds himself, his heirs, executors, and administrators, and the Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this eighth day of February A.D. nineteen hundred and fifty.

THE CONDITION OF THE AFOREGOING OBLIGATION IS SUCH, That WHEREAS, the Principal was elected or appointed Treasurer of the Upper Colorado River Commission

NOW, THEREFORE, if the Principal shall, during the indefinite term beginning on the second day of February, 19 50 , well and faithfully perform all and singular the duties incumbent upon him by reason of his election or appointment as aforesaid, and honestly account for all moneys coming into his hands according to law, then this obligation shall be null and void, otherwise of full force and virtue.

This Bond is executed by the Surety upon the following express conditions, which shall be conditions precedent to the right of recovery hereunder:

FIRST: That regardless of the number of years this Bond shall continue or be continued in force, or be renewed, and of the number of annual premiums that shall be payable or paid, the Surety shall not be liable hereunder for more in the aggregate than the above named penalty.

SECOND: That the Surety may, if it shall so elect, cancel this Bond by giving thirty (30) days notice in writing to Upper Colorado River Commission and this Bond shall be deemed canceled at the expiration of said thirty (30) days; the Surety remaining liable, however, subject to all the terms, conditions and provisions of this Bond, for any act or acts covered by this Bond which may have been committed by the Principal up to the date of such cancelation; and the Surety shall, upon surrender of this Bond and its release from all liability hereunder, refund the premium paid, less a pro rata part thereof for the time this Bond shall have been in force.

Witness:

Barney L. Whatley (SEAL)
Barney L. Whatley *Principal*

As to Principal

FIDELITY AND DEPOSIT COMPANY OF MARYLAND

ATTEST: By Raymond O. McKenzie
Raymond O. McKenzie, Attorney-in-Fact

P113c—3M. 5-43 106827

This Power of Attorney limits the act of those named therein to the bonds and undertakings specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated

L1419—30M. 4-48 180332
General Cir.

POWER OF ATTORNEY

Fidelity and Deposit Company of Maryland

HOME OFFICE, BALTIMORE, MD.

KNOW ALL MEN BY THESE PRESENTS:

That the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, a corporation of the State of Maryland, by WM. H. C. GRIFFITH Vice-President, and T. N. FERCIOT, Jr. Assistant Secretary, in pursuance of authority granted by Article VI, Section 2, of the By-Laws of said Company, which reads as follows:

"The President, or First Vice-President, or Second Vice-President, or any one of the additional Vice-Presidents specially authorized so to do by the Board of Directors or by the Executive Committee, shall have power, by and with the concurrence of the Secretary or any one of the Assistant Secretaries, to appoint Resident Vice-Presidents, Resident Assistant Secretaries and Attorneys-in-Fact as the business of the Company may require, or to authorize any person or persons to execute on behalf of the Company any bonds, undertakings, recognizances, stipulations, policies, contracts, agreements, deeds, and releases and assignments of judgments, decrees, mortgages and instruments in the nature of mortgages, and also all other instruments and documents which the business of the Company may require, and to affix the seal of the Company thereto."

does hereby nominate, constitute and appoint Raymond O. McKenzie, Denver, Colorado

its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings

And the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Company, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the Company at its office in Baltimore, Maryland, in their own proper persons. This power of attorney revokes that issued on behalf of Raymond O. McKenzie, of Hartford, Connecticut, dated July 31, 1937.

The said Assistant Secretary does hereby certify that the aforegoing is a true copy of Article VI, Section 2, of the By-Laws of said Company, and is now in force.

IN WITNESS WHEREOF, the said Vice-President and Assistant Secretary have hereunto subscribed their names and affixed the Corporate Seal of the said FIDELITY AND DEPOSIT COMPANY OF MARYLAND, this 5th day of November, A.D. 19 47.

ATTEST: **FIDELITY AND DEPOSIT COMPANY OF MARYLAND**

(SIGNED) T. N. FERCIOT, Jr. *Assistant Secretary* By WM. H. C. GRIFFITH *Vice-President*

(SEAL)

STATE OF MARYLAND } ss:
CITY OF BALTIMORE }

On this 5th day of November, A.D. 19 47, before the subscriber, a Notary Public of the State of Maryland, in and for the City of Baltimore, duly commissioned and qualified, came the above-named Vice-President and Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and they each acknowledged the execution of the same, and being by me duly sworn, severally and each for himself deposeth and saith, that they are the said officers of the Company aforesaid, and that the seal affixed to the preceding instrument is the Corporate Seal of said Company, and that the said Corporate Seal and their signatures as such officers were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal, at the City of Baltimore, the day and year first above written.

ANNA B. NAU

(SIGNED) (SEAL) My Commission Expires May 2, 1949. *Notary Public*

CERTIFICATE

I, JAY S. PRICE, Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the attached Power of Attorney dated November 2, 19 47, in behalf of Raymond O. McKenzie of Denver, Colorado is a true and correct copy and that same has been in full force and effect since the date thereof and is in full force and effect on the date of this certificate; and I do further certify that the said WM. H. C. GRIFFITH and T. N. FERCIOT, Jr., who executed the attached Power of Attorney as Vice-President and Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, and that the said WM. H. C. GRIFFITH was one of the additional Vice-Presidents specially authorized by the Board of Directors to appoint any Attorney-in-Fact or to authorize any person or persons to execute on behalf of the Company any bonds, recognizances, stipulations, undertakings, deeds, releases of mortgages, contracts, agreements and policies, and to affix the seal of the Company thereto as provided in said Article VI, Section 2 of the By-Laws of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said Company, this Second day of February, 19 50

Jay S. Price *Assistant Secretary*

APPENDIX F

UPPER COLORADO RIVER BASIN
KEY GAGING STATIONS

Animas River near Cedar Hill, New Mexico
Animas River at Durango, Colorado
Animas River at Farmington, New Mexico
Ashley Creek near Jensen, Utah
Ashley Creek at Sign of the Main near Vernal, Utah
Blacks Fork near Millburne, Wyoming
Blacks Fork near Green River, Wyoming
Blue River at Dillon, Colorado
Broomfield Canal diverting around Blanco Gage
Brush Creek near Jensen ,Utah
Burnt Fork near Burntfork, Wyoming
Carter Creek at mouth near Manila, Utah
Colorado River near Cisco, Utah
Colorado River near Colorado-Utah State Line
Colorado River at Hite, Utah
Colorado River at Hot Sulphur Springs, Colorado
Colorado River at Lees Ferry, Arizona
Cottonwood Creek near Orangeville, Utah
Crystal River near Redstone, Colorado
Dirty Devil River at Hite, Utah
Dolores River at Dolores, Colorado
Dolores River at Gateway, Colorado
Duchesne River near Randlett, Utah
Duchesne River near Tabiona, Utah
Eagle River below Gypsum, Colorado
East River at Almont, Colorado
East Fork Beaver Creek near Lonetree, Wyoming
Elk River at Clark, Colorado
Escalante River near Escalante, Utah
Escalante River near mouth, Utah
Florida River near Durango, Colorado
Fontenelle Creek near Fontenelle, Wyoming
Fontenelle Creek above irrigation
Green River near Ashley Falls Damsite, Utah
Green River at Green River, Utah
Green River at Green River, Wyoming
Green River near Jensen, Utah
Green River near Linwood, Utah
Green River near Ouray, Utah
Green River at Warren Bridge near Daniel, Wyoming

Gunnison River near Gunnison, Colorado
Gunnison River below Gunnison Tunnel, Colorado
Ham's Fork above irrigation
Henrys Fork at Linwood, Utah
Henrys Fork near Lonetree, Wyoming
La Plata River at Colorado-New Mexico State Line
La Plata River at Hesperus, Colorado
Little Snake River near Dixon, Wyoming
Little Snake River near Lily, Colorado
Little Snake River near Slater, Colorado
Los Pinos River near Bayfield, Colorado
Los Pinos River near Colorado-New Mexico State Line
Los Pinos River at Ignacio, Colorado
Mancos River near Towoac, Colorado
McElmo Creek near Colorado-Utah State Line
McElmo Creek near Cortez, Colorado
Middle Fork Beaver Creek near Lonetree, Wyoming
Minnie Maud Creek near mouth, Utah
Navajo River at Edith, Colorado
North Fork Gunnison River near Somerset, Colorado
North Fork White River near Buford, Colorado
North Piney Creek near Mason, Wyoming
Paria River at Lees Ferry, Arizona
Pine Creek near Fremont Lake, Wyoming
Pine Creek at Pinedale, Wyoming
Price River near Heiner, Utah
Price River at Woodside, Utah
Roaring Fork at Aspen, Colorado
San Juan River near Blanco, New Mexico
San Juan River near Bluff, Utah
San Juan River at Farmington, New Mexico
San Juan River at Pagosa Springs, Colorado
San Juan River at Rosa, New Mexico
San Juan River at Shiprock, New Mexico
San Miguel River near Placerville, Colorado
San Rafael River near Green River, Utah
Savory Creek near Savory, Wyoming
Sheep Creek near Manila, Utah
Sheep Creek at mouth near Manila, Utah
Sheep Creek Upper Canal near Manila, Utah
Sheep Creek Lower Canal near Manila, Utah
Slater Fork near Slater, Colorado
Snake River near Montezuma, Colorado
South Fork White River near Buford, Colorado
Strawberry River at Duchesne, Utah

Taylor River at Almont, Colorado
Ten Mile Creek at Dillon, Colorado
Tomichi Creek at Gunnison, Colorado
Uinta River near Neola, Utah
Uncompahgre River at Colona, Colorado
West Fork Beaver Creek near Lonetree, Wyoming
White River near Meeker, Colorado
White River near Watson, Utah
Willow Creek near Ouray, Utah
Yampa River near Maybell, Colorado
Yampa River at Steamboat Springs, Colorado

APPENDIX G

RESOLUTION

Passed by the Upper Colorado River Commission, December 12, 1949

"WHEREAS the Upper Colorado River Basin Compact among the States of Colorado, New Mexico, Utah and Wyoming became effective on the 6th day of April, A. D. 1949, and the Upper Colorado River Commission, a body set up by the Compact, has been organized to perform its administrative functions; and

WHEREAS the Colorado River is an interstate and international stream, and the use and control of the waters thereof are affected by the Colorado River Compact, the Upper Colorado River Basin Compact and the Treaty between the United States and Mexico of 1945; and

WHEREAS the establishment, maintenance and operation of gaging stations is of interest and concern to the United States of America in view of the national and international aspects involved in determinations relating to the flow, control and use of waters of the Colorado River System and the discharge of international treaty and of compact obligations connected therewith; and

WHEREAS it is the desire of the Upper Colorado River Commission that gaging stations required for compact administration and for meeting international obligations be operated by a disinterested agency using modern equipment and methods and capable of obtaining records of highest accuracy; and

WHEREAS the United States Geological Survey is recognized as the official Federal agency for collecting, publishing and disseminating stream flow records; and

WHEREAS the Upper Colorado River Commission will be in a position from time to time to make recommendations as to the number and location of gaging stations required to meet the purposes herein above mentioned; and

WHEREAS the Federal Government has heretofore initiated and prosecuted a policy for the installation, maintenance and opera-

tion of gaging stations on interstate streams and particularly to aid in the administration of compacts on such streams:

NOW, THEREFORE, BE IT RESOLVED that the Upper Colorado River Commission recommends to the President, the Secretary of the Interior and the Congress the prosecution of a broad and comprehensive program for the establishment, operation and maintenance of gaging stations to these ends in the Colorado River Basin and the provision of adequate funds therefor."

APPENDIX H

U. S. TREASURY DEPARTMENT

WASHINGTON 25

FEB. 10, 1950

Office of
COMMISSIONER OF INTERNAL REVENUE

Address reply to

COMMISSIONER OF INTERNAL REVENUE
AND REFER TO:
MT:M:WDF
Upper Colorado River Commission
Grand Junction, Colorado

Attention: Mr. John Goeffrey Will
Secretary

Gentlemen:

Reference is made to your letter dated January 1, 1950, transmitting a copy of Public Law 37, 81st Congress, 1st Session, entitled "AN ACT to grant the consent of the United States to the Upper Colorado River Basin Compact," and requesting advice whether the Upper Colorado River Commission is exempt from payment of the taxes imposed by sections 3465, 3469 and 3475 of the Internal Revenue Code, as amended.

You stated that the Commission was created by virtue of Article VIII of the Upper Colorado River Basin Compact, entered into on October 11, 1948, executed by Commissioners for the States of Arizona, Colorado, New Mexico, Utah and Wyoming, ratified by the legislature of each of such states, and consented to by the Congress of the United States through the aforementioned Act approved on April 6, 1949. You further stated that the Commission is an inter-state administrative agency, the expenses of which, except as to those which may be paid by the United States, are borne 51.75 percent by the State of Colorado; 11.25 percent by the State of New Mexico; 23 percent by the State of Utah; and 14 percent by the State of Wyoming. The Commission has power to carry out the various functions required of it by the Compact, as further outlined in your letter.

Upon consideration of the facts presented in your letter and the supplemental material transmitted therewith, it is held that amounts paid for official travel on behalf of the Upper Colorado River Commission are not subject to the tax imposed by section 3469 of the Internal Revenue Code, as amended, irrespective of whether the funds are derived in part from the Federal Government. The exemption should be established by the presentation to the carrier of an exemption certificate on Form 731, Revised, which has been appropriately modified to show that the exemption is claimed on behalf of the Upper Colorado River Commission.

The Upper Colorado River Commission is also exempt from the tax (1) imposed under section 3465 of the Code, as amended, on any payment for telephone, telegraph, radio or cable facilities, and (2) imposed by section 3475 of the Code, as amended, on amounts paid for the transportation of property. No form of exemption certitficate has been prescribed by the Bureau for use by exempt organizations, such as the Upper Colorado River Commission, in establishing exemption from the taxes referred to in the foregoing. In order to obtain exemption from these taxes, it will be necessary for the Commission to establish its exempt status to the satisfaction of the collecting agency.

Very truly yours,

Charles J. Valaer
Deputy Commissioner

APPENDIX I

REPORT OF THE TREASURER PRO TEM.

As of the Close of Business, March 10, 1950

At the First Annual Meeting of the Commission on September 19, 1949, the Treasurer Pro Tem. reported receipts totalling $2,829.82. Since that date, the State of Colorado remitted its portion of the $5,000 originally requested, $2,587.50.

Pursuant to action of the Commission on December 12, 1949, request was made upon the States represented on the Commission for their respective portions of $25,000. The following amounts have been received to date:

State of Wyoming	$3,500.00
State of Utah	5,750.00
State of New Mexico	2,812.50

The total receipts of the Commission to date are $17,479.82.

The following disbursements have been made upon duly approved vouchers:

Personal Services	$3,761.41
Travel	875.43
Current Expenses	552.81
Capital Outlay	3,073.41
	$8,263.06

This leaves a balance on hand of $9,216.76.

If more detail is desired with respect to the nature of any disbursements, all vouchers are on file in the office of the Commission.

Mr. Barney Whatley having duly qualified as the permanent Treasurer of the Commission and my accounts to date having been audited, I have today issued Commission Check No. 29 in the amount of $9,216.76 payable to The First National Bank in Grand Junction for the credit of the Upper Colorado River Commission.

It has been a pleasure to serve as Treasurer Pro Tem. of the Commission.

Respectfully submitted,

(Mrs.) Lois P. Crowder

APPENDIX J

REPORT OF TREASURER

PURSUANT TO ARTICLE IV, PARAGRAPH 10, OF THE BY-LAWS OF THE UPPER COLORADO RIVER COMMISSION

I, Barney L. Whatley, assumed office as Treasurer of the Upper Colorado River Commission on March 10, 1950.

As of the date of my assumption of office, the Commission's balance was Nine Thousand Two Hundred Sixteen Dollars and Seventy-Six Cents ($9,216.76). No expenditures have been made since that date to the date of this report.

/s/ BARNEY L. WHATLEY
Barney L. Whatley

March 20, 1950

APPENDIX J

REPORT OF TREASURER

PURSUANT TO ARTICLE IV, PARAGRAPH 10, OF THE BY-LAWS OF THE UPPER COLORADO RIVER COMMISSION

I, Barney L. Whatley, assumed office as Treasurer of the Upper Colorado River Commission on March 10, 1950.

As of the date of my assumption of office, the Commission's balance was Nine Thousand Two Hundred Sixteen Dollars and Seventy-Six Cents ($9,216.76). No expenditures have been made since that date to the date of this report.

/s/ BARNEY L. WHATLEY
Barney L. Whatley

March 20, 1950

APPENDIX K

Grand Junction, Colorado
March 20, 1950

Upper Colorado River Commission

Gentlemen:

Article VIII (b) of the Upper Colorado River Basin Compact provides as follows:

> "***On or before December 1 of each year, the Commission shall adopt and transmit to the Governors of the four states and to the President a budget covering an estimate of its expenses for the following year, and the amount payable by each state. Each state shall pay the amount due by it to the Commission on or before April 1 of the year following.***"

Article VII, of the by-laws of the Upper Colorado River Commission provides as follows:

> "(3). On or before December 1 of each year, the Commission shall adopt and transmit to the Governors of the four states and to the President of the United States a budget covering an estimate of its expenses for the following year, and of the amount payable by each state under the provisions of the Upper Colorado River Basin Compact."
>
> "(7). The fiscal year of the Commission shall begin July 1 of each year and end June 30 of the next succeeding year."

The Commission, in the adoption of the by-laws above quoted, has interpreted the words "following year" appearing in Article VIII (b) of the Compact to mean fiscal year beginning July 1 of each year and ending June 30 of the next succeeding year.

The budget committee of the Upper Colorado River Commission, acting in accordance with such provisions of the Compact, by-laws, and interpretation of the Compact, recommends:

(1) That for accounting purposes, budget estimates and expenditures be itemized under five general headings as follows:

(a) Personal services
(b) Travel
(c) Current expenses
(d) Capital outlay
(e) Miscellaneous disbursements

It further recommends that re-distribution of funds among purposes covered in a budget be permitted on the recommendation of the Secretary, following approval by action of the Commission.

(2) Your Committee recommends that inasmuch as you did adopt a lump sum $30,000 budget at your meeting of September 19-20, 1949 you now, for record purposes, approve the following budget for the fiscal year beginning July 1, 1949 and ending June 30, 1950.

BUDGET FOR FISCAL YEAR
ENDING JUNE 30, 1950

Personal Services	$12,985.00
Travel	7,940.00
Current Expenses	1,955.00
Capital Outlay	7,120.00
Other disbursements	None
	$30,000.00

(3) That funds carried over from the fiscal year ending June 30, 1950, if any, be made available by the Commission for allocation during the fiscal year ending June 30, 1951.

(4) Your committee further recommends that for record purposes you approve the following budget for the fiscal year beginning July 1, 1950 and ending June 30, 1951:

BUDGET FOR FISCAL YEAR
ENDING JUNE 30, 1951

Personal Services	$35,510.00
Travel	7,190.00
Current Expenses	2,000.00
Capital Outlay	1,000.00
Other Disbursements	-------
	$45,700.00

Respectfully submitted,

/s/ C. O. ROSKELLY

C.O. Koskelly, Chairman
Representing State of Utah

/s/ CLIFFORD H. STONE

Clifford H. Stone, Member
Representing State of Colorado

/s/ JOHN H. BLISS

John H. Bliss, Member
Representing State of New Mexico

/s/ A. P. RUSSELL,

A. P. Russell, Member
Representing State of Wyoming

/s/ JOHN R. RITER

John R. Riter, Member
Representing United States
Government

APPENDIX L

UPPER COLORADO RIVER COMPACT COMMISSION

INFLOW - OUTFLOW MANUAL

PREPARED BY

ENGINEERING ADVISORY COMMITTEE

August, 1949

Salt Lake City, Utah

August 5, 1949

Upper Colorado River Basin Compact Commission

Gentlemen:

Pursuant to instructions given at your Vernal, Utah, meeting July 21, 1948, the Engineering Advisory Committee has investigated methods which might be adopted by the Commission for the measurement of stream depletions. On October 6, 1948, at Bishops Lodge the Engineering Advisory Committee appointed a sub-committee composed of R. D. Goodrich, Chairman, R. M. Gildersleeve, and John R. Erickson to prepare a manual on the inflow-outflow method of determining stream depletions in the Upper Colorado River Basin. The manual has been completed, and was reviewed and adopted by the Engineering Advisory Committee on July 1, 1949, in Denver, Colorado.

The manual submitted herewith provides examples of the administrative procedures which will be required to carry out the provisions of Article VI of the Upper Colorado River Compact.

Respectfully submitted,

(Signed) J. R. Riter
J. R. Riter, Chairman, Federal

(Signed) R. Gail Baker
R. Gail Baker, Arizona

(Signed) R. I. Meeker
R. I. Meeker, Arizona

(Signed) R. J. Tipton
R. J. Tipton, Colorado

(Signed) R. M. Gildersleeve
R. M. Gildersleeve, Colorado

(Signed) F. C. Merriell
F. C. Merriell, Colorado

(Signed) J. H. Bliss
J. H. Bliss, New Mexico

(Signed) J. R. Erickson
J. R. Erickson, New Mexico

(Signed) C. O. Roskelley
C. O. Roskelley, Utah

(Signed) R. D. Goodrich
R. D. Goodrich, Wyoming

(Signed) H. T. Person
H. T. Person, Wyoming

(Signed) H. P. Dugan
H. P. Dugan, Federal

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

INFLOW - OUTFLOW MANUAL

INTRODUCTION

This manual has been prepared in accordance with the directions of the Upper Colorado River Basin Compact Commission to provide examples of the administrative procedures which will be required to carry out the provisions of Article VI of the Upper Colorado River Compact which reads as follows:

> "The Commission shall determine the quantity of the consumptive use of water, which use is apportioned by Article III hereof, for the Upper Basin and for each State of the Upper Basin by the inflow-outflow method in terms of man-made depletions of the virgin flow at Lee Ferry, unless the Commission, by unanimous action, shall adopt a different method of determination."

During the negotiations leading to the adoption of the Upper Colorado River Basin Compact, there was exhaustive discussion and very careful consideration of the problems arising from the necessity of measuring the amount of man-made depletion of the virgin flow of the Colorado River and its tributaries, especially at Lee Ferry and at State lines. After thorough discussion of available methods of measurement of consumptive use of water and stream depetion due to the activities of man, especially that caused by irrigation of agricultural crops, the Compact Commission, at the Vernal, Utah meeting, adopted the "Inflow-Outflow Method" as the most practical one for the required purpose.

At the Vernal meeting Mr. R. J. Tipton discussed the work of the depletions sub-committee and recommended that the Commission instruct the Engineering Advisory Committee to prepare a report outlining methods which could be adopted by the Commission for making these measurements.

Following that suggestion the Commission adopted the motion, made by Commissioner Stone as follows:

> "Mr. Chairman, to implement and to carry out the suggestions made by Mr. Tipton, I move that there be referred to the Engineering advisory Committee for its study and report at the next meeting of the Commission, the matters which were suggested by Mr. Tipton and any other engineering matters which in the judgment of that committee should be included in its report at the next meeting of the Commission." (See page 332 of minutes of Meeting No. 7 held at Vernal, Utah, July 7-21, 1948).

As a result of dscussions at previous meetings and in accordance with the action by the Commission indicated above, a subcommittee of the Engineering Advisory Committee was appointed at its meeting held on October 6, 1948, at Bishop's Lodge, with instructions to "write the manual on the inflow-outflow method of measuring consumptive use for the guidance of the future administrative body to be created by the proposed compact."

In the Final Report of the Engineering Advisory Committee, dated November 29, 1948, under the subject of Assignments by Compact Commission, it is stated that at the Vernal meeting the Engineering Advisory Committee was instructed, among other things, "to prepare additional studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin." (p. 10). On the same page of the Report it is also stated, that "Studies of the inflow-outflow method of measuring uses in the Upper Colorado River Basin are being continued. A manual will be presented to the Compact Commission for use by the administrative body when the studies are completed."

From these brief references to the inflow-outflow method in the proceedings of the Commission and its Engineering Advisory Committee, it is evident that its importance in the future administration of the Upper Colorado River is fully appreciated and that the method and its application should be made a matter of record and easy reference for the guidance of the Administrative Commission.

Article VIII, paragraph (d), of the Compact empowered the Commission to establish and maintain gaging stations, collect and analyze data on stream flow, storage and use of water, and to determine the quantity of water used each year in the Upper Colorado River System and the quantity delivered each year at Lee Ferry. All of these powers and duties are necessary and sufficient for the utilization of the inflow-outflow method in the administrative procedures of the Commission.

UPPER COLORADO RIVER BASIN COMPACT COMMISSION

INFLOW - OUTFLOW MANUAL

INTRODUCTION

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APPLICATION OF INFLOW-OUTFLOW METHOD
UPPER COLORADO RIVER BASIN

General Discussion

On all rivers utilized for irrigation purposes consumptive use or man-made depletion at the point of use differs in varying degrees from depletion at state lines or at the lower end of a valley or of a basin. This is a fact that depends upon the conditions whch modify the quantities of water flowing down stream channels. Of the total amount of precipitation which falls upon any given drainage basin only a small portion ever reaches a stream in the form of actual discharge. After having been gathered from surface run-off and from springs and by seepage from the ground along creek and river banks, losses in stream flow continally occur along these natural banks and from the stream itself. These losses are mostly due to evaporation from the water surface and from the ground adjacent to the stream, especially where the banks are low and the ground water table is relatively high, and to transpiration from the native vegetation, trees, shrubs, or bushes and grasses which now and always have lined most rivers as well as the smaller tributaries. The operations of man do not change the nature of these losses but the quantity is affected in the degree to which the river system is controlled and utilized. Losses due to natural causes vary with the stage of flow in rivers and streams, being greater for high stages than for low stages.

Development of Pertinent Factual Data

After two years of exhaustive research, investigation and study, the Engineering Advisory Committee obtained and agreed upon rates and quantities of man-made depletions at sites of use and the effect of such depletions at key points on the Colorado River and its principal tributaries. The work was carried on by the sub-committee in Depletion, of which Mr. Tipton was chairman. The general studies to determine stream depletions were covered by the following investigations (page 40 of Engineering Advisory Committee Final Report).

1. "Determination of areas using water as a result of man-made irrigation."

2. "Determination of unit rates of consumptive use of irrigation water."

3. "Computation of stream depletions at sites of use by application of unit rates of consumptive use of irrigation to water using areas and summation of transmountain diversions, and other uses of water by man."

4. "Estimation of channel losses between sites of use of water and Lee Ferry, Arizona, for historic and virgin flows during the period 1914-45."

5. "Computation of stream depletions above certain key gages, at state boundaries, and at Lee Ferry."

Unit rates of consumptive use of irrigation water, (item 2 above) were determined by Mr. Harry F. Blaney and Mr. Wayne D. Criddle of the Soil Sonservation Service, U. S. Department of Agriculture. These data can be found in Appendix B of the Engineering Advisory Committee Final Report.

All of this mass of detailed information was utilized in the determination of virgin flows and present stream depletions. As further man-made depletions occur through the development of additional irrigated areas and other uses, the effects of the several factors indicated above upon these depletions will be automatically integrated by the application of the inflow-outflow method.

This method was fully explained by the chairman of the subcommittee on Depletions at the joint meeting of the Legal and Engineering Advisory Committees held in Denver on June 29 and 30, 1948, and thoroughly discussed by them. As a result of the action at this meeting, a similar and more detailed presentation of the subject was made to the entire Commission on July 8, 1948, at Vernal, Utah, illustrated by maps and graphs showing results of earlier studies, and uses that have been made of the method.

The inflow-outflow method of measuring depletion by man's activity is particularly applicable to the Upper Colorado River Basin. A change in the flow of the river at Lee Ferry, because of man's activity in the basin, can be measured by the change in relationship between the sum of the virgin flows of certain key tributaries near the rim of the basin and the outflow at Lee Ferry. The upper rim stations are designated as inflow-index stations because it is not possible or practicable, nor is it necessary, to measure all of the inflow. It is, however, necessary to correct the inflow-index for man-made depletions above the points of measurement.

The depletion by man's activities in the various sub-basins of the Colorado River at or near the state lines can be measured by the change in relationship between the sum of inflow-index amounts and the outflows at points located at or near the state lines.

Practically all of the irrigation development in the Upper Basin will be limited to the irrigation of lands along tributaries and along the upper reaches of the main streams. The lowest major point of diversion of Green River water for irrigation purposes may be a short distance below the Wyoming-Utah state line. Below that point the Green River enters a series of deep canyons. After the Colorado River leaves Colorado and enters Utah it flows in a deep canyon and there is little opportunity to utilize the water in the Upper Basin for irrigation purposes from that point down. The same is true with respect to the San Juan after it leaves the State of New Mexico.

It is in the canyon sections of these rivers where the major reservoir capacity will be provided to generate hydro-electric energy and to enable the States of the Upper Division to comply with their obligation provided for under Article III (d) of the Colorado River Compact, not to deplete the flow of the Colorado River at Lee Ferry below 75,000,000 acre-feet in progressive ten-year series. The Upper Colorado River Basin Compact provides that the evaporation loss from such reservoirs used for the common good of the four States of the Upper Division shall be charged in proportoin to the amount of beneficial consumptive use being made by each state at the time the loss occurs. The evaporation loss is to be measured in terms of depletion at Lee Ferry. The best method of determining this loss is by measuring the change in relationship between inflow to the section (which consists of the sum of the flows of the major tributaries and the main streams below the principal irrigated areas and above the main stem reservoirs) and the outflow from the basin at Lee Ferry.

The following discussion and the accompanying maps and curves are presented as a basis for determining future depletions in the Upper Colorado River Basin and within sub-divisions of the Basin. The inflow-outflow correlation curves have been determined from annual values of discharge. Adjustments have been made for transmountain diversions and depletions for irrigation above the inflow-index stations. Examples of such adjustments are given in the Appendix. As further data are accumulated, while development is proceeding, averages of the data in relation to the average for virgin conditions will measure the total depletion. These averages should be computed for periods which are long enough to define accurately the depletions for given stages of development. Prior to and during the construction of the main stem reservoirs the averages should be continuing until the aggregate capacity of such reservoirs have been filled, drawn-down and re-filled, at which time the period prior to the first filling should be dropped from the computation of continuing averages. The period for computing continuing averages shall then extend until the reservoirs have been drawn-down and filled a third time, when the years between the first and second filling shall be dropped, and so forth.

Plate No. 1 is an outline map of the Upper Colorado River Basin on which is shown the major stream system and the location of inflow-index gaging stations which are applicable to develop an inflow-outflow relationship for that basin. Shown also on the plate is the location of Lee Ferry, which is the outflow point for the basin.

Plate No. 2 is a correlation curve showing the relation between the historic flow at the inflow-index stations corrected for man-made depletion above those stations and the outflow at Lee Ferry. The points from which the curve was developed, are the annual values for the years 1932 through 1948.

The Engineering Advisory Committee to the Upper Colorado River Basin Compact Commission, by exhaustive studies, estimated the mean annual virgin flow at Lee Ferry at 15,638,500 acre-feet for the period 1914 to 1945.

It was estimated that the virgin flow at Lee Ferry for a virgin inflow-index of 5,657,000 acre-feet, which was the average for the period 1932 through 1948, amounts to 13,662,000 acre-feet. This is shown on the Plate, and there has been projected through that point a curve indicating estimated relationship between virgin inflow-index and virgin outflow. Actually, the slope of the curve may not be exactly as shown. As time goes on and more development takes place in the Upper Basin, new relationships will result between inflow-index and outflow and the change in slope of those curves will provide a guide for determining the proper slope of the virgin curve. Under ultimate conditions of development, the slope of the virgin curve will have little significance because the flow at Lee Ferry will be largely equated and the depletion at Lee Ferry by man's activity will be the difference between that equated flow and the long-time average virgin flow.

Table No. 1 indicates inflow-index stations that were used to

develop the curve on Plate 2, and the annual run-off at each of those stations for the period used. The corrections made for man-made depletions above the stations are also shown.

Plate No. 3 is an outline map of the San Juan Basin above Bluff, Utah. Shown on the map is the main stem of the San Juan and its principal tributaries. There are indicated on the map the locations of inflow-index gaging stations, stations near the Colorado-New Mexico stateline, which measure the outflow from the upper San Juan Basin and inflow to the lower San Juan Basin, and the gaging station near Bluff, Utah, where the outflow from the basin is measured.

Plate No. 4 is a correlation curve, showing the relation between the sum of virgin flows at the inflow-index stations and the outflow at the station near Bluff, Utah, for the period 1932 through 1948.

Plate No. 5 is a correlation curve showing the relation between the virgin inflow at the inflow-index stations of the upper San Juan Basin and the outflow stations near the Colorado-New Mexico stateline.

Plate No. 6 shows the relation between the inflow to the lower San Juan Basin as measured by the flow past the stations near the Colorado-New Mexico stateline and the outflow from the basin near Bluff, Utah.

There are shown on Plates 4, 5, and 6 the virgin relationships, the shapes of which may be changed as more information is gathered in the future. The change in relation between the inflow as shown on Plate No. 5, and the outflow shown on that curve will measure the additional depletion made by man in Colorado above points near the Colorado-New Mexico stateline.

The curve shown on Plate 6 is intended to be the means of measuring additional depletion caused by man's activities in New Mexico and portions of Colorado, Utah and Arizona on the flow of the river near Bluff, Utah. The change in relationship as there is additional development in the states will be a measure of the depletion by man's activities in these states of the flow of the river at Bluff, Utah. The man-made depletion by Colorado and by the other states of the flow of the river at Bluff must be determined by adjustments in the changes in relationships of the inflow-outflow curves shown on Plates 4, 5, and 6 as development in the state proceeds.

The data from which Plates No. 4, 5, and 6 were derived are included in Tables No. 2, 3, and 4.

Plate No. 7 is an outline map of the Colorado River Basin above Cisco, Utah. It shows all the main stem of the Colorado River and its tributaries in Colorado. Included above Cisco is a small low water producing tributary drainage area in Utah. On the map are shown the locations of inflow-index gaging stations and the outflow station at Cisco.

Plate No. 8 is a curve showing the relationship between historic flow past the inflow-index stations corrected for man-made depletions above those stations and the outflow as measured at the gaging station near Cisco, Utah, for the period 1932 through 1948. On the plate is shown the estimated virgin inflow-outflow relationship. As time goes on and additional developments are made of the waters of the Colorado River in Colorado, the relationship between the inflow-index and the outflow will change. This change will indicate the increased depletion of the flow of the river at Cisco by man's activities which will have taken place since the period covered by the basic curve, and will also show the depletion of the virgin flow of the river near Cisco.

The values determining the relationships shown on Plate No. 8 are given in Table No. 5.

Plate No. 9 is an outline map of the Green River Basin above Green River, Utah. It shows the Green River and its principal tributaries. Several sub-basins are shown on the map, including the White River above Watson, Utah, the Yampa River above Maybell, Colorado, the Little Snake River above Lily, Colorado, the Green River above Linwood, Utah, and Henry's Fork above Linwood, Utah.

Plate No. 10 shows an inflow-outflow curve for the White River above Watson, Utah. The inflow-index is measured at the gaging station near Meeker. The estimated virgin flow curve is shown on the plate.

On Plate No. 11 is an inflow-outflow curve of the Yampa River above Maybell, Colorado. The inflow stations are the Yampa River at Steamboat Springs and the Elk River at Clark; the outflow station is at Maybell. The period covered by the curve is 1932 through 1948. The estimated virgin relationship is shown on the plate.

The inflow-outflow relationship for the Little Snake River is

shown on Plate 12. The inflow-index stations are the Little Snake River near Slater, Slater's Fork near Slater, and Savery Creek near Savery. The outflow station is at Lily, Colorado. The estimated virgin relationship is shown on the plate.

Plate No. 13 shows the inflow-outflow relationship for the Green River in Wyoming. The index-inflow is measured at Green River at Warren Bridge, North Piney Creek near Mason, Pine Creek at Pinedale, Fontenelle Creek near Fontenelle and Black's Fork near Millburne. The outflow is measured at Linwood, Utah. The estimated virgin relationship is shown on the Plate. The change in relationship of the inflow and outflow as shown on this curve will measure the increase in man-made depletion by Wyoming in the Green River basin, except for the Little Snake River and the Henry's Fork.

The curve on Plate 14 shows the inflow-outflow relationship for Henry's Fork above the outflow station on that tributary near Linwood, Utah. The estimated virgin relationship is also shown on this Plate.

The values used to develop the curves shown on Plates 10 to 14 inclusive are given in Tables 6 to 10 inclusive.

Plate 15 shows the relationship between the inflow to the Green River below all major developments in Colorado and Wyoming and above all major developments in Utah and the outflow of the Green River at Green River, Utah. The inflow stations determining this curve are the White River near Watson, Utah, the Yampa River near Maybell, Colorado, the Little Snake River near Lily, Colorado, the Green River near Linwood, Utah, Henry's Fork near Linwood, Utah, Ashley Creek near Vernal, Utah, the Duchesne River near Tabiona, Utah, the Strawberry River at Duchesne, Utah, and the Price River near Heiner, Utah. The outflow station is at Green River, Utah. The records for the inflow-index of Ashley Creek, the Duchesne, Strawberry, and Price Rivers were corrected for the man-made depletions above the stations. This curve will serve as a temporary means of measuring man-made depletions in Utah of the flow of the Green River at Green River, Utah. There should be established or continued outflow stations on the major Utah tributaries, more specifically enumerated as follows: Sheep Creek, Carter Creek, Brush Creek, Ashley Creek, Duchesne River, and Price River. After records have been accumulated for a sufficient period, the Utah inflow-index stations related to the new outflow stations should be used to determine the man-made depletion of the Utah

tributaries. The values used for Plate No. 15 are shown in Table No. 11.

Plate No. 16 shows the relationship between all of the inflow-index stations shown on Plate 15, plus the Colorado River at Cisco and the San Juan River at Bluff, and the outflow of the Colorado River at Lee Ferry. A change in the relationship shown on this curve can be used at the beginning of the administration to check the effect of Utah's future development on the virgin flow at Lee Ferry and the effect of main stem reservoirs which may be built. After records of flow have been accumulated near the mouths of the Utah tributaries named above and near the mouths of the San Rafael, Dirty Devil and Escalante Rivers, the records at those points should be substituted for the upper Utah stations used in computing the relationship shown on Plate 15. From that time on the correlation developed by such a relation can be utilized to determine the effect on the river at Lee Ferry of the operation of main stem reservoirs. The new records of flow near the mouths of the Utah tributaries will permit the substitution of at least two new relationships for the relationships shown on Plate 15. The new relationships will measure directly the Utah depletions and other changes caused by the activities of man.

As development proceeds, gaging stations may of necessity have to be abandoned and others may have to be added because of the pattern of development. For example, the creation of the Flaming Gorge Reservoir will necessitate the moving of the Green River station near Linwood, Utah, and the Henry's Fork station at Linwood, Utah, to points upstream. In addition to moving the Henry's Fork station it will then be necessary to retain the existing station on Blacks Fork near Green River, Wyoming, and reestablish the Green River station at Green River, Wyoming. The development of the Yellow Jacket Project along the Yampa River in Colorado and/or the Deadman Bench Project along the White River in Colorado and Utah will necessitate some change in the locations of key stations. There will be other instances throughout the basin where changes in locations of gaging stations will be necessary, some of which will be mentioned later.

Table No. 12 includes the data relative to Plate No. 16.

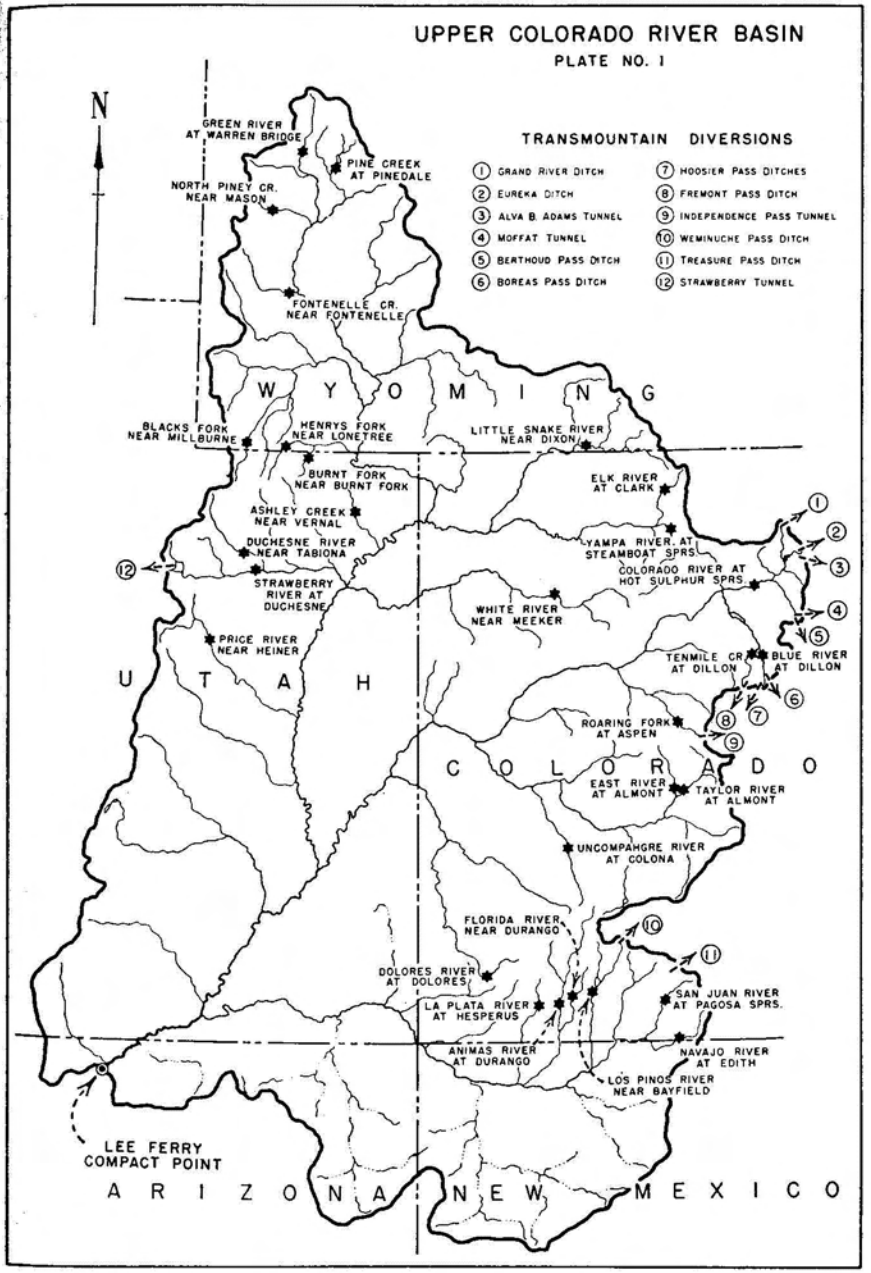

UPPER COLORADO RIVER BASIN
PLATE NO. 1
N
TRANSMOUNTAIN DIVERSIONS
1 GRAND RIVER DITCH
2 EUREKA DITCH
3 ALVA B. ADAMS TUNNEL
4 MOFFAT TUNNEL
5 BERTHOUD PASS DITCH
6 BOREAS PASS DITCH
7 HOOSIER PASS DITCHES
8 FREMONT PASS DITCH
9 INDEPENDENCE PASS TUNNEL
10 WEMINUCHE PASS DITCH
11 TREASURE PASS DITCH
12 STRAWBERRY TUNNEL
GREEN RIVER AT WARREN BRIDGE
PINE CREEK AT PINEDALE
NORTH PINEY CR. NEAR MASON
FONTENELLE CR. NEAR FONTENELLE
WYOMING
BLACKS FORK NEAR MILLBURNE
HENRYS FORK NEAR LONETREE
LITTLE SNAKE RIVER NEAR DIXON
BURNT FORK NEAR BURNT FORK
ELK RIVER AT CLARK
ASHLEY CREEK NEAR VERNAL
DUCHESNE RIVER NEAR TABIONA
YAMPA RIVER AT STEAMBOAT SPRS
COLORADO RIVER AT HOT SULPHUR SPRS
STRAWBERRY RIVER AT DUCHESNE
WHITE RIVER NEAR MEEKER
PRICE RIVER NEAR HEINER
TENMILE CR AT DILLON
BLUE RIVER AT DILLON
UTAH
ROARING FORK AT ASPEN
COLORADO
EAST RIVER AT ALMONT
TAYLOR RIVER AT ALMONT
UNCOMPAHGRE RIVER AT COLONA
FLORIDA RIVER NEAR DURANGO
DOLORES RIVER AT DOLORES
SAN JUAN RIVER AT PAGOSA SPRS.
LA PLATA RIVER AT HESPERUS
ANIMAS RIVER AT DURANGO
NAVAJO RIVER AT EDITH
LOS PINOS RIVER NEAR BAYFIELD
LEE FERRY COMPACT POINT
ARIZONA
NEW MEXICO

TABLE NO. 1
COLORADO RIVER BASIN ABOVE LEE FERRY
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX								OUTFLOW	
	San Juan Index (Table No. 2)	Upper Colo. R. Index (Table No. 5)	White R. near Meeker (Table No. 6)	Yampa R. Index (Table No. 7)	Little Snake R. near Dixon	Green R. Index (Table No. 9)	Henrys Fork Index (Table No. 10)	Utah Index (Table No. 11) (a)	Sum	Colorado R. at Lee Ferry
1932	1887	1891	542	730	c689	691	55	431	6916	15286
33	967	1496	485	582	c487	532	46	341	4936	9745
34	579	923	245	256	c 67	315	12	148	2545	4396
36	1554	1581	366	476	c215	553	30	299	5074	9912
36	1229	1944	419	682	c320	745	47	478	5864	11970
37	1455	1515	330	492	c440	644	68	580	5524	11897
37	1687	2154	496	662	411	724	79	518	6731	15440
39	969	1407	372	503	254	596	49	355	4505	9394
1940	798	1165	360	462	252	388	26	287	3738	7082
41	2317	1816	450	499	316	597	73	509	6577	16052
42	1926	2118	477	541	418	651	85	533	6749	17029
43	1170	1677	377	526	332	841	43	490	5456	11263
44	1746	1791	398	466	333	634	87	542	5997	13221
45	1248	1613	461	611	485	590	68	432	5508	11545
46	819	1359	364	491	288	622	47	388	4378	8745
47	1215	1928	554	643	384	808	88	496	6116	13515
48	1777	1934	459	558	298	598	52	375	6051	13689
									5451	11775
AVERAGE										
Adjustment	12.4	61.8	34.0	15.1	(b)27.5	36.2	0	19.4	206.4	1887.1
									5657	13662
ADJUSTED AVERAGE										(d)1960.4
Depletion at sites of use above Lee Ferry										73.3
Present salvage above Lee Ferry										1887.1

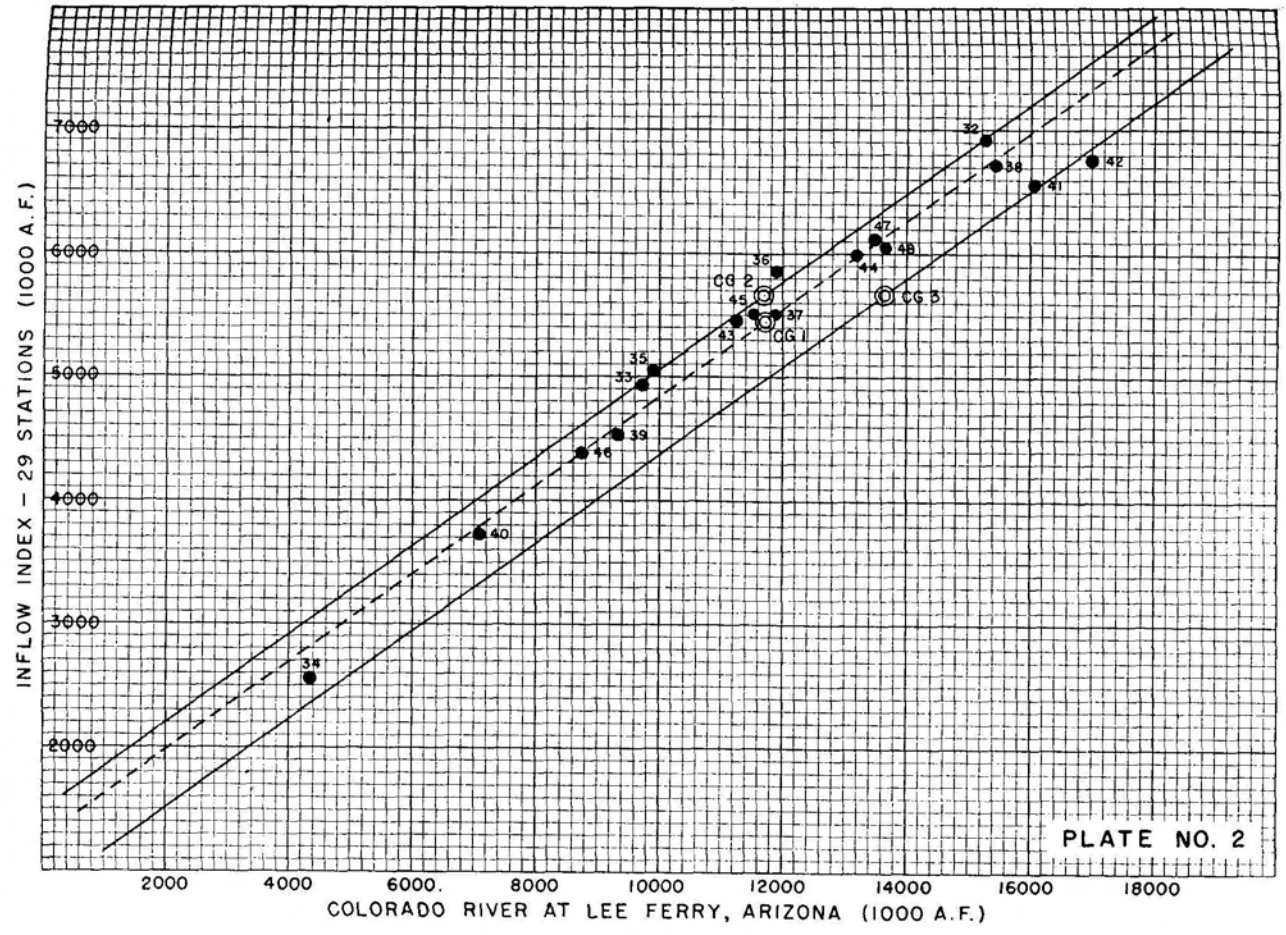
DEPLETION OF VIRGIN FLOW AT LEE FERRY

(a)—Sum Ashley Cr. Near Vernal, Duchesne R. near Tabiona, Strawberry R. at Duchesne and Price R. near Heiner corrected for transmountain diversions.

(b)—Adjustment for irrigation depletions of 9510 acres above station at rate of 1.42 acre feet per acre; also for estimated by-passed water amounting to 14,000 acre feet to irrigate 3820 acres below the station.

c —Estimated by correlation.

(d)—Transmountain diversions in Colorado averaged 37,200 acre feet more for the 1932-1948 period than for the 1914-1945 period.



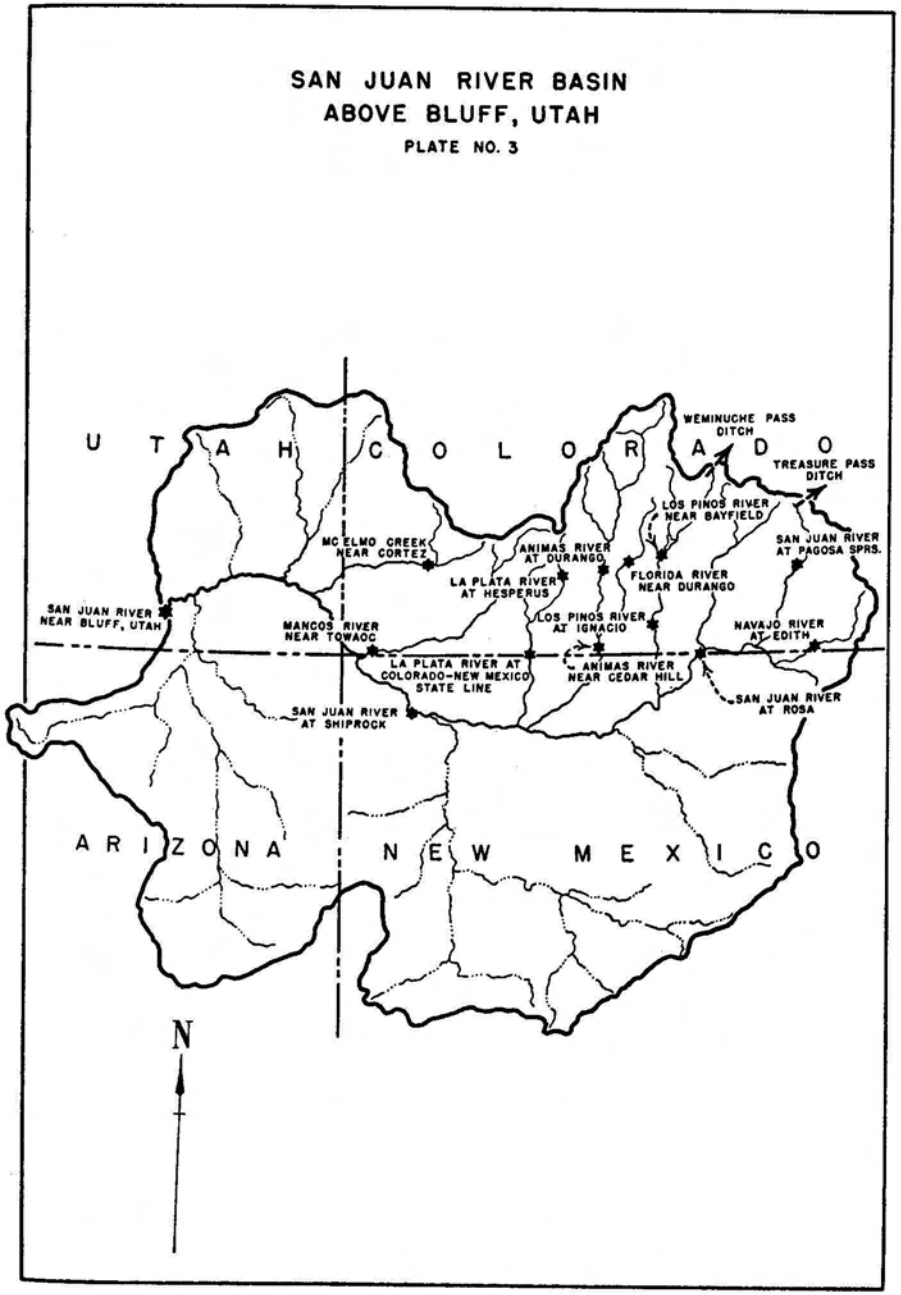

SAN JUAN RIVER BASIN
ABOVE BLUFF, UTAH
PLATE NO. 3
U T A H
C O L O R A D O
A R I Z O N A
N E W M E X I C O
N
WEMINUCHE PASS DITCH
TREASURE PASS DITCH
LOS PINOS RIVER NEAR BAYFIELD
SAN JUAN RIVER AT PAGOSA SPRS.
MC ELMO CREEK NEAR CORTEZ
ANIMAS RIVER AT DURANGO
FLORIDA RIVER NEAR DURANGO
LA PLATA RIVER AT HESPERUS
SAN JUAN RIVER NEAR BLUFF, UTAH
MANCOS RIVER NEAR TOWAOC
LOS PINOS RIVER AT IGNACIO
NAVAJO RIVER AT EDITH
LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE
ANIMAS RIVER NEAR CEDAR HILL
SAN JUAN RIVER AT ROSA
SAN JUAN RIVER AT SHIPROCK

TABLE NO. 2

SAN JUAN RIVER BASIN ABOVE BLUFF

Units—1000 Acre Feet

WATER YEAR	INFLOW—INDEX								OUTFLOW
	San Juan R. at Pagosa Spgs.	Navajo R. at Edith	Los Pinos R. near Bayfield	Animas R. at Durango	Florida R. near Durango	La Plata R. at Hesperus	Transmountain Diversions above Stations	Sum	San Juan R. near Bluff
1932	c435	c183	373	743	111	42	0	1887	2948
33	c190	c 78	194	431	52	22	0	967	1242
34	c105	c 57	125	250	28	14	0	579	662
35	c375	c155	317	567	100	40	0	1554	2183
36	233	115	255	522	72	32	0	1229	1631
37	342	170	284	540	80	38	1	1455	2336
38	345	142	351	710	98	40	1	1687	2466
39	184	86	208	426	46	17	2	969	1239
1940	157	70	149	361	40	20	1	798	996
41	528	218	412	949	142	66	2	2317	4242
42	401	191	350	832	105	46	1	1926	3078
43	225	89	221	538	62	32	3	1170	1445
44	351	116	382	768	87	41	1	1746	2289
45	290	119	192	548	68	29	2	1248	1620
46	120	54	166	422	39	16	2	819	865
47	205	78	211	626	67	26	2	1215	1488
48	353	103	411	769	102	37	2	1777	2319
AVERAGE								1373	1944
								12.4	162.1
ADJUSTED AVERAGE								1385	2106
Acres irrigated above station	3150	2930	0	4060	160	350			
Depletion rate a.f. per acre	0.81	1.25		1.16	1.00	0.90			
Acres irrigated by by-passed water	0	75	100	0	0	0			
Irrigation depletions above station	2.6	3.7	0	4.7	0.2	0.3			
Estimated by-passed water	0	0.4	0.5	0	0	0			
ADJUSTMENT TO INFLOW INDEX	2.6	4.1	0.5	4.7	0.2	0.3		12.4	
Depletion at sites of use above Bluff									(a)166.6
Present salvage above Bluff									4.5
DEPLETION OF VIRGIN FLOW AT BLUFF									*162.1*

(a)—Transmountain diversions averaged 800 acre feet more for 1932-1948 period than for 1914-1945 period.

c—Estimated by correlation.

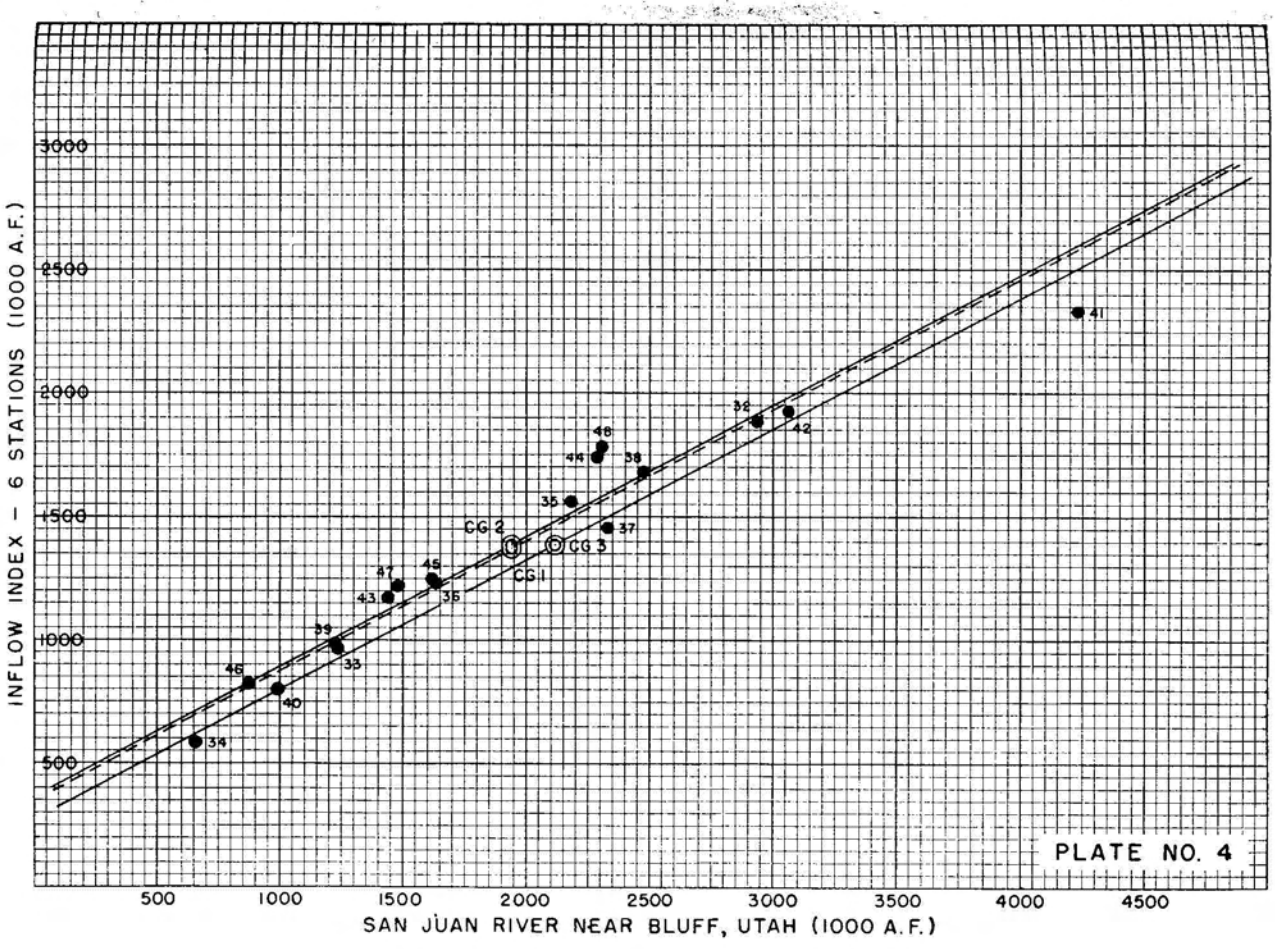


TABLE NO. 3
SAN JUAN BASIN IN COLORADO
Units 1000 AF

WATER YEAR	INFLOW—INDEX	OUTFLOW						
	San Juan Index (Table No. 2)	San Juan R. at Rosa	Los Pinos R. at Ignacio	Animas R. near Cedar Hill	La Plata R. at Colo.-N.M. Stateline	Mancos R. near Towaoc	McElmo Cr. near Cortez	Sum
1932	1887	1401	362	c 925	30	58	c 45	2821
33	967	528	118	c 515	14	21	c 32	1228
34	579	321	59	c 300	8	9	c 30	727
35	1554	1143	272	758	22	35	c 41	2271
36	1229	741	173	636	25	37	c 38	1650
37	1455	1149	235	689	45	57	c 42	2217
38	1687	1096	281	879	28	53	c 46	2383
39	969	578	136	488	11	15	c 33	1261
1940	798	425	84	417	10	18	c 38	992
41	2317	1777	431	1240	70	87	59	3664
42	1926	1334	295	992	66	92	51	2830
43	1170	622	127	623	24	43	45	1484
44	1746	923	273	861	29	c 61	36	2183
45	1248	758	91	590	25	c 42	35	1541
46	819	342	42	439	10	c 15	(a) 28	876
47	1215	546	96	668	12	c 28	c 46	1396
48	1777	926	298	866	22	c 40	c 43	2195
AVERAGE	1373							1866
Adjustment	12.4							49.0
ADJUSTED AVERAGE	1385							1915
Depletion at sites of use above stateline stations								(d) 49.0
Present salvage above stateline stations								(b)
DEPLETION OF VIRGIN FLOW AT STATELINE STATIONS								49.0

(a) — Furnished by Durango office, U.S.B.R.
(b) — Not estimated by Engineering Advisory Committee
c — Estimated by correlation
(d) — Transmountain diversions averaged 800 acre feet more for 1932-1948 period than for 1914-1945 period.

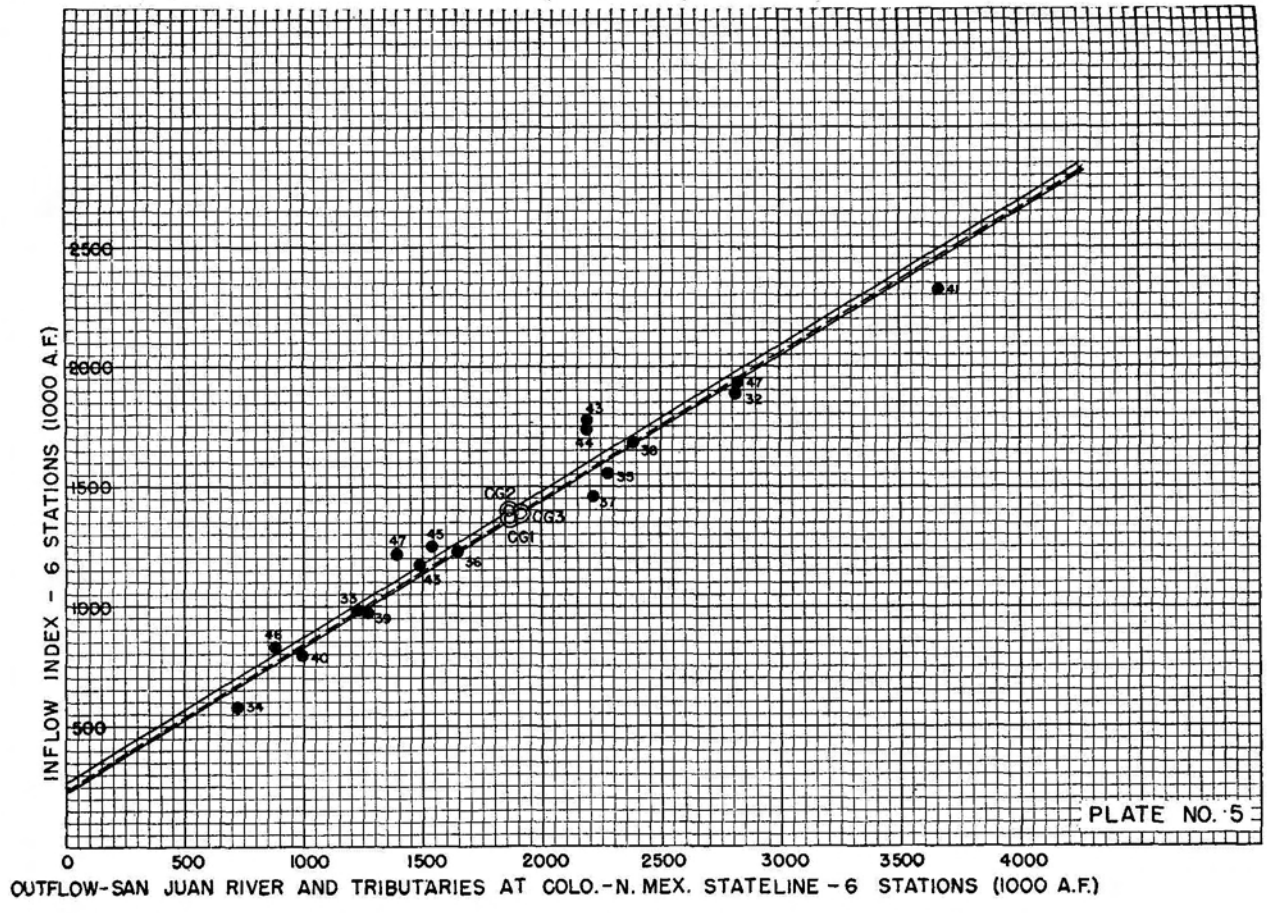


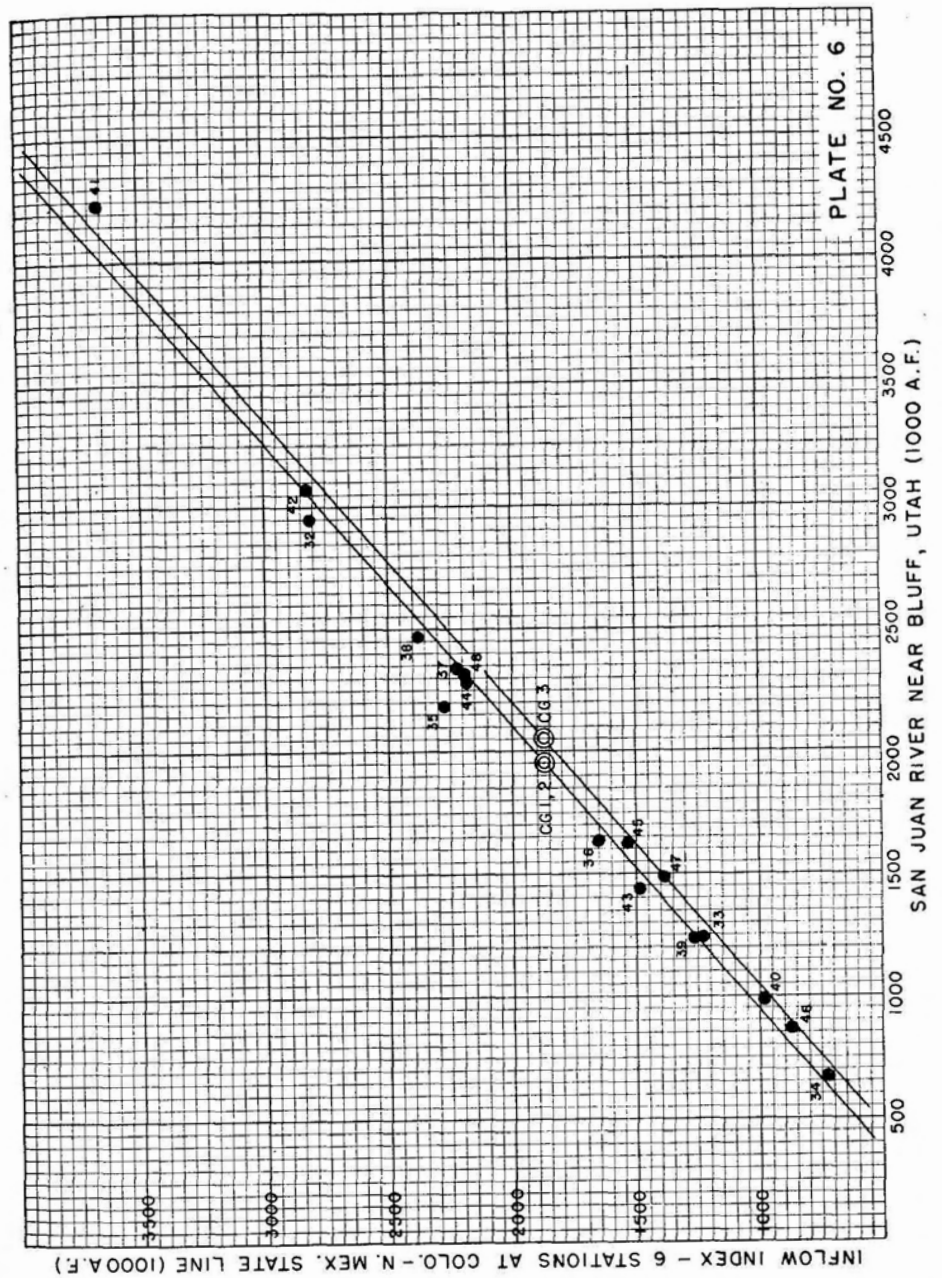
TABLE NO. 4
SAN JUAN BASIN - COLO.-N.M. STATELINE TO BLUFF
Units 1000 AF

WATER YEAR	INFLOW-INDEX Table No. 3 (a)	OUTFLOW San Juan R. near Bluff
1932	2821	2948
33	1228	1242
34	727	662
35	2271	2183
36	1650	1631
37	2217	2336
38	2383	2466
39	1261	1239
1940	992	996
41	3664	4242
42	2830	3078
43	1484	1445
44	2183	2289
45	1541	1620
46	876	865
47	1396	1488
48	2195	2319
AVERAGE	1866	1944
Adjustment		113.1
ADJUSTED AVERAGE		2057

Depletions at sites of use - Stateline stations to Bluff	117.6
Present salvage - Stateline stations to Bluff	4.5
DEPLETION OF VIRGIN FLOW AT BLUFF - Stateline Stations to Bluff	113.1

(a) = Sum San Juan R. at Rosa, Los Pinos R. at Ignacio, Animas R. near Cedar Hill, La Plata R. at Stateline, Mancos R. near Towaoc, McElmo Cr. near Cortez.

PLATE NO. 6



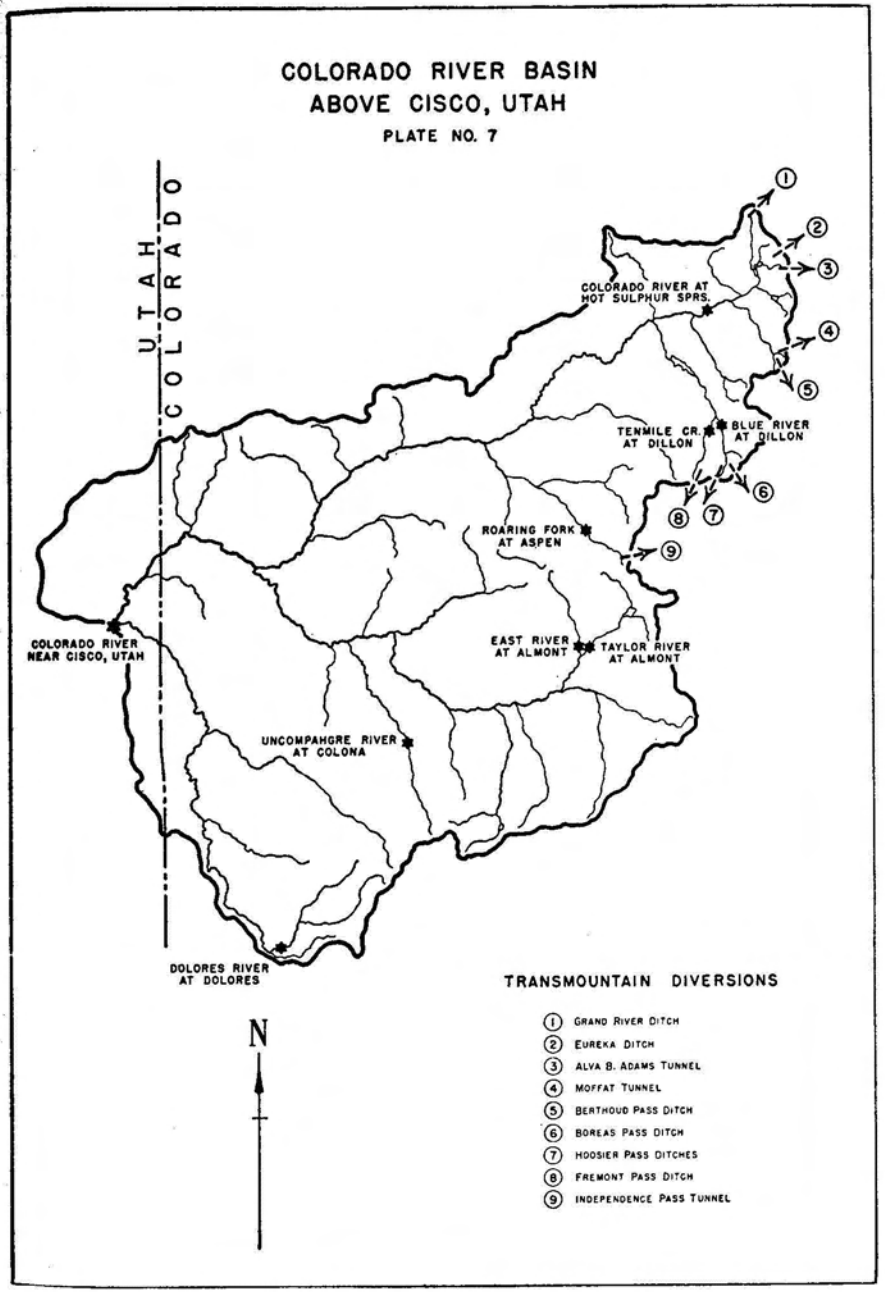
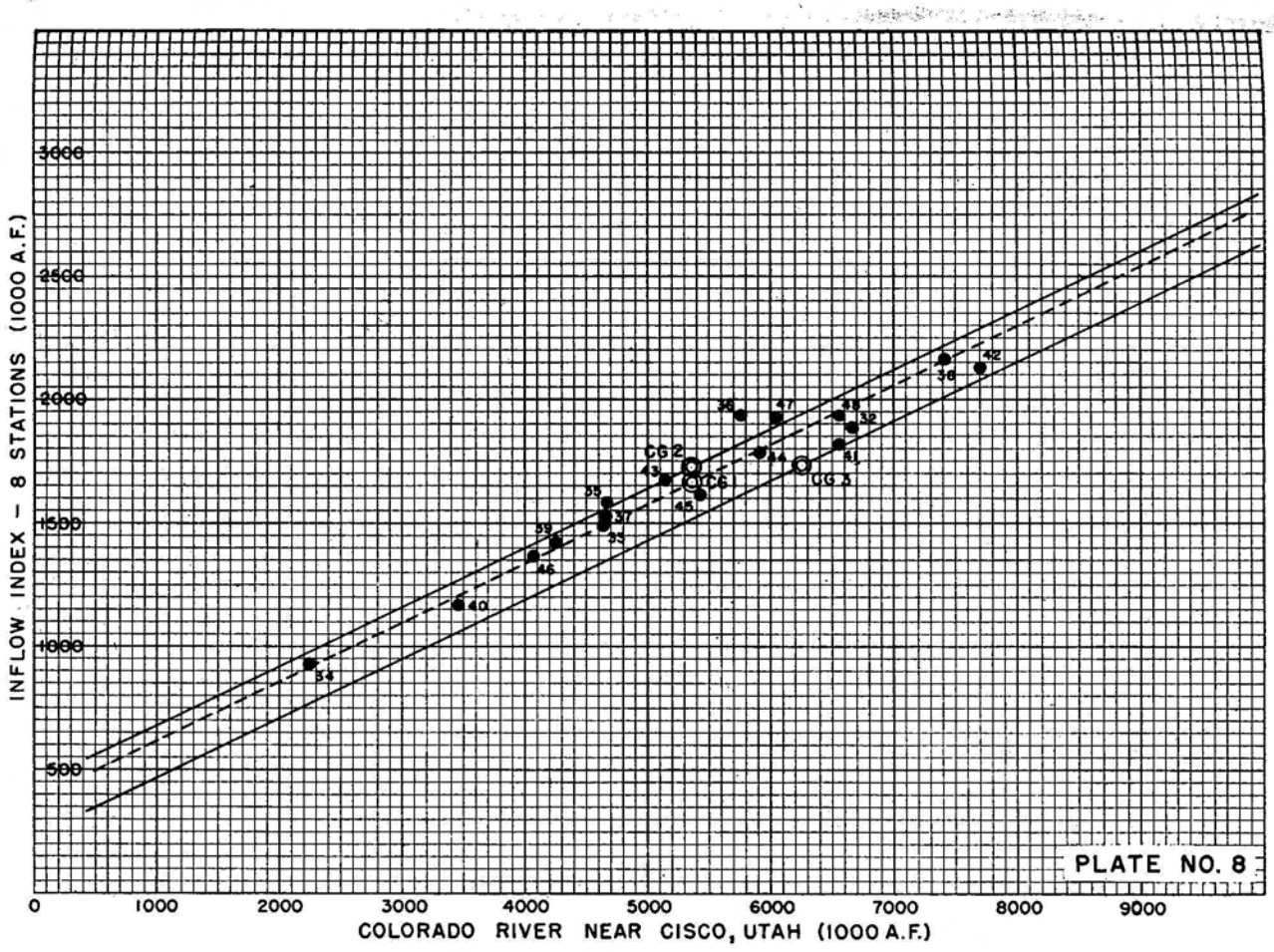

COLORADO RIVER BASIN
ABOVE CISCO, UTAH
PLATE NO. 7
UTAH
COLORADO
COLORADO RIVER AT HOT SULPHUR SPRS.
TENMILE CR AT DILLON
BLUE RIVER AT DILLON
ROARING FORK AT ASPEN
EAST RIVER AT ALMONT
TAYLOR RIVER AT ALMONT
COLORADO RIVER NEAR CISCO, UTAH
UNCOMPAHGRE RIVER AT COLONA
DOLORES RIVER AT DOLORES
N
TRANSMOUNTAIN DIVERSIONS
1 GRAND RIVER DITCH
2 EUREKA DITCH
3 ALVA B. ADAMS TUNNEL
4 MOFFAT TUNNEL
5 BERTHOUD PASS DITCH
6 BOREAS PASS DITCH
7 HOOSIER PASS DITCHES
8 FREMONT PASS DITCH
9 INDEPENDENCE PASS TUNNEL

TABLE NO. 5
COLORADO RIVER BASIN ABOVE CISCO
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX										OUTFLOW
	Colorado R. at Hot Sulphur Springs	Blue R. at Dillon	Tenmile Cr. at Dillon	Roaring Fork at Aspen	East R. at Almont	Taylor R. at Almont	Uncompahgre R. near Colona	Dolores R. at Dolores	Transmountain Diversions above stations	Sum	Colorado R. near Cisco
1932	462	76	81	c 114	c 238	232	216	453	19	1891	6687
33	466	70	88	* 104	c 197	192	150	213	16	1496	4631
34	254	54	55	● 63	c 144	138	102	102	11	923	2220
35	397	65	71	80	247	223	* 160	306	32	1581	4681
36	550	108	113	95	298	288	142	291	59	1944	5766
37	321	56	60	51	208	197	157	396	69	1515	4664
38	563	88	97	81	276	226	280	426	117	2154	7422
39	353	77	82	60	183	213	158	192	89	1407	4252
1940	293	49	53	35	135	149	160	216	75	1165	3463
41	358	70	67	53	243	138	272	522	93	1816	6576
42	434	78	77	96	232	261	323	572	45	2118	7706
43	376	77	88	67	247	228	170	325	99	1677	5137
44	334	63	70	57	232	256	260	448	71	1791	5903
45	388	75	82	57	217	156	204	328	106	1613	5406
46	306	74	78	56	194	191	153	216	91	1359	4062
47	498	108	112	103	271	217	212	316	91	1928	6051
48	373	93	94	85	280	317	226	389	77	1934	6587
AVERAGE										1665	5366
										61.8	889.6
ADJUSTED AVERAGE										1727	6256
Acres irrigated above station	12710	143	201	120	7360	360	15510	2525			
Depletion rate - acre feet per acre	0.83	1.00	1.00	1.03	0.82	0.82	1.44	1.43			
Acres irrigated by by-passed water	140	0	0	2100	0	0	1500	0			
Irrigation depletions above station	10.5	0.1	0.2	0.1	6.0	0.3	22.3	3.6			
Estimated by-passed water	0.7	0	0	10.5	0	0	7.5	0			
ADJUSTMENT TO INFLOW-INDEX	11.2	0.1	0.2	10.6	6.0	0.3	29.8	3.6		61.8	
Depletion at sites of use above Cisco											(a) 919.5
Present salvage above Cisco											29.9
DEPLETION OF VIRGIN FLOW AT CISCO											889.6

c = Estimated by correlation
* = Runoff estimated for winter months

(a) = Transmountain diversions averaged 36,400 acre feet more for 1932-1940 period than for 1914-1945 period.



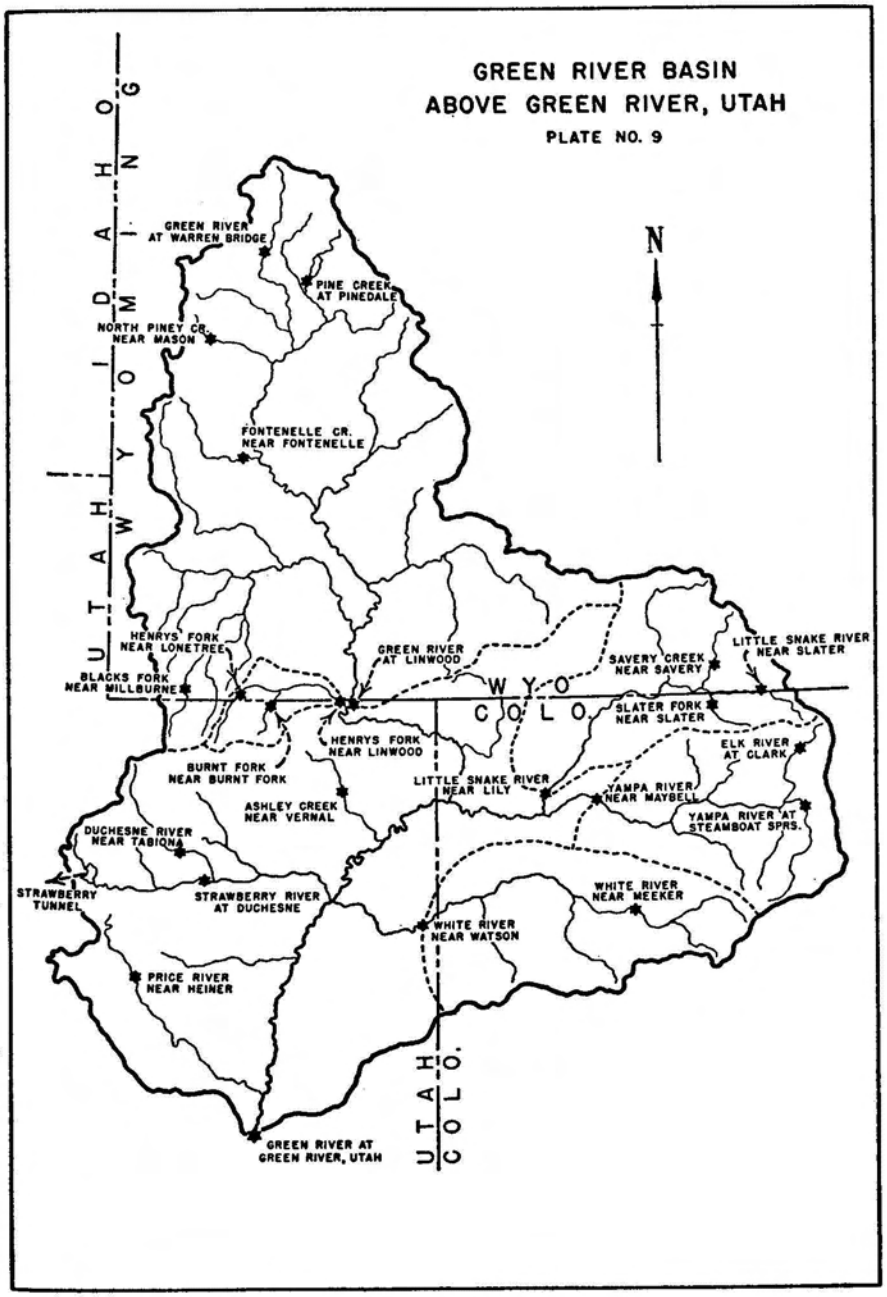

GREEN RIVER BASIN
ABOVE GREEN RIVER, UTAH
PLATE NO. 9
N
IDAHO
WYO.
UTAH
COLO.
GREEN RIVER AT WARREN BRIDGE
PINE CREEK AT PINEDALE
NORTH PINEY CR. NEAR MASON
FONTENELLE CR. NEAR FONTENELLE
HENRYS FORK NEAR LONETREE
BLACKS FORK NEAR MILLBURNE
GREEN RIVER AT LINWOOD
SAVERY CREEK NEAR SAVERY
LITTLE SNAKE RIVER NEAR SLATER
SLATER FORK NEAR SLATER
ELK RIVER AT CLARK
HENRYS FORK NEAR LINWOOD
BURNT FORK NEAR BURNT FORK
LITTLE SNAKE RIVER NEAR LILY
YAMPA RIVER NEAR MAYBELL
YAMPA RIVER AT STEAMBOAT SPRS.
ASHLEY CREEK NEAR VERNAL
DUCHESNE RIVER NEAR TABIONA
STRAWBERRY TUNNEL
STRAWBERRY RIVER AT DUCHESNE
WHITE RIVER NEAR MEEKER
WHITE RIVER NEAR WATSON
PRICE RIVER NEAR HEINER
GREEN RIVER AT GREEN RIVER, UTAH

TABLE NO. 6
WHITE RIVER BASIN
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX White River near Meeker	OUTFLOW White River near Watson
1932	542	595
33	485	537
34	245	281
35	366	402
36	419	472
37	330	392
38	496	599
39	372	448
1940	360	388
41	450	552
42	477	688
43	377	436
44	398	446
45	461	499
46	364	394
47	554	569
48	459	528
AVERAGE	421	484
	33.7	33.7
ADJUSTED AVGE.	455	518
Acres irrigated above station	12270	
Depletion rate - acre feet per acre	1.28	
Acres irrigated by by-passed water	3600	
Irrigation depletions above station	15.7	
Estimated by-passed water	18.0	
ADJUSTMENT TO INFLOW-INDEX	33.7	
Depletion at sites of use above Watson		33.7
Present salvage above Watson		(a)
DEPLETION OF VIRGIN FLOW AT WATSON		33.7

(a) = Not estimated by Engineering Advisory Committee

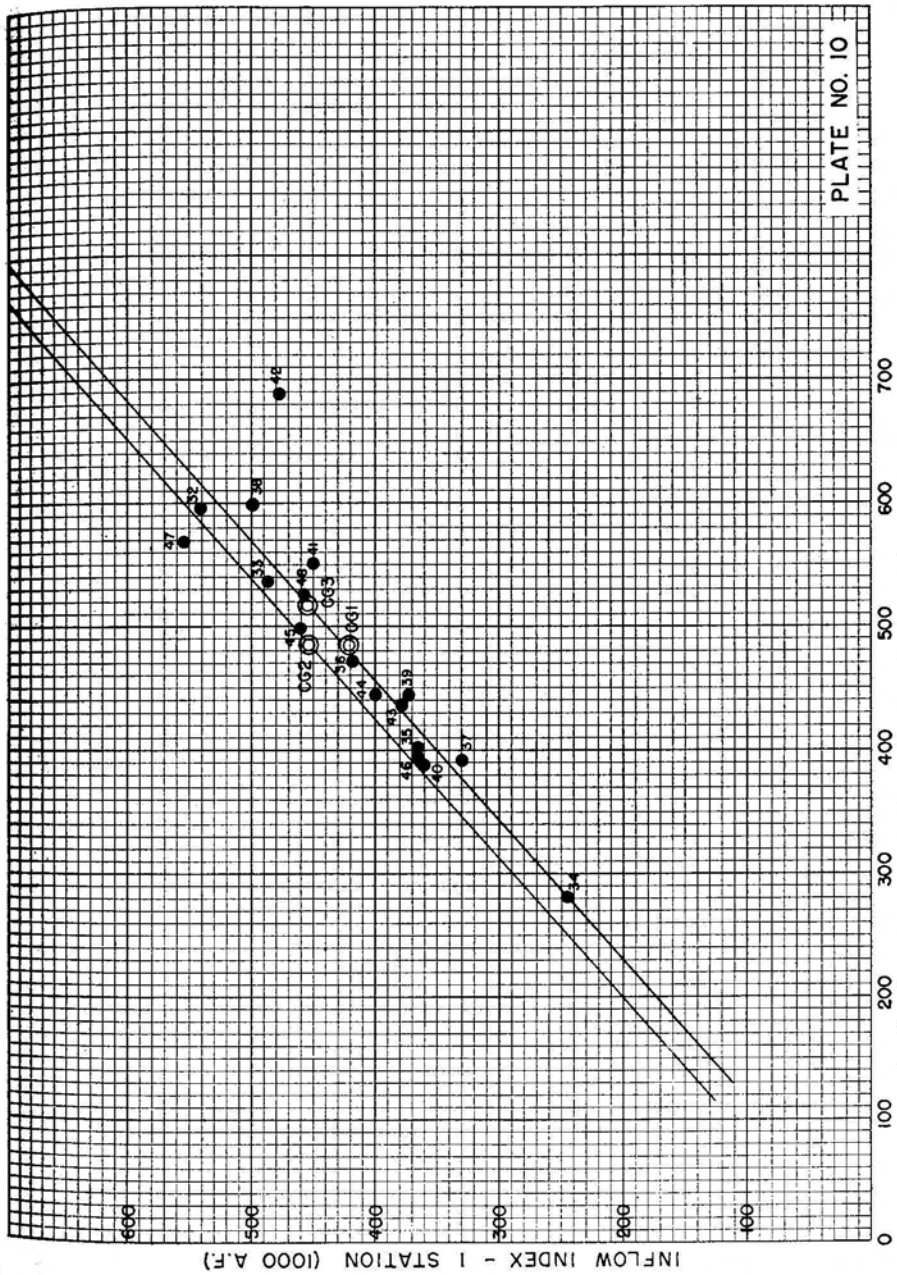


TABLE NO. 7
YAMPA RIVER BASIN
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX: Yampa R. at Steamboat Springs	Elk R. at Clark	Sum	OUTFLOW Yampa R. near Maybell
1932	378	352	730	1388
33	342	240	582	1061
34	127	129	256	374
35	252	224	476	878
36	384	298	682	1144
37	231	261	492	940
38	374	288	662	1228
39	300	203	503	930
1940	260	202	462	847
41	303	196	499	990
42	317	224	541	1189
43	294	232	526	905
44	248	218	466	851
45	322	289	611	1243
46	275	216	491	856
47	382	261	643	1310
48	344	214	558	1183
AVERAGE	302	238	540	1019
			15.1	52.8
ADJUSTED AVERAGE			555	1072
Acres irrigated above station	19730	230		
Depletion rate - acre feet per acre	0.64	0.73		
Acres irrigated by by-passed water	0	460		
Irrigation depletions above station	12.6	0.2		
Estimated by-passed water	0	2.3		
ADJUSTMENT TO INFLOW-INDEX	12.6	2.5	15.1	
Depletion at sites of use above Maybell				53.0
Present salvage above Maybell				0.2
DEPLETION OF VIRGIN FLOW AT MAYBELL				52.8

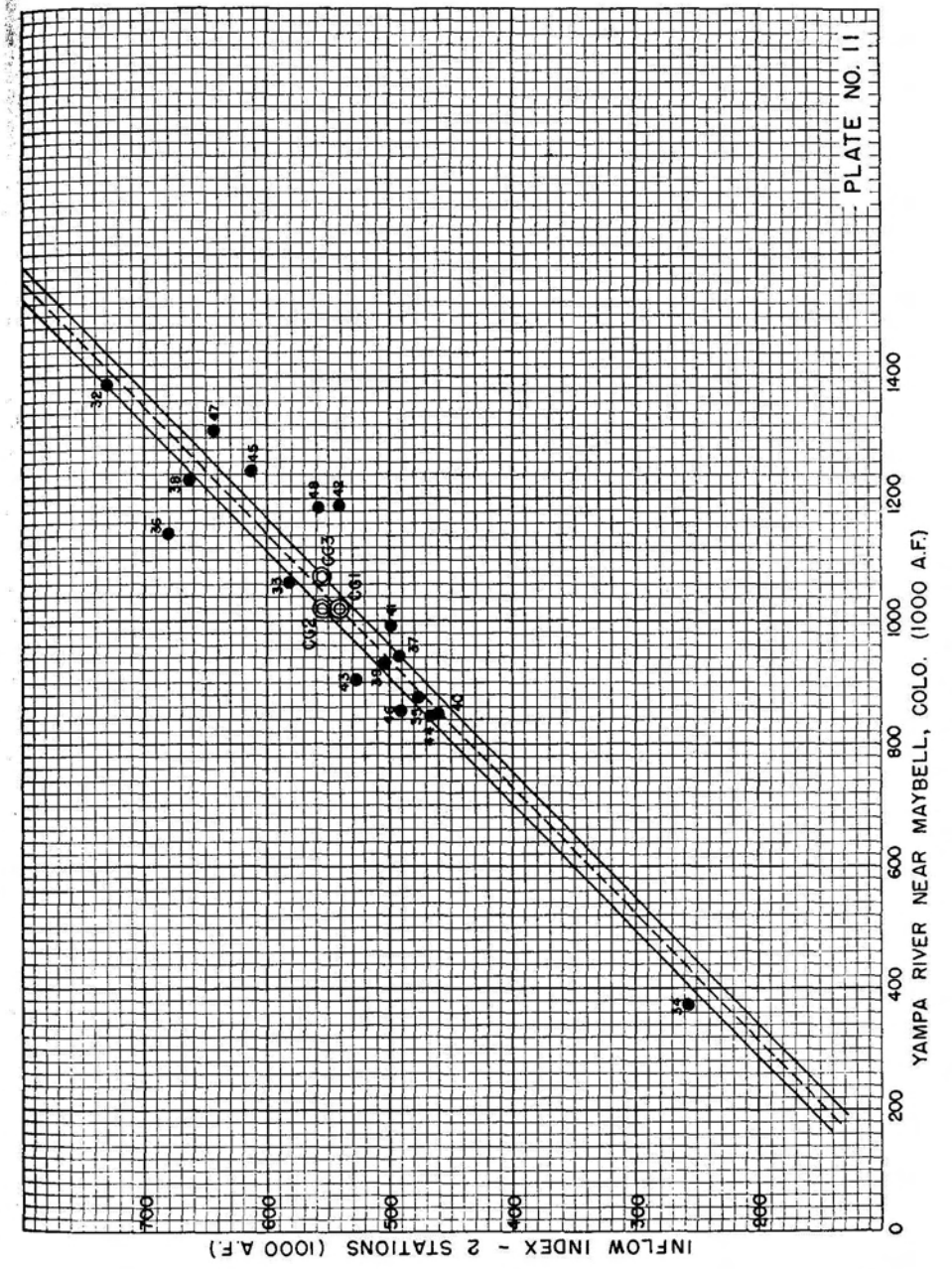


TABLE NO. 8
LITTLE SNAKE RIVER BASIN
Units 1000 Acre Feet

WATER YEAR	INFLOW - INDEX				OUTFLOW
	Little Snake R. near Slater	Savery Cr. near Savery	Slater Fk. near Slater	Sum	Little Snake R. near Lily
1942	180	95	61	336	461
43	155	61	45	261	340
44	146	80	50	276	391
45	200	108	79	387	479
46	152	58	45	255	324
AVERAGE	167	80	56	303	399
				7.2	30.2
ADJUSTED AVERAGE				310	429
Acres irrigated above station	2000	1400	1300		
Depletion rate - acre feet per acre	1.42	1.42	1.42		
Acres irrigated by by-passed water	10	130	0		
Irrigation depletions above station	2.8	2.0	1.8		
Estimated by-passed water	0	0.6	0		
ADJUSTMENT TO INFLOW-INDEX	2.8	2.6	1.8	7.2	
Depletion at sites of use above Lily					30.5
Present salvage above Lily					0.3
DEPLETION OF VIRGIN FLOW AT LILY					30.2

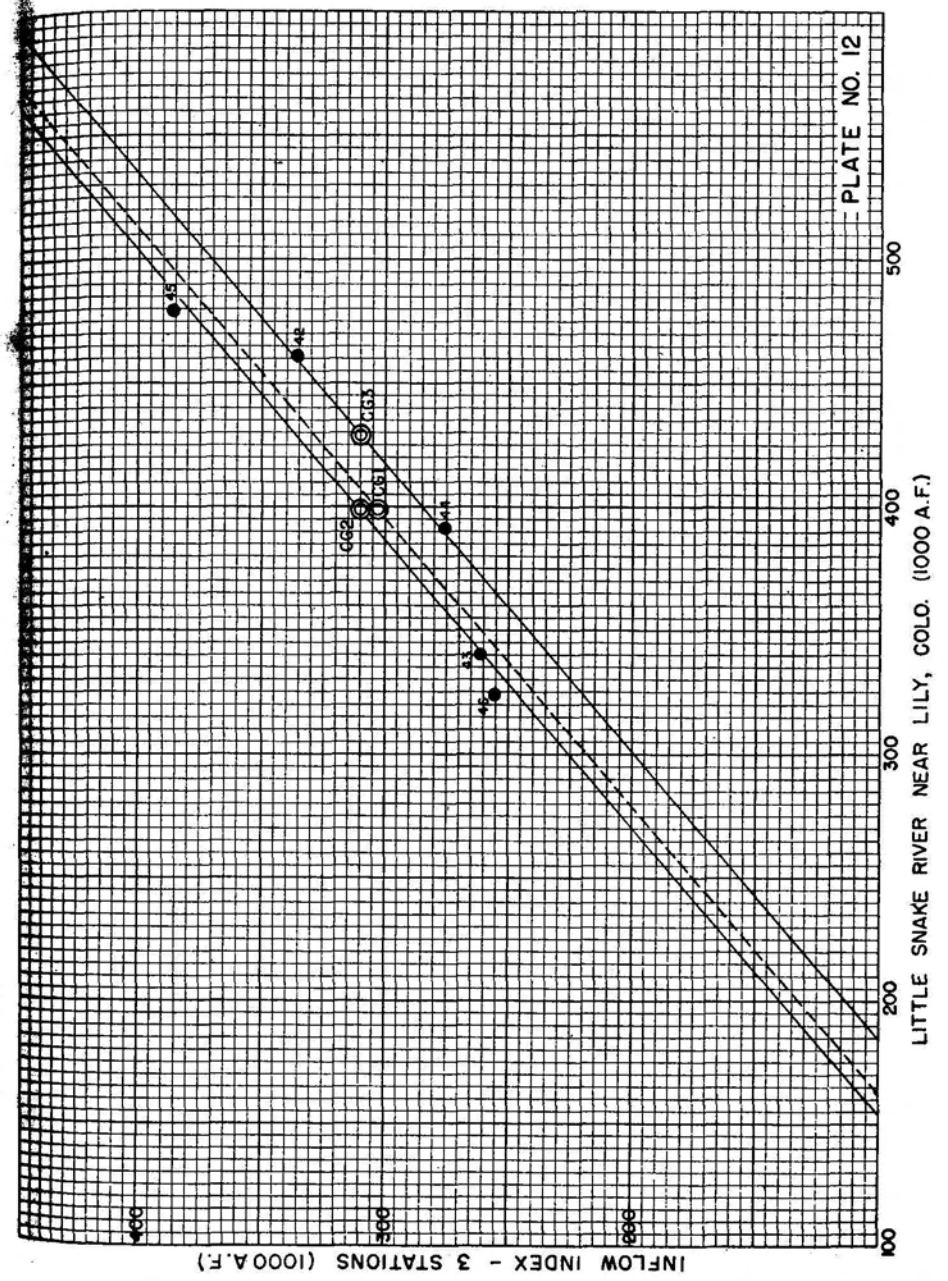


TABLE NO. 9
GREEN RIVER BASIN ABOVE LINWOOD
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX						OUTFLOW
	Green R. at Warren Br. near Daniel	N. Piney Cr. near Mason	Pine Cr. at Pinedale	Fontenelle Cr. near Fontenelle	Blacks Fork near Millburne	Sum	Green R. near Linwood
1932	375	* 45	* 100	* 55	c 116	691	1371
33	* 315	* 29	* 69	* 33	c 86	532	1054
34	209	* 18	* 28	* 7	c 53	315	396
35	319	● 34	78	28	c 94	553	917
36	433	● 52	103	66	c 91	745	1700
37	* 380	* 32	70	44	c 118	644	1368
38	394	* 43	115	51	c 121	724	1533
39	338	* 41	78	39	c 100	596	1132
1940	238	20	43	11	76	388	535
41	342	11	87	21	136	597	1255
42	392	27	94	19	* 119	651	1434
43	486	59	127	67	* 102	841	1938
44	375	36	77	36	* 110	634	1515
45	328	36	81	26	* 119	590	1304
46	345	40	90	44	103	622	1425
47	427	55	133	62	131	808	2235
48	341	40	67	46	104	598	1447
AVERAGE	355	36	85	38	105	619	1327
						36.2	193.6
ADJUSTED AVERAGE						655	1521
Acres irrigated above station	3600	620	200	3640	0		
Depletion rate - acre feet per acre	0.95	0.95	0.95	0.95			
Acres irrigated by by-passed water	500	200	5000	0	0		
Irrigation depletions above station	3.4	0.6	0.2	3.5			
Estimated by-passed water	2.5	1.0	25.0	0	0		
ADJUSTMENT TO INFLOW-INDEX	5.9	1.6	25.2	3.5	0	36.2	
Depletion at sites of use above Linwood							194.9
Present salvage above Linwood							1.3
DEPLETION OF VIRGIN FLOW AT LINWOOD							193.6

c = Estimated by correlation
* = Runoff estimated for winter months

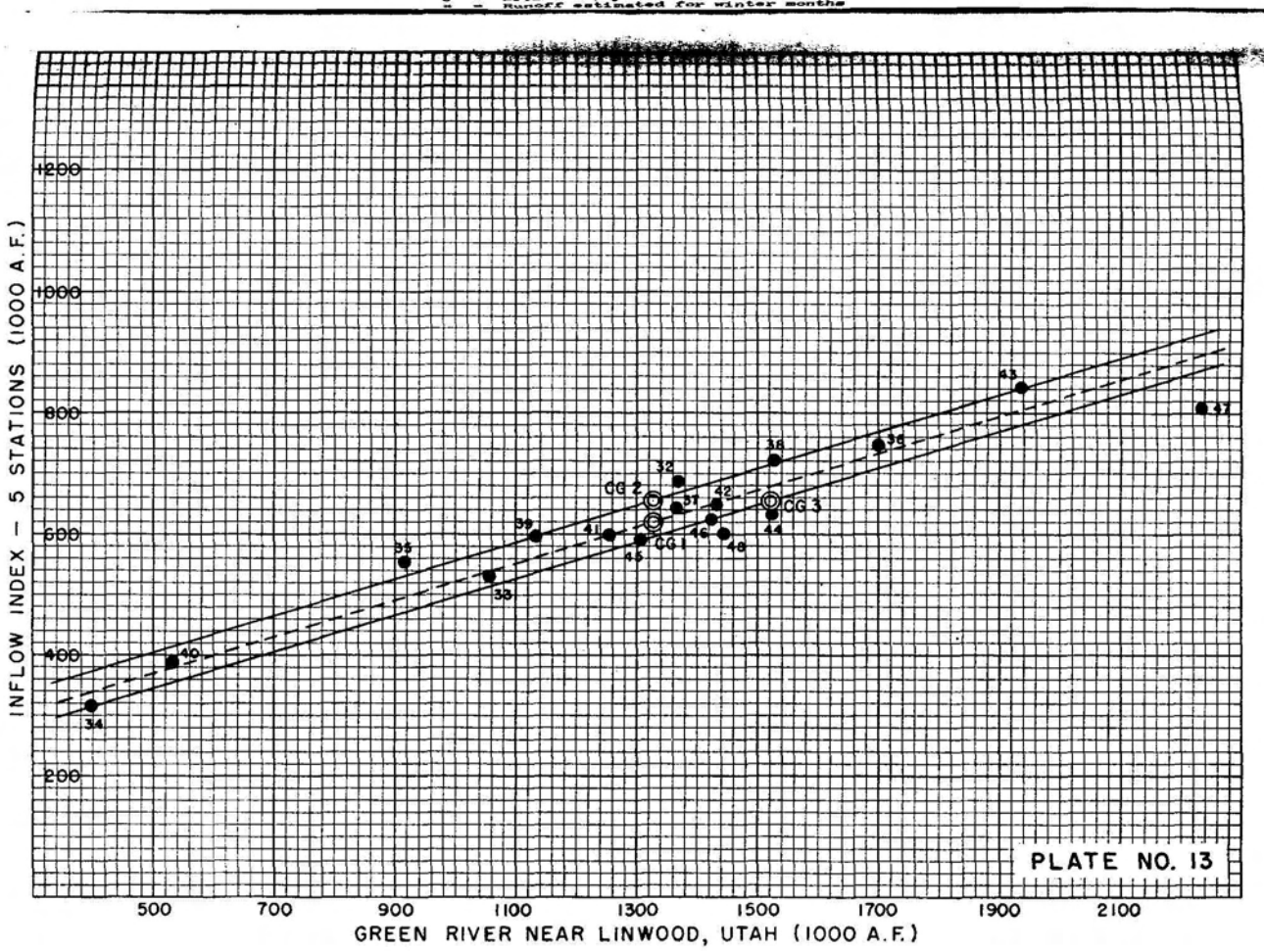


TABLE NO. 10
HENRYS FORK BASIN
Units 1000 Acre Feet

WATER YEAR	INFLOW-INDEX Henrys Fork near Lonetree	Burnt Fork near Burntfork	Sum	OUTFLOW Henrys Fork at Linwood
1929	c 46	c 37	83	105
1930	c 35	c 28	63	73
31	c 13	c 12	25	28
32	c 35	c 25	60	55
33	c 20	c 16	36	46
34	c 9	c 8	17	12
35	c 23	c 18	41	30
36	c 21	c 18	39	47
37	c 33	c 26	59	68
38	c 36	c 27	63	79
39	c 23	c 20	43	49
1940	c 16	c 14	30	26
41	c 41	c 32	73	73
42	c 35	c 28	63	85
43	* 22	* 17	39	43
44	* 41	* 34	75	87
45	* 35	* 22	57	68
46	20	14	34	47
47	34	28	62	88
48	25	22	47	52
AVERAGE	28	22	50	58
ADJUSTED AVERAGE				24.9 83

Depletion at sites of use above Linwood	24.9
Present salvage above Linwood	(a)
DEPLETION OF VIRGIN FLOW AT LINWOOD	24.9

(a) = Not estimated by Engineering Advisory Committee
c = Estimated by correlation
* = Runoff estimated for winter months

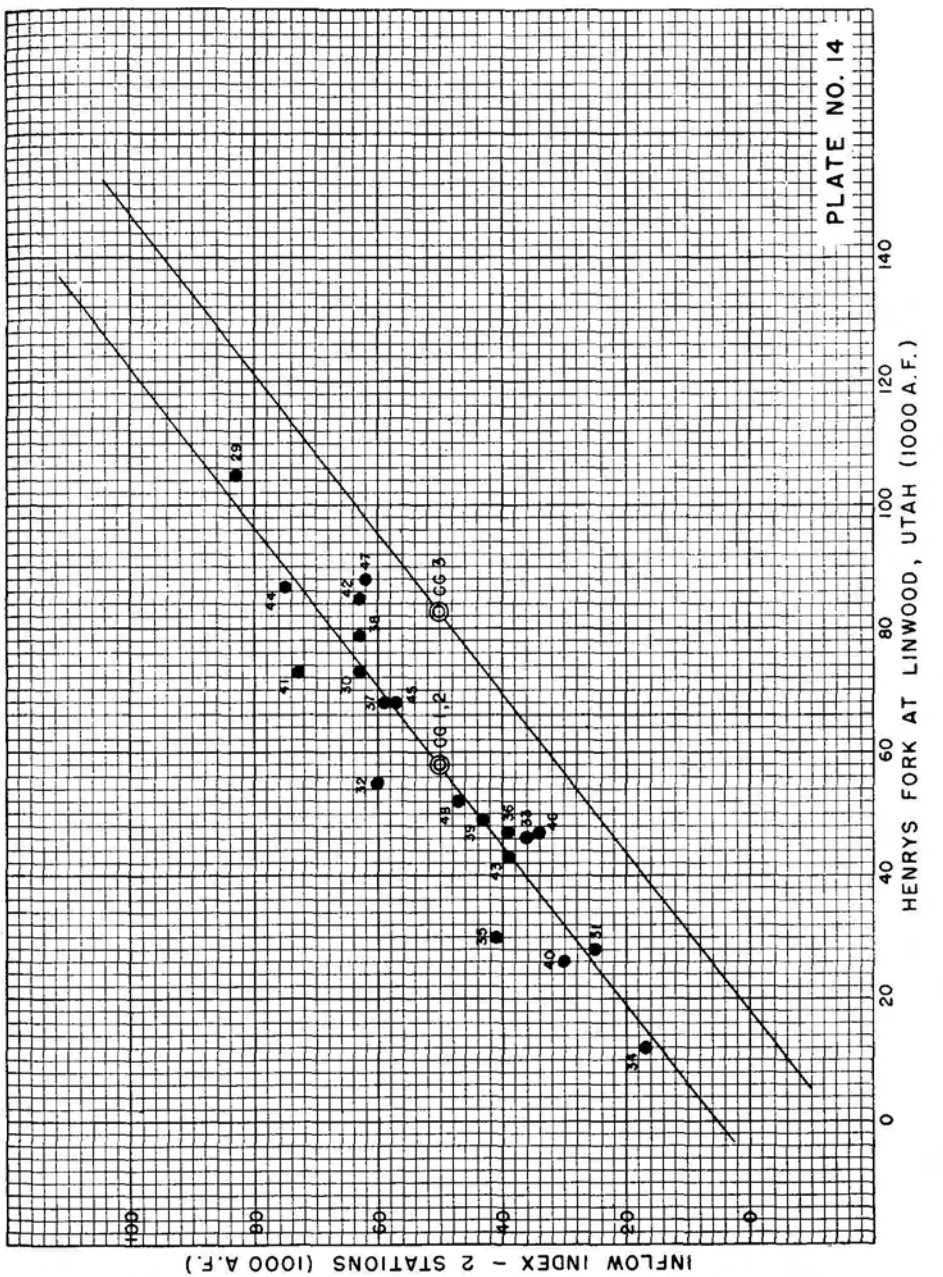


TABLE NO. 11
GREEN RIVER BASIN ABOVE GREEN RIVER UTAH
Below Major Developments in Colorado and Wyoming
Units 1000 Acre feet

WATER YEAR	INFLOW-INDEX											OUTFLOW
	White R. near Watson	Yampa R. near Maybell	Little Snake R. near Lily	Green R. near Linwood	Henrys Fork at Linwood	Ashley Cr. near Vernal	Duchesne R. near Tabiona	Strawberry R. at Duchesne	Price R. near Heiner	Transmountain Diversion Operation (a)	Sum	Green R. at Green R., Utah
1932	595	1388	758	1371	55	74	145	92	58	62	4598	4822
33	537	1061	538	1054	46	48	107	73	65	48	3577	3525
34	281	374	80	396	12	31	57	23	26	11	1291	1307
35	402	878	242	917	30	64	94	49	48	44	2768	2850
36	472	1144	356	1700	47	42	167	106	86	77	4197	4147
37	392	940	487	1368	68	79	158	148	113	82	3835	4134
38	599	1228	480	1533	79	77	162	117	93	69	4437	4747
39	448	930	303	1132	49	66	117	70	61	41	3217	3420
1940	388	847	260	535	26	54	96	49	53	35	2343	2376
41	552	990	395	1255	73	92	150	106	107	54	3774	4242
42	688	1189	461	1434	85	101	144	107	122	59	4390	4990
43	436	905	340	1938	43	63	181	103	70	73	4152	4270
44	446	851	391	1515	87	94	164	115	98	71	3832	4476
45	499	1243	479	1304	68	63	144	88	67	70	4025	4159
46	394	856	324	1425	47	47	144	78	54	65	3434	3469
47	569	1310	467	2235	88	92	178	97	65	64	5165	5484
48	528	1183	285	1447	52	68	125	65	63	54	3870	4146
AVERAGE											3700	3917
ADJUSTED AVERAGE											19.4 3719	401.6 4319
Acres irrigated above station						0	6915	3700	1000			
Depletion rate - acre feet per acre							1.60	1.60	1.70			
Irrigation depletions above stations						0	11.8	5.9	1.7		19.4	
ADJUSTMENT TO INFLOW-INDEX											19.4	
Depletion at sites of use below Colorado and Wyoming developments and above Green River, Utah												415.8
Present salvage in area												14.2
DEPLETION OF VIRGIN FLOW IN AREA												401.6

(a) - Information from Region IV, U.S.B.R.

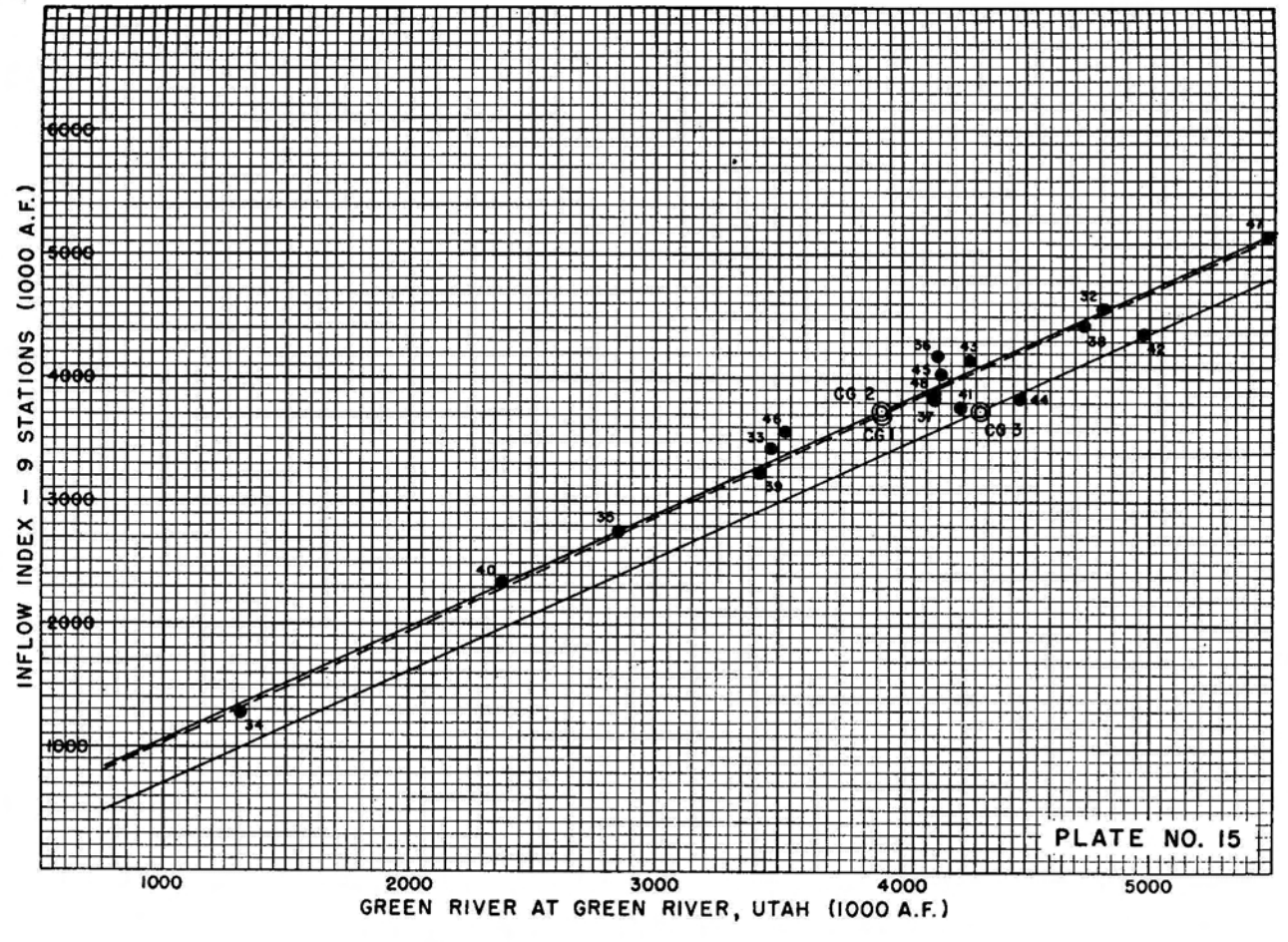
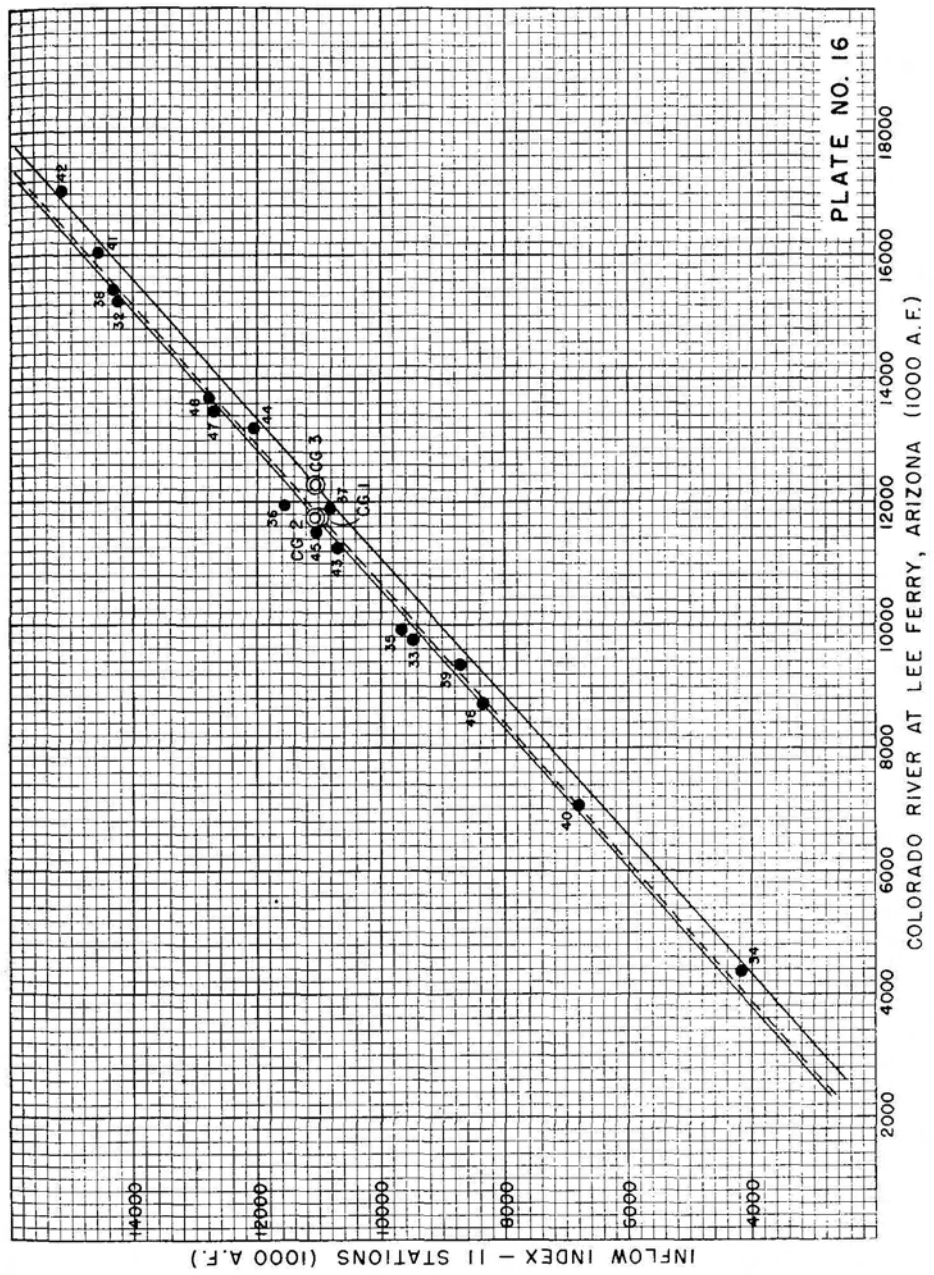


TABLE NO. 12
COLORADO RIVER BASIN ABOVE LEE FERRY
Below Major Developments in Colorado, Wyoming, New Mexico and Arizona
Units - 1000 Acre Feet

WATER YEAR	INFLOW-INDEX				OUTFLOW
	Sum-Inflow-Indices (Table No. 11)	Colo. R. near Cisco	San Juan R. near Bluff	Sum	Colorado R. at Lee Ferry
1932	4598	6687	2948	14233	15286
33	3577	4631	1242	9450	9745
34	1291	2220	662	4173	4396
35	2768	4681	2183	9632	9912
36	4197	5766	1631	11594	11970
37	3835	4664	2336	10835	11897
38	4437	7422	2466	14325	15440
39	3217	4252	1239	8708	9394
1940	2343	3463	996	6802	7082
41	3774	6576	4242	14592	16052
42	4390	7706	3078	15174	17029
43	4152	5137	1445	10734	11263
44	3832	5903	2289	12024	13221
45	4025	5406	1620	11051	11545
46	3434	4062	865	8361	8745
47	5165	6051	1488	12704	13515
48	3870	6587	2319	12776	13689
AVERAGE				11010	11775
Adjustment				(a)19.4	500.2
ADJUSTED AVERAGE				11029	12275

Depletion at sites of use in area and above Lee Ferry	537.3
Present salvage in area	37.1
DEPLETION OF VIRGIN FLOW IN AREA	500.2

(a) From Table No. 11



RECOMMENDATIONS

The Engineering Advisory Committee recommends that:

A. In General:

1. The Commission follow the basic procedure herein outlined as a means of measuring depletions by the inflow-outflow methods until refinements or changes are made and agreed to by the Commission.

2. As records of run-off are accumulated the basic procedure be checked and relationships extended for the river sections covered by this report.

3. Studies be made by the Commission in regard to:

   a. Other areas and river sections which may require inflow-outflow relationships.

   b. Segregation of depletions between states in sections where more than one state is involved and where the water leaving the states passes through common carrier channels.

   c. A determination of virgin conditions, throughout the variation of meteorological conditions that can reasonably be expected.

4. Where new gaging stations are constructed to replace old ones, all be maintained concurrently for as long a period as necessary to establish a reliable correlation between the records of these stations.

B. Specifically:

1. The following existing stations were utilized in the determination of the inflow-outflow relationships described herein and should be retained for compact administrative purposes:

   a. LaPlata River at Hesperus, Colorado
   b. LaPlata River at Colorado-New Mexico State Line
   c. Animas River at Durango, Colorado
   d. Florida River near Durango, Colorado
   e. Animas River near Cedar Hill, New Mexico

   f. Los Pinos River near Bayfield, Colorado
   g. Los Pinos River at Ignacio, Colorado
   h. San Juan River at Pagosa Springs, Colorado
   i. Navajo River at Edith, Colorado
   j. San Juan River at Rosa, New Mexico
   k. Dolores River at Dolores, Colorado
   l. Uncompahgre River near Colona, Colorado
   m. Taylor River at Almont, Colorado
   n. East River at Almont, Colorado
   o. Roaring Fork at Aspen, Colorado
   p. Ten Mile Creek at Dillon, Colorado
   q. Blue River at Dillon, Colorado
   r. Colorado River at Hot Sulphur Springs, Colorado
   s. White River near Meeker, Colorado
   t. White River near Watson, Utah
   u. Yampa River at Steamboat Springs, Colorado
   v. Elk River at Clark, Colorado
   w. Yampa River near Maybell, Colorado
   x. Little Snake River near Slater, Colorado
   y. Slater Fork near Slater, Colorado
   z. Savery Creek near Savery, Wyoming
   aa. Little Snake River near Dixon, Wyoming
   bb. Little Snake River near Lily, Colorado
   cc. Pine Creek at Pinedale, Wyoming
   dd. Green River at Warren Bridge near Daniel, Wyoming
   ee. North Piney Creek near Mason, Wyoming
   ff. Fontenelle Creek near Fontenelle, Wyoming
   gg. Black's Fork near Millburne, Wyoming
   hh. Green River near Linwood, Utah
   ii. Henry's Fork near Lonetree, Wyoming
   jj. Burnt Fork near Burntfork, Wyoming
   kk. Henry's Fork at Linwood, Utah
   ll. Ashley Creek near Vernal, Utah
   mm. Duchesne River near Tabiona, Utah
   nn. Strawberry River at Duchesne, Utah
   oo. Price River near Heiner, Utah
   pp. Green River at Green River, Utah
   qq. Colorado River near Cisco, Utah
   rr. San Juan River near Bluff, Utah
   ss. Colorado River at Lees Ferry, Arizona
   tt. Paria River at Lees Ferry, Arizona

2. The following gaging stations which have been discontinued, be re-established:

   a. South Fork White River near Buford, Colorado

b. North Fork White River near Buford, Colorado
c. McElmo Creek near Cortez, Colorado
d. Mancos River near Towaoc, Colorado
e. Green River at Green River, Wyoming

3. New gaging stations as follows be established:

a. Colorado River near Colorado-Utah State Line
b. Los Pinos River near Colorado-New Mexico State Line
c. McElmo Creek near Colorado-Utah State Line
d. Pine Creek near Fremont Lake, Wyoming
e. Fontenelle Creek above irrigation
f. Ham's Fork above irrigation
g. Dirty Devil near mouth
h. San Rafael near mouth

APPENDIX

Statistical Method for Virgin Condition Correlations

Many of the early records of stream discharge in the basin were obtained under less favorable conditions than is the case in more recent years. In many instances, also, it was necessary to complete partial or missing records by estimating. A frequent necessity was that of extending records back for years on numerous tributary streams as well as at some points on the main river when discharge records were only for short periods. This was accomplished by correlations with flow at stations with longer records and usually with satisfactory results. For the present purpose, however, shorter series of years are used since a larger number of index stations can then be selected, including but few estimated values of discharge.

Example of Method as Applied to a Sub-Basin

Perhaps the best procedure for illustrating the methods used in deriving the correlation curves between inflows and outflows shown in the report is by the use of a typical example.

The data relative to which are shown in Table No. 5, Plate No. 8, and which has been previously presented as showing the inflow-outflow relationship for the Colorado River Basin above Cisco, Utah, is an example where both irrigation depletions and transmountain diversions are made above the inflow-index stations. Depletions above these stations due to irrigation have been comparatively constant from year to year during the period of correlation. However, during the same period the annual transmountain diversions made above the inflow-index stations varied between 11,000 acre-feet and 117,000 acre-feet.

The starting point for determining the inflow-outflow relationship was the correlation of historic data for selected inflow and outflow stations. In this case the annual amounts of transmountain diversions above the inflow stations were added to the recorded flows at those stations before the original correlation was made. The average of such adjusted inflow-indices was then plotted against the average of the outflows for the period of correlation as indicated by the point labeled C.G.1. The slope of the curve through the point C.G.1 was calculated from the annual data, and the coefficient of determination for this historic relationship computed to be 0.915. This shows in general 91.5 percent of the variation in outflow is due to corresponding variation in the inflow-index.

The correction for the smaller, more constant depletion due to irrigation was then applied to the average point described above, resulting in a point C.G.2, which is the point from which the average virgin relationship for the period may be determined.

The average of the transmountain diversions made in the entire basin above Cisco for the period of correlation, together with the average of all other man-made depletions in that basin were used in determining the point representing average virgin flow at Cisco for that period.

In the final report of the Engineering Advisory Committee the estimated average depletion at sites of use, due to irrigation, municipal uses, and reservoir evaporation losses, is given as 840,000 acre-feet. The salvage in the basin was also estimated to be 29,900 acre-feet. The average of the transmountain diversions made above Cisco is 79,500 acre-feet for the period of correlation. The sum of the average transmountain diversions and the average depletion at sites of use, minus the estimated salvage, is the average depletion of the virgin flow at Cisco for the period, which in this case amounts to 889,600 acre-feet.

A distance representing this amount was therefore laid off by scale to the right of C.G.2 and marked C.G.3. Lines were then drawn through the points C.G.1, C.G.2, and C.G.3 on the slope previously determined for the historic correlation, to indicate the probable relationship between virgin inflow-index and virgin outflow quantities. As stated in the description of the inflow-outflow curves previously presented, this virgin flow curve may not be exactly parallel to the historic trend lines, but until further data are obtained these curves may be used with reasonable results.

Inflow Stations Required for Index

Throughout the Colorado River Basin there are a few rim gaging stations with long records concurrent with outflow records. Correlations may be established for long periods by using the stations available, including some estimated values to complete missing portions of the record. A considerable number of additional stations have been installed on various tributaries in recent years. A study was made to determine the effect on a basic inflow-outflow relationship of the addition of more rim gaging stations to the original inflow-index, or the substitution of gaging stations for some which were used in the basic correlation.

The Colorado River Basin above Cisco was selected as an example, and the comparative results of the study are shown in the following tabulation:

Number of Inflow-Index Stations	Period of Correlation	Coefficient of Determination	Ratio of Inflow-Index to Outflow
9	1914-1947	0.952	31%
9	1939-1947	0.957	31%
15	1939-1947	0.966	46%
11	1939-1947	0.946	29%

A basic relationship between inflow-index at selected rim stations and outflow of the Colorado River at the gaging station near Cisco, Utah, was determined for the period 1914-1947. No corrections other than for annual transmountain diversions above them were made to the recorded flows at the index stations in determining this relation. The coefficient of determination (r^2), computed by least squares for the relation for individual years, is 0.952. Total corrected run-off at the inflow stations was about 31 percent of the run-off at Cisco for the period.

The inflow stations were selected primarily because of the long period of recorded run-off, rather than that they were ideally located to represent index inflow. The following tabulation lists the inflow stations used in the basic correlation, together with the approximate areas irrigated both above the gage and by water bypassing the gage. These areas were determined by a study of the U.S.B.R. land classification plane table sheets.

Gaging Stations	Acres Irrigated	
	Above Gage	By water Bypassing Gage
Colorado River near Hot Sulphur Springs	12,710	140
Blue River at Dillon	143	0
Roaring Fork at Aspen	120	2,100
Plateau Creek near Collbran plus Buzzard Creek near Collbran	2,180	410
East River at Almont	7,360	0
Taylor River at Almont	360	0
Uncompahgre River at Colona	15,510	1,502
Dolores River at Dolores	2,525	0

By 1939 a number of gaging stations had been established on other tributaries of the Colorado River above Cisco. In order to determine the effect on the inflow-outflow relationship of the addition of inflow stations a correlation was first made between the combined run-off of the stations listed above and the run-off at the outflow station near Cisco for the period 1939-1947. It was assumed that no significant changes had occurred in acreages irrigated above the gages or in the amounts of bypassed water for the long or short periods. Run-off at the inflow stations was corrected for annual transmountain diversions above the stations. For this correlation, $r^2 = 0.957$. The combined corrected run-off of the inflow stations represents about 31 percent of the outflow run-off for the period.

A second annual correlation for the period 1939-1947 was made between inflow-index run-off and outflow run-off at Cisco. The combined run-off of the following gaging stations was added to that of the stations listed above.

Gaging Stations	Acres Irrigated	
	Above Gage	By water Bypassing Gage
Williams River near Leal	50	40
Snake River at Dillon	225	18,000 acre-feet (for power)
Ten Mile Creek at Dillon	201	0
Crystal River near Redstone	115	2,040
North Fork Gunnison River near Somerset	3,207	0
Tomichi Creek near Sargents	1,940	0

This group of inflow stations, together with those listed above, includes gaging stations on the important tributaries of the Colorado River system above Cisco, with the exception of the Eagle River and the Lake Fork of the Gunnison River. Corrections to the recorded run-off at the inflow stations were made for transmountain diversions as for the other correlations. No corrections were made for diversions above or bypassing the stations. The values for r^2, as computed for this correlation was 0.966. Total run-off of the inflow stations was approximately 46 per cent of the run-off at the outflow station near Cisco.

Of the inflow stations represented in the latter correlation, there are some with considerable areas irrigated above the gages or

comparatively large amounts of water bypassing the gages. In some instances it might be difficult to determine whether changes had occurred in depletions above the gages, or it might be expensive to make measurements of water bypassing the gages. As an example, the Granby and Shadow Mountain Lake Reservoirs, which are regulatory reservoirs for the Colorado-Big Thompson Transmountain Diversion Project, are being constructed above the gage on the Colorado River at Hot Sulphur Springs, Colorado. In the future, the record at Hot Sulphur Springs must necessarily be corrected for the operation of these reservoirs, including the net evaporation losses resulting from their operation.

A third correlation, for the 1939-1947 period was therefore made to ascertain the effect of eliminating some of the stations, or substituting other stations higher on the streams, so that the major portion of the consumptive uses would occur below the inflow stations and thus be automatically integrated into the inflow-outflow relationship. For this analysis, the stations on Colorado River near Grand Lake and Fraser River at Winter Park were substituted for Colorado River at Hot Sulphur Springs and the stations on Snake River at Dillon, Crystal River near Redstone, Uncompahgre River at Colona, and Buzzard and Plateau Creeks near Collbran were eliminated. Such elimination would preclude the necessity for measuring winter flows around Snake River at Dillon or for measuring bypassed water at Colona and Redstone in several ditches. The inflow stations used for the third correlation are listed in the following table:

Gaging Stations	Acres Irrigated	
	Above Gage	By water Bypassing Gage
Colorado River near Grand Lake	200	2,430
Fraser River at Winter Park	0	0
Blue River at Dillon	143	0
Ten Mile Creek at Dillon	201	0
Williams River near Leal	50	40
Roaring Fork at Aspen	120	2,100
East River at Almont	7,360	0
North Fork Gunnison River near Somerset	360	0
Tomichi Creek near Sargents	1,940	0
Dolores River at Dolores	2,525	0

The value for r^2 in this correlation was 0.946, with the total run-off at the inflow stations representing 29 percent of the total outflow as compared with the ratio of 31 percent for the first correlation and 46 percent for the second.

The coefficient of determination for the third correlation is not significantly different from the coefficients for the other correlations for the 1939-1947 period, indicating that the final list of 11 stations would form the basis of a satisfactory inflow-outflow relationship. At the same time the list included only two stations with any considerable amounts of water bypassing them, and in each instance the major portion of this water may be measured in one canal. The irrigated areas above each of the stations is of the native hay meadow type, and these areas have become practically stabilized over a long period of years. Consumptive uses for presently contemplated projects, exclusive of transmountain diversions, will occur in most instances below the inflow stations.

The addition of a station which has been re-established on North Inlet to Grand Lake and stations above principal diversions on Crystal River and Eagle River might strengthen the relationship by increasing the ratio of total measured inflow to recorded outflow.

In any instance of the addition or elimination of inflow stations from those used as an original basis, the stations whch are eliminated should be continued in operation for a sufficient length of time to permit correlations to be made so that the relations shown by any selected new group of inflow stations may be used in lieu of the original relation to insure continuity over a long period of time.

APPENDIX M

TREATY BETWEEN THE UNITED STATES AND MEXICO

The Government of the United States of America and the Government of the United Mexican States: animated by the sincere spirit of cordiality and friendly cooperation which happily governs the relations between them; taking into account the fact that Articles VI and VII of the Treaty of Peace, Friendship and Limits between the United States of America and the United Mexican States signed at Guadalupe Hidalgo on February 2, 1848, (*) and Article IV of the boundary treaty between the two countries signed at the City of Mexico December 30, 1853 (**) regulate the use of the waters of the Rio Grande (Rio Bravo) and the Colorado River for purposes of navigation only; considering that the utilization of these waters for other purposes is desirable in the interests of both countries, and desiring, moreover, to fix and delimit the rights of the two countries with respect to the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, United States of America, to the Gulf of Mexico, in order to obtain the most complete and satisfactory utilization thereof, have resolved to conclude a treaty and for this purpose have named as their plenipotentiaries:

The President of the United States of America:

Cordell Hull, Secretary of State of the United States of America, George S. Messersmith, Ambassador Extraordinary and Plenipotentiary of the United States of America in Mexico, and Lawrence M. Lawson, United States Commissioner, International Boundary Commission, United States and Mexico; and

The President of the United Mexican States:

Francisco Castillo Najera, Ambassador Extraordinary and Plenipotentiary of the United Mexican States in Washington, and Rafael Fernandez MacGregor, Mexican Commissioner, International Boundary Commission, United States and Mexico; who, having communicated to each other their respective Full Powers and having found them in good and due form, have agreed upon the following:

* (Treaty Series 207; 9 Stat. 922; 18 Stat. (pt. 2, Public Treaties) 492.)
**(Treaty Series 208; 10 Stat. 1031; 18 Stat. (pt. 2, Public Treaties) 503.)

1—PRELIMINARY PROVISIONS

ARTICLE 1

For the purposes of this Treaty it shall be understood that:

(a) "The United States" means the United States of America.

(b) "Mexico" means the United Mexican States.

(c) "The Commission" means the International Boundary and Water Commission, United States and Mexico, as described in Article 2 of this Treaty.

(d) "To divert" means the deliberate act of taking water from any channel in order to convey it elsewhere for storage, or to utilize it for domestic, agricultural, stock-raising or industrial purposes whether this be done by means of dams across the channel, partition weirs, lateral intakes, pumps or any other methods.

(e) "Point of diversion" means the place where the act of diverting the water is effected.

(f) "Conservation capacity of storage reservoirs" means that part of their total capacity devoted to holding and conserving the water for disposal thereof as and when required, that is, capacity additional to that provided for silt retention and flood control.

(g) "Flood discharges and spills" means the voluntary or involuntary discharge of water for flood control as distinguished from releases for other purposes.

(h) "Return flow" means that portion of diverted water that eventually finds it way back to the source from which it was diverted.

(i) "Release" means the deliberate discharge of stored water for conveyance elsewhere or for direct utilization.

(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.

(k) "Lowest major international dam or reservoir" means the major international dam or reservoir situated farthest downstream.

(l) "Highest major international dam or reservoir" means the major international dam or reservoir situated farthest upstream.

ARTICLE 2

The International Boundary Commission established pursuant to the provisions of the Convention between the United States and Mexico signed in Washington March 1, 1889 (*) to facilitate the carrying out of the principles contained in the Treaty of November 12, 1884 (**) and to avoid dfficulties occasioned by reason of the changes which take place in the beds of the Rio Grande (Rio Bravo) and the Colorado River shall hereafter be known as the International Boundary and Water Commission, United States and Mexico, which shall continue to function for the entire period during which the present Treaty shall continue in force. Accordingly, the term of the Convention of March 1, 1889 shall be considered to be indefinitely extended, and the Convention of November 21, 1900 (***) between the United States and Mexico regarding that Convention shall be considered completely terminated.

The application of the present Treaty, the regulation and exercise of the rights and obligations which the two Governments assume thereunder, and the settlement of all disputes to which its observance and execution may give rise are hereby entrusted to the International Boundary and Water Commission, which shall function in conformity with the powers and limitations set forth in this Treaty.

The Commission shall in all respects have the status of an international body, and shall consist of a United States section and a Mexican Section. The head of each Section shall be an Engineer Commissioner. Wherever there are provisions in this Treaty for joint action or joint agreement by the two Governments, or for

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* (Treaty Series 232; 26 Stat. 1512.)
** (Treaty Series 226; 24 Stat. 1011.)
***(Treaty Series 244; 31 Stat. 1936.)

the furnishing of reports, studies or plans to the two Governments, or similar provisions, it shall be understood that the particular matter in question shall be handled by or through the Department of State of the United States and the Ministry of Foreign Relations of Mexico.

The Commission or either or its two Sections may employ such assistants and engineering and legal advisers as it may deem necessary. Each Government shall accord diplomatic status to the Commissioner, designated by the other Government. The Commissioner, two principal engineers, a legal adviser, and a secretary, designated by each Government as members of its Section of the Commission, shall be entitled in the territory of the other country to the privileges and immunities appertaining to diplomatc officers. The Commission and its personnel may freely carry out their observations, studies and field work in the territory of either country.

The jurisdiction of the Commission shall extend to the limitrophe parts of the Rio Grande (Rio Bravo) and the Colorado River, to the land boundary between the two countries, and to works located upon their common boundary, each Section of the Commission retaining jurisdiction over that part of the works located within the limits of its own country. Neither Section shall assume jurisdiction or control over works located within the limits of the country of the other without the express consent of the Government of the latter. The works constructed, acquired or used in fulfillment of the provisions of this Treaty and located wholly within the territorial limits of either country, although these works may be international in character, shall remain, except as herein otherwise specfically provided, under the exclusive jurisdiction and control of the Section of the Commission in whose country the works may be situated.

The duties and powers vested in the Commission by this Treaty shall be in addition to those vested in the International Boundary Commisson by the Convention of March 1, 1889 and other pertinent treaties and agreements in force between the two countries except as the provisions of any of them may be modified by the present Treaty.

Each Government shall bear the expenses incurred in the maintenance of its Section of the Commission. The joint expenses, which may be incurred as agreed upon by the Commission, shall be borne equally by the two Governments.

ARTICLE 3

In matters in which the Commission may be called upon to make provision for the joint use of international waters, the following order of preferences shall serve as a guide:

1. Domestic and municipal uses.
2. Agriculture and stock-raising.
3. Electric power.
4. Other industrial uses.
5. Navigation.
6. Fishing and hunting.
7. Any other beneficial uses which may be determined by the Commission.

All of the foregoing uses shall be subject to any sanitary measures or works which may be mutually agreed upon by the two Governments, which hereby agree to give preferential attention to the solution of all border sanitation problems.

II—RIO GRANDE (RIO BRAVO)

ARTICLE 4

The waters of the Rio Grande (Rio Bravo) between Fort Quitman, Texas and the Gulf of Mexico are hereby allotted to the two countries in the following manner:

A. To Mexico:

(a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the San Juan and Alamo Rivers, including the return flow from the lands irrigated from the latter two rivers.

(b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries.

(c) Two-thirds of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, subject to the provisions of subparagraph (c) of Paragraph B of this Article.

(d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

B. To the United States:

(a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the Pecos and Devils Rivers, Goodenough Spring, and Alamito, Terlingua, San Felipe and Pinto Creeks.

(b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries.

(c) One-third of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, provided that this third shall not be less, as an average amount in cycles of five consecutive years, than 350,000 acre-feet (431,721,000 cubic meters) annually. The United States shall not acquire any right by the use of the waters of the tributaries named in this subparagraph, in excess of the said 350,000 acre-feet (431,721,000 cubic meters) annually, except the right to use one-third of the flow reaching the Rio Grande (Rio Bravo) from said tributaries, although such one-third may be in excess of that amount.

(d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

In the event of extraordinary drought or serious accident to the hydraulic systems on the measured Mexican tributaries, making it difficult for Mexico to make available the run-off of 350,000 acre-feet (431,721,000 cubic meters) annually, allotted in subparagraph (c) of Paragraph B of this Article to the United States as the minimum contribution from the aforesaid Mexican tributaries, any deficiencies existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle with water from the said measured tributaries.

Whenever the conservation capacities assigned to the United States in at least two of the major international reservoirs, including the highest major reservoir, are filled with waters belonging to the United States, a cycle of five years shall be considered as terminated and all debits fully paid, whereupon a new five-year cycle shall commence.

ARTICLE 5

The two Governments agree to construct jointly, through their respective Sections of the Commission, the following works in the main channel of the Rio Grande (Rio Bravo):

I. The dams required for the conservation, storage and regulation of the greatest quantity of the annual flow of the river in a way to ensure the continuance of existing uses and the development of the greatest number of feasible projects, within the limits imposed by the water allotments specified.

II. The dams and other joint works required for the diversion of the flow of the Rio Grande (Rio Bravo).

One of the storage dams shall be constructed in the section between Santa Helena Canyon and the mouth of the Pecas River; one in the section between Eagle Pass and Laredo, Texas (Piedras Negras and Neuvo Laredo in Mexico); and a third in the section between Laredo and Roma, Texas (Neuvo Laredo and San Pedro de Roma in Mexico). One or more of the stipulated dams may be omitted, and others than those enumerated may be built, in either case as may be determined by the commission, subject to the approval of the two Governments.

In planning the construction of such dams the Commission shall determine:

(a) The most feasible sites;

(b) The maximum feasible reservoir capacity at each site;

(c) The conservation capacity required by each country at each site, taking into consideration the amount and regimen of its allotment of water and its contemplated uses;

(d) The capacity required for retention of silt;

(e) The capacity required for flood control.

The conservation and silt capacities of each reservoir shall be assigned to each country in the same proportion as the capacities required by each country in such reservoir for conservation purposes. Each country shall have an undivided interest in the flood control capacity of each reservoir.

The construction of the international storage dams shall start within two years following the approval of the respective plans by the two Governments. The works shall begin with the construction of the lowest major international storage dam, but works in the upper reaches of the river may be constructed simultaneously. The lowest major international storage dam shall be completed within a period of eight years from the date of the entry into force of this Treaty.

The construction of the dams and other joint works required for the diversion of the flows of the river shall be initiated on the dates recommended by the Commission and approved by the two Governments.

The cost of construction, operation and maintenance of each of the international storage dams shall be prorated between the two Governments in proportion to the capacity allotted to each country for conservation purposes in the reservoir at such dam.

The cost of construction, operation and maintenance of each of the dams and other joint works required for the diversion of the flows of the river shall be prorated between the two Governments in proportion to the benefits which the respective countries receive therefrom, as determined by the Commission and approved by the two governments.

ARTICLE 6

The Commission shall study, investigate, and prepare plans for flood control works, where and when necessary, other than those

referred to in Article 5 of this Treaty, on the Rio Grande (Rio Bravo) from Fort Quitman, Texas to the Gulf of Mexico. These works may include levees along the river, floodways and grade-control structures, and works for the canalization, rectification and artificial channeling of reaches of the river. The Commission shall report to the two Governments the works which should be built, the estimated cost thereof, the part of the works to be constructed by each Government, and the part of the works to be operated and maintained by each Section of the Commission. Each Government agrees to construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments. Each Government shall pay the costs of the works constructed by it and the costs of operation and maintenance of the part of the works assigned to it for such purpose.

ARTICLE 7

The commission shall study, investigate and prepare plans for plants for generating hydro-electric energy which it may be feasible to construct at the international storage dams on the Rio Grande (Rio Bravo). The Commission shall report to the two Governments in a Minute the works which should be built, the estimated cost thereof, and the part of the works to be constructed by each Government. Each Government agrees to construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments. Both Governments, through their respective Sections of the Commission, shall operate and maintain jointly such hydro-electric plants. Each Government shall pay half the cost of the construction, operation and maintenance of such plants, and the energy generated shall be assigned to each country in like proportion.

ARTICLE 8

The two governments recognize that both countries have a common interest in the conservation and storage of waters in the international reservoirs and in the maximum use of these structures for the purpose of obtaining the most beneficial, regular and constant use of the waters belonging to them. Accordingly, within the year following the placing in operation of the first of the major international storage dams which is constructed, the Commission shall submit to each Government for its approval, regulations for the storage, conveyance and delivery of the waters of the Rio Grande (Rio Bravo) from Fort Quitman, Texas to the Gulf of

Mexico. Such regulations may be modified, amended or supplemented when necessary by the Commission, subject to the approval of the two Governments. The following general rules shall severally govern until modified or amended by agreement of the Commission, with the approval of the two Governments:

(a) Storage in all major international reservoirs above the lowest shall be maintained at the maximum possible water level, consistent with flood control, irrigation use and power requirements.

(b) Inflows to each reservoir shall be credited to each country in accordance with the ownership of such inflows.

(c) In any reservoir the ownership of water belonging to the country whose conservation capacity therein is filled, and in excess of that needed to keep it filled, shall pass to the other country to the extent that such country may have unfilled conservation capacity, except that one country may at its option temporarily use the conservation capacity of the other country not currently being used in any of the upper reservoirs; provided that in the event of flood discharge or spill occurring while one country is using the conservation capacity of the other, all of such flood discharge or spill shall be charged to the country using the other's capacity, and all inflow shall be credited to the other country until the flood discharge or spill ceases or until the capacity of the other country becomes filled with its own water.

(d) Reservoir losses shall be charged in proportion to the ownership of water in storage. Releases from any reservoir shall be charged to the country requesting them, except that releases for the generation of electrical energy, or other common purpose, shall be charged in proportion to the ownership of water in storage.

(e) Flood discharges and spills from the upper reservoirs shall be divided in the same proportion as the ownership of the inflows occurring at the time of such flood discharges and spills, except as provided in subparagraph (c) of this Article. Flood discharges and spills from the lowest reservoir shall be divided equally, except that one country, with the consent of the Commission, may use such part of the share of the other country as is not used by the latter country.

(f) Either of the two countries may avail itself, whenever it so desires, of any water belonging to it and stored in the international reservoirs, provided that the water so taken is for direct beneficial use or for storage in other reservoirs. For this purpose the Commissioner of the respective country shall give appropriate notice to the Commission, which shall prescribe the proper measures for the opportune furnishing of the water.

ARTICLE 9

(a) The channel of the Rio Grande (Rio Bravo) may be used by either of the two countries to convey water belonging to it.

(b) Either of the two countries may, at any point on the main channel of the river from Fort Quitman, Texas to the Gulf of Mexico, divert and use the water belonging to it and may for this purpose construct any necessary works. However, no such diversion or use, not existing on the date this Treaty enters into force, shall be permitted in either country, nor shall works be constructed for such purpose, until the Section of the Commission in whose country the diversion or use is proposed has made a finding that the water necessary for such diversion or use is available from the share of that country, unless the Commission has agreed to a greater diversion or use as provided by paragraph (d) of this Article. The proposed use and the plans for the diversion works to be constructed in connection therewith shall be previously made known to the Commission for its information.

(c) Consumptive uses from the main stream and from the unmeasured tributaries below Fort Quitman shall be charged against the share of the country making them.

(d) The Commission shall have the power to authorize either country to divert and use water not belonging entirely to such country, when the water belonging to the other country can be diverted and used without injury to the latter and can be replaced at some other point on the river.

(e) The Commission shall have the power to authorize temporary diversion and use by one country of water belong-

ing to the other, when the latter does not need it or is unable to use it, provided that such authorization or the use of such water shall not establish any right to continue to divert it.

(f) In case of the occurence of an extraordinary drought in one country with an abundant supply of water in the other country, water stored in the international storage reservoirs and belonging to the country enjoying such abundant water supply may be withdrawn, with the consent of the Commission, for the use of the country undergoing the drought.

(g) Each country shall have the right to divert from the main channel of the river any amount of water, including the water belonging to the other country, for the purpose of generating hydro-electric power, provided that such diversion causes no injury to the other country and does not interfere with the international generation of power and that the quantities not returning directly to the river are charged against the share of the country making the diversion. The feasibility of such diversions not existing on the date this Treaty enters into force shall be determined by the Commission, which shall also determine the amount of water consumed, such water to be charged against the country making the diversion.

(h) In case either of the two countries shall construct works for diverting into the main channel of the Rio Grande (Rio Bravo) or its tributaries waters that do not at the time this Treaty enters into force contribute to the flow of the Rio Grande (Rio Bravo) such waters shall belong to the country making such diversion.

(i) Main stream channel losses shall be charged in proportion to the ownership of water being conveyed in the channel at the times and places of the losses.

(j) The Commission shall keep a record of the waters belonging to each country and of those that may be available at a given moment, taking into account the measurement of the allotments, the regulation of the waters in storage, the consumptive uses, the withdrawals, the diversions, and the losses. For this purpose the Commission shall construct, operate and maintain on the main channel of

the Rio Grande (Rio Bravo), and each Section shall construct, operate and maintain on the measured tributaries in its own country, all the gaging stations and mechanical apparatus necessary for the purpose of making computations and of obtaining the necessary data for such record. The information with respect to the diversions and consumptive uses on the unmeasured tributaries shall be furnished to the Commission by the appropriate Section. The cost of construction of any new gaging stations located on the main channel of the Rio Grande (Rio Bravo) shall be borne equally by the two Governments. The operation and maintenance of all gaging stations or the cost of such operation and maintenace shall be apportioned between the two Sections in accordance with determinations to be made by the Commission.

III—COLORADO RIVER

ARTICLE 10

Of the waters of the Colorado River, from any and all sources, there are allotted to Mexico:

(a) A guaranteed annual quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) to be delivered in accordance with the provisions of Article 15 of this Treaty.

(b) Any other quantities arriving at the Mexican points of diversion, with the understanding that in any year in which, as determined by the United States Section, there exists a surplus of waters of the Colorado River in excess of the amount necessary to supply uses in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) annually to Mexico, the United States undertakes to deliver to Mexico, in the manner set out in Article 15 of this Treaty, additional waters of the Colorado River system to provide a total quantity not to exceed 1,700,000 acre-feet (2,096,931,000 cubic meters) a year. Mexico shall acquire no right beyond that provided by this subparagraph by the use of the waters of the Colorado River system, for any purpurpose whatsoever, in excess of 1,500,000 acre feet (1,850,234,000 cubic meters) annually.

In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it diffi-

cult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) a year, the water allotted to Mexico under subparagraph (a) of this Article will be reduced in the same proportion as consumptive uses in the United States are reduced.

ARTICLE 11

(a) The United States shall deliver all waters allotted to Mexico wherever these waters may arrive in the bed of the limitrophe section of the Colorado River, with the exceptions hereinafter provided. Such waters shall be made up of the waters of the said river, whatever their origin, subject to the provisions of the following paragraphs of this article.

(b) Of the waters of the Colorado River allotted to Mexico by subparagraph (a) of Article 10 of this Treaty, the United States shall deliver, wherever such waters may arrive in the limitrophe section of the river, 1,000,000 acre-feet (1,233,489,000 cubic meters) annually from the time the Davis dam and reservoir are placed in operation until January 1, 1980 and thereafter 1,125,000 acre-feet (1,387,675,000 cubic meters) annually, except that, should the main diversion structure referred to in subparagraph (a) of Article 12 of this Treaty be located entirely in Mexico and should Mexico so request, the United States shall deliver a quantity of water not exceeding 25,000 acre-feet (30,837,000 cubic meters) annually, unless a larger quantity may be mutually agreed upon, at a point, to be likewise mutually agreed upon, on the international land boundary near San Luis, Sonora, in which event the quantities of 1,000,000 acre-feet (1,233,489,000 cubic meters) and 1,125,000 acre-feet (1,387,675,000 cubic meters) provided hereinabove as deliverable in the limitrophe section of the river shall be reduced by the quantities to be delivered in the year concerned near San Luis, Sonora.

(c) During the period from the time the Davis dam and reservoir are placed in operation until January 1, 1980, the United States shall also deliver to Mexico annually, of the water allotted to it, 500,000 acre-feet (616,745,000 cubic meters), and thereafter the United States shall deliver annually 375,000 acre-feet (462,558,000 cubic meters), at the international boundary line, by means of

the All-American Canal and a canal connecting the lower end of the Pilot Knob Wasteway with the Alamo Canal or with any other Mexican canal which may be substituted for the Alamo Canal. In either event the deliveries shall be made at an operating water surface elevation not higher than that of the Alamo Canal at the point where it crossed the international boundary line in the year 1943.

(d) All the deliveries of water specified above shall be made subject to the provisions of Article 15 of this Treaty.

ARTICLE 12

The two Governments agree to construct the following works:

(a) Mexico shall construct at its expense, within a period of five years from the date of the entry into force of this Treaty, a main diversion structure below the point where the northernmost part of the international land boundary line intersects the Colorado River. If such diversion structure is located in the limitrophe section of the river, its location, design and construction shall be subject to the approval of the Commission. The Commission shall thereafter maintain and operate the structure at the expense of Mexico. Regardless of where such diversion structure is located, there shall simultaneously be constructed such levees, interior drainage facilities and other works, or improvements to existing works, as in the opinion of the Commission shall be necessary to protect lands within the United States against damage from such floods and seepage as might result from the construction, operation and maintenance of this diversion structure. These protective works shall be constructed, operated and maintained at the expense of Mexico by the respective Sections of the Commission, or under their supervision, each within the territory of its own country.

(b) The United States, within a period of five years from the date of the entry into force of this Treaty, shall construct in its own territory and at its expense, and thereafter operate and maintain at its expense, the Davis storage dam and reservoir, a part of the capacity of which shall be used to make possible the regulation at the boundary

of the waters to be delivered to Mexico in accordance with the provisions of Article 15 of this Treaty.

(c) The United States shall construct or acquire in its own territory the works that may be necessary to convey a part of the waters of the Colorado River allotted to Mexico to the Mexican diversion points on the international land boundary line referred to in this Treaty. Among these works shall be included: the canal and other works necessary to convey water from the lower end of the Pilot Knob Wasteway to the international boundary, and, should Mexico request it, a canal to connect the main diversion structure referred to in subparagraph (a) of this Article, if this diversion structure should be built in the limitrophe section of the river, with the Mexican system of canals at a point to be agreed upon by the Commission on the international land boundary near San Luis, Sonora. Such works shall be constructed or acquired and operated and maintained by the United States Section at the expense of Mexico. Mexico shall also pay the costs of any sites or rights of way required for such works.

(d) The Commission shall construct, operate and maintain in the limitrophe section of the Colorado River, and each Section shall construct, operate and maintain in the territory of its own country on the Colorado River below Imperial Dam and on all other carrying facilities used for the delivery of water to Mexico, all necessary gaging stations and other measuring devices for the purpose of keeping a complete record of the waters delivered to Mexico and of the flows of the river. All data obtained as to such deliveries and flows shall be periodically compiled and exchanged between the two Sections.

ARTICLE 13

The Commission shall study, investigate and prepare plans for flood control on the Lower Colorado River between Imperial Dam and the Gulf of California, in both the United States and Mexico, and shall, in a Minute, report to the two Governments the works which should be built, the estimated cost thereof, and the part of the works to be constructed by each Government. The two Governments agree to construct, through their respective Sections of the Commission, such works as may be recommended by the

Commission and approved by the two Governments, each Government to pay the costs of the works constructed by it. The Commission shall likewise recommend the parts of the works to be operated and maintained jointly by the Commission and the parts to be operated and maintained by each Section. The two Governments agree to pay in equal shares the cost of joint operation and maintenance, and each Government agrees to pay the cost of operation and maintenance of the works assigned to it for such purpose.

ARTICLE 14

In consideration of the use of the All-American Canal for the delivery to Mexico, in the manner provided in Articles 11 and 15 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 proportion of the costs actually incurred in the construction of Imperial Dam and the Imperial Dam-Pilot Knob section of the All-American Canal, this proportion and the method and terms of repayment to be determined by the two Governments, which, for this purpose, shall take into consideration the 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.

(b) Annually, a proportionate part of the total costs of maintenance and operation of such facilities, these costs to be prorated between the two countries in proportion to the amount of water delivered annually through such facilities for use in each of the two countries.

In the event that revenues from the sale of hydro-electric power which may be generated at Pilot Knob become available for the amortization of part or all of the costs of the facilities named in subparagraph (a) of this Article, the part that Mexico should pay of the costs of said facilities shall be reduced or repaid in the same proportion as the balance of the total costs are reduced or repaid. It is understood that any such revenue shall not become available until the cost of any works which may be constructed for the generation of hydro-electric power at said location has been fully amortized from the revenues derived therefrom.

ARTICLE 15

A. The water allotted in subparagraph (a) Article 10 of this Treaty shall be delivered to Mexico at the points of delivery specified in Article 11, in accordance with 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:

SCHEDULE I

Schedule I shall cover the delivery, in the limitrophe section of the Colorado River, of 1,000,000 acre-feet (1,233,489,000 cubic meters) of water each year from the date Davis dam and reservoir are placed in operation until January 1, 1980 and the delivery of 1,125,000 acre-feet (1,387,675,000 cubic meters) of water each year thereafter. This schedule shall be formulated subject to the following limitations:

With reference to the 1,000,000 acre-foot (1,233,489,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 600 cubic feet (17.0 cubic meters) nor more than 3,500 cubic feet (99.1 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 1,000 cubic feet (28.3 cubic meters) nor more than 3,500 cubic feet (99.1 cubic meters) per second.

With reference to the 1,125,000 acre-foot (1,387,675,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 675 cubic feet (19.1 cubic meters) nor more than 4,000 cubic feet (113.3 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 1,125 cubic feet (31.9 cubic meters) nor more than 4,000 cubic feet (113.3 cubic meters) per second.

Should deliveries of water be made at a point on the land boundary near San Luis, Sonora, as provided for in Article 11, such deliveries shall be made under a sub-schedule to be formulated and furnished by the Mexican Section. The Quantities and monthly rates of deliveries under such sub-schedule shall be in proportion to those specified for Schedule I, unless otherwise agreed upon by the Commission.

SCHEDULE II

Schedule II shall cover the delivery at the boundary line by means of the All-American Canal of 500,000 acre-feet (616,745,000 cubic meters) of water each year from the date Davis dam and reservoir are placed in operation until January 1, 1980 and the delivery of 375,000 acre-feet (462,558,000 cubic meters) of water each year thereafter. This schedule shall be formulated subject to the following limitations:

With reference to the 500,000 acre-foot (616,745,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 300 cubic feet (8.5 cubic meters) nor more than 2,000 cubic feet (56.6 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 500 cubic feet (14.2 cubic meters) nor more than 2,000 cubic feet (56.6 cubic meters) per second.

With reference to the 375,000 acre-foot (462,558,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 225 cubic feet (6.4 cubic meters) nor more than 1,500 cubic feet (42.5 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 375 cubic feet (10.6 cubic meters) nor more than 1,500 cubic feet (42.5 cubic meters) per second.

B. The United States shall be under no obligation to deliver, through the All-American Canal, more than 500,000 acre-feet (616,745,000 cubic meters) annually from the date Davis dam and reservoir are placed in operation until January 1, 1980 or more than 375,000 acre-feet (462,558,000 cubic meters) annually thereafter. If, by mutual agreement, any part of the quantities of water specified in this paragraph are delivered to Mexico at points on the land boundary otherwise than through the All-American Canal, the above quantities of water and the rates of deliveries set out under Schedule II of this Article shall be correspondingly diminished.

C. The United States shall have the option of delivering, at the point on the land boundary mentioned in subparagraph (c) of Artcile 11, any part or all of the water to be delivered at that point under Schedule II of this Article during the months of January, February, October, November and December of each year, from any source whatsoever, with the understanding that the total specified annual quantities to be delivered through the All-American Canal shall not be reduced because of the exercise of this option, unless such reduction be requested by the Mexican Section, provided that the exercise of this option shall not have the effect of increasing the total amount of scheduled water to be delivered to Mexico.

D. In any year in which there shall exist in the river water in excess of that necessary to satisfy the requirements in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) allotted to Mexico, the United States hereby declares its intention to cooperate with Mexico in attempting to supply additional quantities of water through the All-American Canal as such additional quantities are desired by Mexico, if such use of the Canal and facilities will not be detrimental to the United States, provided that the delivery of any additional quantities through the All-American Canal shall not have the effect of increasing the total scheduled deliveries to Mexico. Mexico hereby declares its intention to cooperate with the United States by attempting to curtail deliveries of water through the All-American Canal in years of limited supply, if such curtailment can be accomplished without detriment to

Mexico and is necessary to allow full use of all available water supplies, provided that such curtailment shall not have the effect of reducing the total scheduled deliveries of water to Mexico.

E. In any year in which there shall exist in the river water in excess of that necessary to satisfy the requirements in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) allotted to Mexico, the United States Section shall so inform the Mexican Section in order that the latter may schedule such surplus water to complete a quantity up to a maximum of 1,700,000 acre-feet (2,096,931,000 cubic meters). In this circumstance the total quantities to be delivered under Schedules I and II shall be increased in proportion to their respective total quantities and the two schedules thus increased shall be subject to the same limitations as those established for each under paragraph A of this Article.

F. Subject to the limitations as to rates of deliveries and total quantities set out in Schedules I and II, Mexico shall have the right, upon thirty 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% of the monthly quantity.

G. The total quantity of water to be delivered under Schedule I of paragraph A of this Article may be increased in any year if the amount to be delivered under Schedule II is correspondingly reduced and if the limitations as to rates of delivery under each schedule are correspondingly increased and reduced.

IV—TIJUANA RIVER

ARTICLE 16

In order to improve existing uses and to assure any feasible further development, the Commission shall study and investigate, and shall submit to the two Governments for their approval:

(1) Recommendations for the equitable distribution between the two countries of the waters of the Tijuana River system;

(2) Plans for storage and flood control to promote and develop domestic, irrigation and other feasible uses of the waters of this system;

(3) An estimate of the cost of the proposed works and the manner in which the construction of such works or the cost thereof should be divided between the two Governments;

(4) Recommendations regarding the parts of the works to be operated and maintained by the Commission and the parts to be operated and maintained by each Section.

The two Governments through their respective Sections of the Commission shall construct such of the proposed works as are approved by both Governments, shall divide the work to be done or the cost thereof, and shall distribute between the two countries the waters of the Tijuana River system in the proportions approved by the two Governments. The two Governments agree to pay in equal shares the costs of joint operation and maintenance of the works involved, and each Government agrees to pay the cost of operation and maintenance of the works assigned to it for such purpose.

V—GENERAL PROVISIONS

ARTICLE 17

The use of the channels of the international rivers for the discharge of flood or other excess waters shall be free and not subject to limitation by either country, and neither country shall have any claim against the other in respect of any damage caused by such use. Each Government agrees to furnish the other Government, as far in advance as practicable, any information it may have in regard to such extraordinary discharges of water from reservoirs and flood flows on its own territory as may produce floods on the territory of the other.

Each Government declares its intention to operate its storage dams in such manner, consistent with the normal opreations of its hydraulic systems, as to avoid, as far as feasible, material damage in the territory of the other.

ARTICLE 18

Public use of the water surface of lakes formed by international dams shall, when not harmful to the services rendered by such

dams, be free and common to both countries, subject to the police regulations of each country in its territory, to such general regulations as may appropriately be prescribed and enforced by the Commission with the approval of the two Governments for the purpose of the application of the provisions of this Treaty, and to such regulations as may appropriately be prescribed and enforced for the same purpose by each Section of the Commission with respect to the areas and borders of such parts of those lakes as lie within its territory. Neither Government shall use for military purposes such water surface situated within the territory of the other country except by express agreement between the two Governments.

ARTICLE 19

The two Governments shall conclude such special agreements as may be necessary to regulate the generation, development and disposition of electric power at international plants, including the necessary provisions for the export of electric current.

ARTICLE 20

The two Governments shall, through their respective Sections of the Commission, carry out the construction of works allotted to them. For this purpose, the respective Sections of the Commission may make use of any competent public or private agencies in accordance with the laws of the respective countries. With respect to such works as either Section of the Commission may have to execute on the territory of the other, it shall, in the execution of such works, observe the laws of the place where such works are located or carried out, with the exceptions hereinafter stated.

All materials, implements, equipment and repair parts intended for the construction, operation and maintenance of such works shall be exempt from import and export customs duties. The whole of the personnel employed either directly or indirectly on the construction, operation or maintenance of the works may pass freely from one country to the other for the purpose of going to and from the place of location of the works, without any immigration restrictions, passports or labor requirements. Each Government shall furnish, through its own Section of the Commission, convenient means of identification to the personnel employed by it on the aforesaid works and verification certificates covering all materials, implements, equipment and repair parts intended for the works.

Each Government shall assume responsibility for and shall adjust exclusively in accordance with its own laws all claims arising within its territory in connection with the construction, operation or maintenance of the whole or of any part of the works herein agreed upon, or of any works which may, in the execution of this Treaty, be agreed upon in the future.

ARTICLE 21

The construction of the international dams and the formation of artificial lakes shall produce no change in the fluvial international boundary, which shall continue to be governed by existing treaties and conventions in force between the two countries.

The Commission shall, with the approval of the two Governments, establish in the artificial lakes, by buoys or by other suitable markers, a practicable and convenient line to provide for the exercise of the jurisdiction and control vested by this Treaty in the Commission and its respective Sections. Such line shall also mark the boundary for the application of the customs and police regulations of each country.

ARTICLE 22

The provisions of the Convention between the United States and Mexico for the rectification of the Rio Grande (Rio Bravo) in the El Paso-Juarez Valley signed on February 1, 1933, (*) shall govern, so far as delimitation of the boundary, distribution of jurisdiction and sovereignty, and relations with private owners are concerned, in any places where works for the artificial channeling, canalization or rectification of the Rio Grande (Rio Bravo) and the Colorado River are carried out.

ARTICLE 23

The two Governments recognize the public interest attached to the works required for the execution and performance of this Treaty and agree to acquire, in accordance with their respective domestic laws, any private property that may be required for the construction of the said works, including the main structures and their appurtenances and the construction materials therefor, and for the operation and maintenance thereof, at the cost of the

(*) Treaty Series 864; 48 Stat. 1621.

country within which the property is situated, except as may be otherwise specifically provided in this Treaty.

Each Section of the Commission shall determine the extent and location of any private property to be acquired within its own country and shall make the necessary requests upon its Government for the acquisition of such property.

The Commission shall determine the cases in which it shall become necessary to locate works for the conveyance of water or electrical energy and for the servicing of any such works, for the benefit of either of the two countries, in the territory of the other country, in order that such works can be built pursuant to agreement between the two Governments. Such works shall be subject to the jurisdiction and supervision of the Section of the Commission within whose country they are located.

Construction of the works built in pursuance of the provisions of this Treaty shall not confer upon either of the two countries any rights either of property or of jurisdiction over any part whatsoever of the territory of the other. These works shall be part of the territory and be the property of the country wherein they are situated. However, in the case of any incidents occurring on works constructed across the limitrophe part of a river and with supports on both banks, the jurisdiction of each country shall be limited by the center line of such works, which shall be marked by the Commission, without thereby changing the international boundary.

Each Government shall retain, through its own Section of the Commission and within the limits and to the extent necessary to effectuate the provisions of this Treaty, direct ownership, control and jurisdiction within its own territory and in accordance with its own laws, over all real property—including that within the channel of any river—rights of way and rights "in rem," that it may be necessary to enter upon and occupy for the construction, operation or maintenance of all the works constructed, acquired or used pursuant to this Treaty. Furthermore, each Government shall similarly acquire and retain in its own possession the titles, control and jurisdiction over such works.

ARTICLE 24

The International Boundary and Water Commission shall have, in addition to the powers and duties otherwise specifically provided in this Treaty, the following powers and duties:

(a) To initiate and carry on investigations and develop plans for the works which are to be constructed or established in accordance with the provisions of this and other treaties or agreements in force between the two Governments dealing with boundaries and international waters; to determine, as to such works, their location, size, kind and characteristic specifications; to estimate the cost of such works; and to recommend the division of such costs between the two Governments, the arrangements for the furnishing of the necessary funds, and the dates for the beginning of the works, to the extent that the matters mentioned in this subparagraph are not otherwise covered by specific provisions of this or any other Treaty.

(b) To construct the works agreed upon or to supervise their construction and to operate and mantain such works or to supervise their operation and maintenance, in accordance with the respective domestic laws of each country. Each Section shall have, to the extent necessary to give effect to the priovisions of this Treaty, jurisdiction over the works constructed exclusively in the territory of its country whenever such works shall be connected with or shall directly affect the execution of the provisions of this Treaty.

(c) In general to exercise and discharge the specific powers and duties entrusted to the Commission by this and other treaties and agreements in force between the two countries, and to carry into execution and prevent the violation of the provisions of those treaties and agreements. The authorities of each country shall aid and support the exercise and discharge of these powers and duties, and each Commissioner shall invoke when necessary the jurisdiction of the courts or other appropriate agencies of his country to aid in the execution and enforcement of these powers and duties.

(d) To settle all differences that may arise between the two Governments with respect to the interpretation or application of this Treaty, subject to the approval of the two Governments. In any case in which the Commissioners do not reach an agreement, they shall so inform their respective governments reporting thier respective opinions and the grounds therefor and the points upon which they

differ, for discussion and adjustment of the difference through diplomatic channels and for application where proper of the general or special agreements which the two Governments have concluded for the settlement of controversies.

(e) To furnish the information requested of the Commissioners jointly by the two Governments on matters within their jurisdiction. In the event that the request is made by one Government alone, the Commissioner of the other Government must have the express authorization of his Government in order to comply with such request.

(f) The Commission shall construct, operate and maintain upon the limitrophe parts of the international streams, and each Section shall severally construct, operate and maintain upon the parts of the international streams and their tributaries within the boundaries of its own country, such stream gaging stations as may be needed to provide the hydrographic data necessary or convenient for the proper functioning of this Treaty. The data so obtained shall be compiled and periodically exchanged between the two Sections.

(g) The Commission shall submit annually a joint report to the two Governments on the matters in its charge. The Commission shall also submit to the two Governments joint reports on general or any particular matters at such other times as it may deem necessary or as may be requested by the two Governments.

ARTICLE 25

Except as otherwise specifically provided in this Treaty, Articles III and VII of the Convention of March 1, 1889 shall govern the proceedings of the Commission in carrying out the provisions of this Treaty. Supplementary thereto the Commission shall establish a body of rules and regulations to govern its procedure, consistent with the provisions of this Treaty and of Articles III and VII of the Convention of March 1, 1889 and subject to the approval of both Governments.

Decisions of the Commission shall be recorded in the form of Minutes done in duplicate in the English and Spanish languages, signed by each Commissioner and attested by the Secretaries, and

copies thereof forwarded to each Government within three days after being signed. Except where the specific approval of the two Governments is required by any provision of this Treaty, if one of the Governments fails to communicate to the Commission its approval or disapproval of a decision of the Commission within thirty days reckoned from the date of the Minute in which it shall have been pronounced, the Minute in question and the decisions which it contains shall be considered to be approved by that Government. The Commissioners, within the limits of their respective jurisdictions, shall execute the decisions of the Commission that are approved by both Governments.

If either Government disapproves a decision of the Commission the two Governments shall take cognizance of the matter, and if an agreement regarding such matter is reached between the two Governments, the agreement shall be communicated to the Commissioners, who shall take such further proceedings as may be necessary to carry out such agreement.

VI—TRANSITORY PROVISIONS

ARTICLE 26

During a period of eight years from the date of the entry into force of this Treaty, or until the beginning of operation of the lowest major international reservoir on the Rio Grande (Rio Bravo), should it be placed in operation prior to the expiration of said period, Mexico will cooperate with the United States to relieve, in times of drought, any lack of water needed to irrigate the lands now under irrigation in the Lower Rio Grande Valley in the United States, and for this purpose Mexico will release water from El Azucar reservoir on the San Juan River and allow that water to run through its system of canals back into the San Juan River in order that the United States may divert such water from the Rio Grande (Rio Bravo). Such releases shall be made on condition that they do not affect the Mexican irrigation system, provided that Mexico shall, in any event, except in cases of extraordinary drought or serious accident to its hydraulic works, release and make available to the United States for its use the quantities requested, under the following conditions: that during the said eight years there shall be made available a total of 160,000 acre-feet (197,358,000 cubic meters) and up to 40,000 acre-feet (49,340,000 cubic meters) in any one year; that the water shall be made available as requested at rates not exceeding 750 cubic feet (21.2 cubic meters) per second; that when the rates of flow requested and made available have been

more than 500 cubic feet (14.2 cubic meters) per second the period of release shall not extend beyond fifteen consecutive days; and that at least thirty days must elapse between any two periods of release during which rates of flow in excess of 500 cubic feet (14.2 cubic meters) per second have been requested and made available. In addition to the guaranteed flow, Mexico shall release from El Azucar reservoir and conduct through its canal system and the San Juan River, for use in the United States during periods of drought and after satisfying the needs of Mexican users, any excess water that does not in the opinion of the Mexican Section have to be stored and that may be needed for the irrigation of lands which were under irrigation during the year 1943 in the Lower Rio Grande Valley in the United States.

ARTICLE 27

The provisions of Article 10, 11, and 15 of this Treaty shall not be applied during a period of five years from the date of the entry into force of this Treaty, or until the Davis dam and the major Mexican diversion structure on the Colorado River are placed in operation, should these works be placed in operation prior to the expiration of said period. In the meantime Mexico may construct and operate at its expense a temporary diversion structure in the bed of the Colorado River in territory of the United States for the purpose of diverting water into the Alamo Canal, provided that the plans for such structure and the construction and operation thereof shall be subject to the approval of the United States Section. During this period of time the United States will make available in the river at such diversion structure river flow not currently required in the United States, and the United States will cooperate with Mexico to the end that the latter may satisfy its irrigation requirements within the limits of those requirements for lands irrigated in Mexico from the Colorado River during the year 1943.

VII—FINAL PROVISIONS

ARTICLE 28

This Treaty shall be ratified and the ratifications thereof shall be exchanged in Washington. It shall enter into force on the day of the exchange of ratifications and shall continue in force until terminated by another Treaty concluded for that purpose between the two Governments.

In witness whereof the respective Plenipotentiaries have signed this Treaty and have hereunto affixed their seals.

Done in duplicate in the English and Spanish languages, in Washington on this third day of February, 1944.

FOR THE
GOVERNMENT OF THE UNITED STATES OF AMERICA:

CORDELL HULL (SEAL)

GEORGE S. MESSERSMITH (SEAL)

LAWRENCE M. LAWSON (SEAL)

FOR THE
GOVERNMENT OF THE UNITED MEXICAN STATES:

F. CASTILLO NAJERA (SEAL)

RAFAEL FERNANDEZ MAC GREGOR (SEAL)

PROTOCOL

The Government of the United States of America and the Government of the United Mexican States agree and understand that:

Wherever, by virtue of the provisions of the Treaty between the United States of America and the United Mexican States, signed in Washington on February 3, 1944, relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas, to the Gulf of Mexico, specific functions are imposed on, or exclusive jurisdiction is vested in, either of the Sections of the International Boundary and Water Commission, which involve the construction or use of works for storage or conveyance of water, flood control, stream gaging, or for any other purpose, which are situated wholly within the territory of the country of that Section, and which are to be used only partly for the performance of treaty provisions, such jurisdiction shall be exercised, and such functions, including the construction, operation and maintenance of the said works, shall be performed and carried out by the Federal agencies of that country which now or hereafter may be authorized by domestic law to construct, or to operate and maintain, such works. Such functions or jurisdictions shall be exercised in conformity with the provisions of the Treaty and in cooperation with the respective Section of the Commission, to the end that all international obligations and functions may be coordinated and fulfilled.

The works to be constructed or used on or along the boundary, and those to be constructed or used exclusively for the discharge of treaty stipulations, shall be under the jurisdiction of the Commission or of the respective Section, in accordance with the provisions of the Treaty. In carrying out the construction of such works the Sections of the Commission may utilize the services of public or private organizations in accordance with the laws of their respective countries.

This Protocol, which shall be regarded as an integral part of the aforementioned Treaty signed in Washington on February 3, 1944, shall be ratified and the ratifications thereof shall be exchanged in Washington. This Protocol shall be effective beginning with the day of the entry into force of the Treaty and shall continue effective so long as the Treaty remains in force.

In witness whereof the respective Plenipotentiaries have signed this Protocol and have hereunto affixed their seals.

Done in duplicate, in the English and Spanish languages, in Washington, this fourteenth day of November, 1944.

FOR THE
GOVERNMENT OF THE UNITED STATES OF AMERICA:

E. R. STETTINIUS, JR. (SEAL)
Acting Secretary of State of the
United States of America.

FOR THE
GOVERNMENT OF THE UNITED MEXICAN STATES

F. CASTILLO NAJERA (SEAL)
Ambassador Extraordinary and Plenipotentiary
of the United Mexican States in Washington.

And whereas the Senate of the United States of America by their Resolution of April 18, 1945, two-thirds of the Senators present concurring therein, did advise and consent to the ratification of the said treaty and protocol, subject to certain understandings, the text of which Resolution is word for word as follows:

"Resoved (two-thirds of the Senators present concurring therein), That the Senate advise and consent to the ratification of Executive A, Seventy-eighth Congress, second session, a treaty between the United States of America and the United Mexican States, signed at Washington on February 3, 1944, relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas, to the Gulf of Mexico, and Executive H, Seventy-eighth Congress, second session, a protocol, signed at Washington on November 14, 1944, supplementary to the treaty, subject to the followng understandings, and that these understandings will be mentioned in the ratification of this treaty as conveying the true meaning of the treaty, and will in effect form a part of the treaty:

"(a) That no commitment for works to be built by the United States in whole or in part at its expense, or for expenditures by the United States, other than those specifically provided for in the treaty, shall be made by the Secretary of State of the United States, the Commissioner of the United States Section of the International Boundary and Water Commission, the United States Section of said Commission, or any other officer or employee of the United States, without prior approval of the Congress of the United States. It is understood that the works to be built by the United States, in whole or in part at its expense, and the expenditures by the United States which are specifically provided for in the treaty, are as follows:

"1. The joint construction of the three storage and flood-control dams on the Rio Grande below Fort Quitman, Texas, mentioned in Article 5 of the treaty.

"2. The dams and other joint works required for the diversion of the flow of the Rio Grande mentioned in subparagraph II Article 5 of the treaty, it being understood that the commitment of the United States to make expenditures under this subparagraph is limited to its share of the cost of one dam and works appurtenant thereto.

"3. Stream-gaging stations which may be required under the provisions of section (j) of article 9 of the treaty and of subparagraph (d) of article 12 of the treaty.

"4. The Davis Dam and Reservoir mentioned in subparagraph (b) of article 12 of the treaty.

"5. The joint flood-control investigations, preparations of plans, and reports on the Rio Grande below Fort Quitman required by the provisions of article 6 of the treaty.

"6. The joint flood-control investigations, preparations of plans, and reports on the lower Colorado River between the Imperial Dam and the Gulf of California required by article 13 of the treaty.

"7. The joint investigations, preparation of plans, and reports on the establishment of hydroelectric plants at the international dams on the Rio Grande below Fort Quitman provided for by article 7 of the treaty.

"8. The studies, investigations, preparation of plans, recommendations, reports and other matters dealing with the Tijuana River system provided for by the first paragraph (including the numbered subparagraphs) of article 16 of the treaty.

"(b) Insofar as they affect persons and property in the territorial limits of the United States, the powers and functions of the Secretary of State of the United States, the Commissioner of the United States Section of the International Boundary and Water Commission, the United States Section of said Commission, and any other officer or employee of the United States, shall be subject to the statutory and constitutional controls and processes. Nothing contained in the treaty or protocol shall be construed as impairing the power of the Congress of the United States to define the terms of office of members of the United States Section of the International Boundary and Water Commission or to provide for their appointment by the President by and with the advice and consent of the Senate or otherwise.

"(c) That nothing contained in the treaty or protocol shall be construed as authorizing the Secretary of State of the United States, the Commissioner of the United States Section of the International Boundary and Water Commission, or the United States Section of said Commission, directly or indirectly to alter or control the distribution of water to users within the territorial limits of any of the individual States.

"(d) That "international dam or reservoir" means a dam or reservoir built across the common boundary between the two countries.

"(e) That the words "international plants," appearing in article 19, mean only hydroelectric generating plants in connection with dams built across the common boundary between the two countries.

"(f) That the words "electric current," appearing in article 19, mean hydroelectric power generated at an international plant.

"(g) That by the use of the words "The jurisdiction of the Commission shall extend to the limitrophe parts of the Rio Grande (Rio Bravo) and the Colorado River, to the land boundary between the two countries, and to works located upon their common boundary"—in the first sentence of the fifth paragraph of article 2, is meant: "The jurisdiction of the Commission shall extend and be limited to the limitrophe parts of the Rio Grande (Rio Bravo) and the Colorado River, to the land boundary between the two countries, and to works located upon their common boundary—".

(h) The word "agreements" whenever used in subparagraphs (a), (c), and (d) of article 24 of the treaty shall refer only to agreements entered into pursuant to and subject to the provisions and limitations of treaties in force between the United States of America and the United Mexican States.

"(i) The word "disputes" in the second paragraph of article 2 shall have reference only to disputes between the Governments of the United States of America and the United Mexican States.

"(j) First, that the one million seven hundred thousand acre-feet specified in subparagraph (b) of article 10 includes and is not in addition to the one million five hundred thousand acre-feet, the delivery of which to Mexico is guaranteed in subparagraph (a) of article 10; second, that the one million five hundred thousand acre-feet specified in three places in said subparagraph (b) is identical with the one million five hundred thousand acre-feet specified in said subparagraph (a); third, that any use by Mexico under said subparagraph (b) of quantities of water arriving at the Mexican points of diversion in excess of said one million five hundred thousand acre-feet shall not give rise to any future claim of right by Mexico in excess of said guaranteed quantity of one million five hundred thousand acre-feet of water.

"(k) The United States recognizes a duty to require that the protective structures to be constructed under article 12, paragraph (a), of this treaty, are so constructed, operated, and maintained as to adequately prevent damage to property and lands within the United States from the construction and operation of the diversion structure referred to in said paragraph."

And whereas the said treaty and protocol were duly ratified

by the President of the United States of America on November 1, 1945, in pursuance of the aforesaid advice and consent of the Senate and subject to the aforesaid understandings on the part of the United States of America;

And whereas the said treaty and protocol were duly ratified by the President of the United Mexican States on October 16, 1945, in pursuance and according to the terms of a Decree of September 27, 1945 of the Senate of the United Mexican States approving the said treaty and protocol and approving the said understandings on the part of the United States of America in all that refers to the rights and obligations between the parties;

And whereas, it is provided in Article 28 of the said treaty that the treaty shall enter into force on the day of the exchange of ratifications;

And whereas it is provided in said protocol that the protocol shall be regarded as an integral part of the said treaty and shall be effective beginning with the day of the entry into force of the said treaty;

And whereas the respective instruments of ratification of the said treaty and protocol were duly exchanged, and a protocol of exchange of instruments of ratification was signed in the English and Spanish languages, by the respective Plenipotentiaries of the United States of America and the United Mexican States on November 8, 1945, the English text of which protocol of exchange of instruments of ratification reads in part as follows:

"The ratification by the Government of the United States of America of the treaty and protocol aforesaid recites in their entirety the understandings contained in the resolution of April 18, 1945 of the Senate of the United States of America advising and consenting to ratification, the text of which resolution was communicated by the Government of the United States of America to the Government of the United Mexican States. The ratification by the Government of the United Mexican States of the treaty and proocol aforesaid is effected, in the terms of its instrument of ratification, in conformity to the Decree of September 27, 1945 of the Senate of the United Mexican States approving the treaty and protocol aforesaid and approving also the aforesaid understandings on the part of the United States of America in all that refers to the rights and obligations between both parties, and in which the Mexican Senate refrains from considering, because it is not

competent to pass judgment upon them, the provisions which relate exclusively to the internal application of the treaty within the United States of America and by its own authorities, and which are included in the understandings set forth under the letter (a) in its first part to the period preceding the words "It is understood" and under the letters (b) and (c)."

Now, therefore, be it known that I, Harry S. Truman, President of the United States of America, do hereby proclaim and make public the said treaty and the said protocol supplementary thereto, to the end that the same and every article and clause thereof may be observed and fulfilled with good faith, on and from the eighth day of November, one thousand nine hundred forty-five, by the United States of America and by the citizens of the United States of America and all other persons subject to the jurisdiction thereof.

In testimony whereof, I have hereunto set my hand and caused the Seal of the United States of America to be affixed.

Done at the city of Washington this twenty-seventh day of November in the year of our Lord one thousand nine hundred forty-five and of the Independence of the United States of America the one hundred seventieth.

(SEAL) HARRY S. TRUMAN.

By the President:

James F. Byrnes, Secretary of State

APPENDIX N

AUDIT

WALTER E. DALBY
Certified Public Accountant
310 First National Bank Building
Grand Junction, Colorado
March 20, 1950

Mr. John Geoffrey Will, Secretary
Upper Colorado River Commission
Grand Junction, Colorado

Dear Mr. Will:

Enclosed herewith are the following statements of the Upper Colorado River Commission for the period ended March 10, 1950:

Balance Sheet—General Fund
Balance Sheet—Equipment Fund
Statement of Revenues and Expenditures

As an examination of the records of the Commission was not anticipated, time was not available to include audit procedures to the extent necessary to express an opinion upon the statements. I will be happy to make a complete examination and issue a formal report thereon as of any date you state, if you deem it necessary.

The foregoing statements were prepared from the records on the cash basis and cover the period from inception to March 10, 1950, the date Mr. Barney Whatley assumed his duties as Treasurer of the Commission.

Oral confirmation was obtained from the First National Bank in Grand Junction that a balance of $9,216.76 was shown to the credit of the Commission as of March 10th. Approved invoices were inspected in support of disbursements, and checks paid by the bank were compared with entries in the disbursements record. Recorded deposits were compared with amounts appearing on bank statements on file.

On December 14, 1949, an assessment of $25,000.00 was made by the Commission to the states. As of March 10, 1950, Colorado had not paid its portion of $12,937.50.

When the Commission was organized, the balance remaining in funds supplied by the states to the predecessor organization, was transferred to the Commission. As the $417.32 transferred is not in proportion to the assessment ratio of the various states, the amount has been set aside in a separate account until disposition thereof is decided. This amount is shown as part of the fund balance of the General Fund.

A $40,000.00 fidelity bond is carried on the Treasurer. The automobile owned by the Commission is insured as follows:

Comprehensive	Actual Value
Collision	$100.00 deductible
Property damage	$5,000.00
Bodily injury	$25/50,000.00

Section 5 of Article VII of the by-laws of the Commission provides for a yearly audit and the inclusion of the audit in the annual report of the Commission. Section 7 of Article VII provides that the fiscal year of the Commission shall begin July 1st of each year and shall end June 30th of the next succeeding year. It would appear from these sections that the annual audit should cover the fiscal year ending June 30th. Section 1 of Article VIII provides for an annual report to be transmitted by the Commission on or before April 1st. This section provides that the report should cover the activities of the Commission for the water year ending the preceding September 30th. Section 3 of Article VII provides that on or before December 1st of each year the Commission shall submit a budget for the following year.

It is not clear to me as to the period to be covered by an audit and I suggest that consideration be given to clarification.

Very truly yours,

/s/ Walter E. Dalby

Certified Public Accountant

WED : wmd
Encls.

BALANCE SHEET — GENERAL FUND
UPPER COLORADO RIVER COMMISSION
March 10, 1950

ASSETS

CASH		
Demand deposit	$ 9,216.76	
Office cash fund	25.00	
		$ 9,241.76
ASSESSMENTS RECEIVABLE		
State of Colorado		12,937.50
		$ 22,179.26

FUND BALANCE

FUND BALANCE		
Funds received from predecessor organization	$ 417.32	
Fund balance	21,761.94	$ 22,179.26
		$ 22,179.26

BALANCE SHEET — EQUIPMENT FUND
UPPER COLORADO RIVER COMMISSION
March 10, 1950

ASSETS

Automobile	$ 2,754.00
Furniture and fixtures	360.46
	$ 3,114.46

FUND BALANCE

Investment in automobile and fixtures	$ 3,114.46
	$ 3,114.46

STATEMENT OF REVENUES AND EXPENDITURES
UPPER COLORADO RIVER COMMISSION
From Inception to March 10, 1950

Revenues:			
Assessments			$ 30,000.00
Balance of funds of predecessor organization transferred to the Commission			417.32
			$ 30,417.32
Expenditures:			
Automobile	$ 2,754.00		
Furniture and fixtures	360.46		
		$ 3,114.46	
Salaries—administrative		2,291.66	
Salaries—clerical		288.00	
Reporting expense		1,181.75	
Automobile expense		68.67	
Insurance and bonds		314.70	
Office expense		79.50	
Telephone and telegraph		13.75	
Travel		885.57	8,238.06
EXCESS OF REVENUES OVER EXPENDITURES			$ 22,179.26

SENTINEL PRINTERS, GRAND JUNCTION, COLO.