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WESTERN WATER BULLETIN 1977

Flow of The Colorado River and other Western Boundary Streams and Related Data

COLORADO RIVER

TIJUANA RIVER

SANTA CRUZ RIVER

SAN PEDRO RIVER

WHITEWATER DRAW

1977

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FOREWORD

This bulletin is the eighteenth annual compilation of stream discharges and other hydrographic data relating to the international aspects of the Colorado River below Imperial Dam, the Tijuana River, and other streams crossing the western land boundary of the United States and Mexico. The compilation was prepared jointly by the United States and Mexican Sections of the International Boundary and Water Commission, solely for the purpose of presenting statistical data relating to stream flow and kindred subjects for the Colorado River from Imperial Dam to the Gulf of California, the Tijuana River and its important tributaries in the United States and Mexico, and other streams, including the Alamo and New Rivers which cross the California-Baja California boundary, and the Santa Cruz River and Whitewater Draw which cross the Arizona-Sonora boundary. This volume contains the information for the year 1977.

Stream gaging on the Colorado River below Imperial Dam began in 1902 when the station at Yuma, Arizona was established. Stage records were obtained at this station from January 1878 until December 1973, when it was discontinued. Continuous stream gaging on the Tijuana River and its important tributaries in the United States and in Mexico began in 1936. Each government operates the gaging stations located within its own country.

Colorado River below Imperial Dam

Below Imperial Dam, the Colorado River flows southward 10 miles to the mouth of the Gila River, thence westward 11 miles to Pilot Knob Mountain, and south 1 mile to the point where the northerly international land boundary, between California and Baja California, intersects the river. From this point the river continues to flow southward and forms the boundary between the United States and Mexico for a distance of about 22 miles to the point where the southerly international land boundary between Arizona and Sonora intersects the river. From this point the river continues to flow southward about 90 miles to discharge into the Gulf of California.

The ordinary flows of Colorado River below Imperial Dam are largely controlled by releases at Hoover Dam, completed in 1935. The releases are further regulated at Davis Dam, completed in 1950, and by Parker and Imperial Dams, completed in 1938. Small amounts of runoff may occasionally be contributed to the flow in the lower river from the usually dry arroyos draining the 10,900 square miles along the river from Hoover Dam to the mouth of the Gila River, not including 5,500 square miles in the Bill Williams River watershed. In addition, flows ranging from usually minor amounts to infrequent torrential floods may enter the lower Colorado River from the Bill Williams River and from the Gila River, draining about 7,300 square miles below Painted Rock Dam and Reservoir, completed in January 1960.

At Imperial Dam, diversions are made to Gila Gravity Main Canal and All-American Canal for irrigation projects in Arizona, including the Yuma Valley, Gila and Wellton-Mohawk projects, and in California, including the Imperial Valley, Coachella Valley and Reservation Division of Yuma Project. Also, under the provisions of the 1944 Water Treaty, there may be diverted to the All-American Canal at Imperial Dam for delivery to Mexico in the Alamo Canal, or substitute canal, at the northerly boundary, a portion of Mexico's guaranteed annual allotment of waters of the Colorado River. No such diversions were made in 1977.

Below Laguna Dam, measured and unmeasured flows are returned to the river principally as waste and drainage water from the irrigation projects in the United States. Waste and drainage waters from irrigation projects in the United States also cross the boundary into Mexico near San Luis, Arizona without returning to the river in the United States.

In the limitrophe section of the river, 1.1 miles downstream from the northerly boundary, Morelos Dam, the principal diversion structure for Mexico, was completed and placed in operation on November 8, 1950. Since that date almost all the Colorado River flows that cross the northerly boundary (except emergency deliveries to Tijuana beginning in August 1972) have been diverted to the Alamo Canal at Morelos Dam.

Tijuana River Basin

The total drainage area of the Tijuana River basin is 1,731 square miles, of which 27 percent lies in the United States and 73 percent in Mexico. This river is formed by the principal tributaries, Cottonwood Creek, which rises in the United States and Rio de las Palmas, which rises in Mexico. Cottonwood Creek crosses the international land boundary 21 miles from the Pacific Ocean to join the Rio de las Palmas in Mexico. From the confluence of these tributaries, the Tijuana River flows northwesterly 5 miles to cross the land boundary into the United States near San Ysidro, California and Tijuana, Baja California, and then flows westerly 6 miles to discharge into the Pacific Ocean 2 miles north of the boundary. The flow of Cottonwood Creek is partially controlled by Barrett and Morena Reservoirs in the United States and the flow of the Rio de las Palmas is partially controlled by Rodriguez Reservoir in Mexico.

Whitewater Draw near Douglas, Arizona

Whitewater Draw rises in the United States and flows south into Mexico crossing the international boundary near Douglas, Arizona, eventually discharging into the Gulf of California through the Yaqui River in Mexico. The total drainage area above the Douglas Gaging Station is 1,023 square miles. A number of mountain streams in the upper reaches of the basin are diverted for irrigation, but they would normally sink or go to ground water before reaching the main water course.

FOREWORD

San Pedro River at Palominas, Arizona

The San Pedro River rises in Mexico and flows north into the United States, crossing the boundary near Palominas, Arizona and thence northwesterly into the Gila River. The river in the vicinity of the international boundary drains an area of 741 square miles of which 649 square miles are in Mexico.

Santa Cruz River near Nogales and Lochiel, Arizona

The Santa Cruz River rises in the United States and flows south into Mexico, crossing the international boundary near Lochiel, Arizona and returning to the United States near Nogales, Arizona, eventually discharging into the Gila River southwest of Phoenix, Arizona. The drainage area of the Santa Cruz River above Nogales station is 533 square miles. Of this amount, 348 square miles lie in Mexico. There are a few ground water irrigation diversions above the Lochiel station in Arizona and an unknown amount of water diverted for irrigation in Mexico.

Acknowledgments

Other agencies which have contributed to the data published herein include the Bureau of Reclamation and the Geological Survey of the U. S. Department of the Interior; the National Weather Service Department, of Commerce; the Yuma County Water Users' Association; the Imperial Irrigation District; the city of San Diego, California; the Otay Municipal Water District; and the Ministry of Agriculture and Hydraulic Resources of Mexico. Specific notation is made of each of the above named agencies, where the data appear. The courtesy and cooperation of those who have made these contributions are acknowledged with appreciation.

Units of Measure

Data collected by the Mexican Section are computed and published in a Spanish version of the water bulletin in metric units. The Mexican data are converted and reported in this bulletin in English units. Conversion factors conform generally to those in the National Bureau of Standards Miscellaneous Publication 286 "Units of Weight and Measure (United States Customary and Metric) - Definitions and Tables of Equivalents." However, for convenience some of the factors have been shortened and modified to facilitate conversion, reconversion to the original units when necessary, and checking of data. Conversion of the mean daily discharges, the monthly average discharge, and the monthly and annual volumes from metric to English units is direct. For this reason the monthly average discharge in cubic feet per second and monthly volumes in acre-feet shown for gaging stations operated by the Mexican Section cannot necessarily be obtained in the usual manner from the total monthly flow in second-foot days. For the same reason, evaporation and rainfall data, when totaled, may not be equivalent to the direct conversion from metric to English units. The following factors have been used for data in this bulletin:

METRIC UNITS	ENGLISH UNITS
LENGTHS	
1 Centimeter	0.393701 Inch
1 Meter	3.28084 Feet
1 Kilometer	0.621371 Mile
AREAS	
1 Square Meter	10.76391 Square Feet
1 Hectare	2.471054 Acres
1 Square Kilometer	0.386102 Square Mile
VOLUMES	
1 Cubic Meter	61023.74 Cubic Inches
1 Cubic Meter	35.31467 Cubic Feet
1 Cubic Meter	1.30795 Cubic Yards
1000 Cubic Meters	0.81071 Acre-Foot
1 Liter	0.264172 U.S. Gallon
WEIGHTS	
1 Kilogram	2.204623 Pounds
1 Metric Ton	2204.623 Pounds
1 Metric Ton	1.102311 Short Tons (2000 lbs)

Beginning in 1976, as a step toward eventual publication of this bulletin in metric units only, both English and metric units are used to report the figures in the descriptive headings and for the yearly figures of the annual and period summaries of all gaging station pages. The yearly figures for the summaries are obtained by direct conversion, except for those stations operated by the Mexican Section, where the metric system of units is used.

GENERAL HYDROLOGIC CONDITIONS FOR 1977

Colorado River

Normally, there is no measurable amount of runoff from the portion of the Colorado River basin in the United States and Mexico below Hoover Dam, not including Bill Williams and Gila Rivers. There was no significant amount in 1977. The average seasonal (October 1976-September 1977) rainfall over the upper basin, as gaged at 13 index stations, was about 8.75 inches compared to a seasonal average of about 14.20 inches for the 26 seasons (1952-1977). In the lower basin of the Colorado River in Mexico, from Morelos Diversion Dam to the Gulf of California, the average precipitation (1977) measured at 6 index stations was 3.94 inches compared to an average of 2.68 inches during the last 19 years (1959-1977).

The flow of the Colorado River reaching Imperial Dam was 5,704,600 acre-feet, about 71% of the 43-year average (1935-1977) of 8,006,977 acre-feet. At the northerly international boundary, the total flow of the river during 1977 was 1,469,062 acre-feet, about 42% of the 1935-1977 average of 3,512,411 acre-feet. At the southerly international boundary, the flow during 1977 was 120,978 acre-feet, or about 4.6% of the 1935-1977 average of 2,644,273 acre-feet. The total flow of the Colorado River reaching the M. C. Rodriguez gaging station, 24.5 miles downstream from the southerly international boundary, and 4.5 miles upstream from the Sonora-Baja California railroad bridge, was 58,189 acre-feet in 1977, about 6.1% of the 1951-1977 average of 947,317 acre-feet.

The total of all flows of the Colorado River entering Mexico in 1977 amounted to 1,778,906 acre-feet, 43% of the 1935-1977 average of 4,103,252 acre-feet, as measured 1) in the Colorado River at the northerly international boundary, 2) in the Wellton-Mohawk Main Outlet Drain Extension near Morelos Dam, 3) in the wasteways that discharge into the limitrophe section of the river from the United States bank, 4) in the canal which discharges waste and drainage waters from the Yuma Project across the southerly land boundary into Mexico near San Luis, Arizona, 5) emergency delivery of Colorado River water for use in Tijuana, Baja California, and 6) in the Wellton-Mohawk Bypass Drain at southerly land boundary near San Luis, Arizona.

No flood peaks of importance occurred in streams of the lower Colorado River basin during 1977. A maximum instantaneous flow of 11,960 second-feet occurred in the Colorado River at the northerly boundary station on August 18, 1977.

Stored waters at the end of the year in the three major reservoirs on the Colorado River below Lee's Ferry amounted to 22,437,700 acre-feet, 78% of the usable capacity of 28,588,400 acre-feet. The greater part (20,250,000 acre-feet) of the storage was contained in Lake Mead (Hoover Dam). There were no reported shortages of Colorado River water for irrigation during 1977 due to drought or accident to the irrigation system.

The total reported acreage irrigated from waters of the Colorado River below Imperial Dam in 1977 was 1,184,773 acres; 683,555 acres in the United States and 501,218 acres in Mexico. An estimated 33% of acreage in Mexico is served by pumping from ground water.

The suspended sediment load passing the northerly boundary station in 1977 was 76.0 acre-feet, about 33% of the 1956-1977 average of 229 acre-feet.

Tijuana River Basin

During 1977, the temperatures at Barrett Dam, California (elevation 1,750 feet) in the upper portion of the basin in the United States averaged 61.6 degrees, 0.4 degree above the 47-year mean. In the extreme upper portion of the basin in Mexico at San Juan de Dios, Baja California (elevation 3,280 feet), the recorded temperatures during the year averaged 54 degrees, 2 degrees below the long-term average; and at Rodriguez Dam, Baja California (elevation 459 feet), the recorded temperatures averaged 64 degrees, 2 degrees above the normal of many years.

At Barrett Dam in the upper portion of the basin in the United States, the recorded precipitation was 14.75 inches, 86% of normal, and at Chula Vista near the lower end of the basin, 9.85 inches, or 105% of normal. The recorded precipitation at San Juan de Dios in the upper portion of the basin in Mexico, was 17.99 inches, approximately 123% of the normal during the 22-year period, and at Rodriguez Dam in the lower portion of the basin in Mexico, 10.94 inches, 134% of the 40-year average.

Runoff in the basin during 1977 averaged less than 5% of normal. Above Morena Reservoir the runoff was 272 acre-feet, or about 5% of the 41-year 1937-1977 mean of 5,150 acre-feet. At Rodriguez Reservoir, the runoff was 679 acre-feet, or about 6% of the 40-year mean of 12,256 acre-feet.

The flow of the Tijuana River at the international boundary was 1,490 acre-feet during 1977, and the flow in the Tijuana River near Nestor was 87.6 acre-feet.

Whitewater Draw

During 1977, the average annual temperature over the watershed was slightly above normal, while the annual precipitation was above normal. Runoff for the year at the gaging station near Douglas, Arizona of 10,678 acre-feet was about 156% of average.

GENERAL HYDROLOGIC CONDITIONS FOR 1977

San Pedro River

During 1977, the average annual temperature was above normal. The annual precipitation, as measured at Coronado National Monument Headquarters, was 119% of the 1961-1977 mean of 19.48 inches. The stream flow at the international boundary was 62,788 acre-feet, 281% of the 1951-1977 normal.

Santa Cruz River

During 1977, the average annual temperature over the watershed was somewhat above normal, and the annual precipitation was about 131% of the 39-year 1939-1977 mean. Runoff measured at the Nogales gaging station where the stream re-enters the United States was 66,030 acre-feet. The total runoff for the year measured at the gaging station near Lochiel, Arizona, where the stream enters Mexico from the United States, was 6,004 acre-feet. Therefore, neglecting stream flow depletions in Mexico, the records indicate a contribution of about 60,026 acre-feet from the loop of the river lying in Mexico, or approximately 91% of the flow reaching the Nogales station.

Alamo and New Rivers

During 1977 the average annual temperature over the drainage area of the Alamo River, as recorded at El Centro, California, was 71.4 degrees, 0.8 degree below normal; and over the drainage area of the New River, as recorded at Mexicali, Baja California, it was 73.0 degrees, 2 degrees above the 52-year average.

At El Centro, the precipitation was 4.54 inches, about 184% of the 47-year average, and in Mexicali, the annual precipitation was 6.10 inches, 201% of the 52-year average. The total flow of the New River at the international boundary in 1977 was 107,711 acre-feet, which was about 134% of the 1943-1977 normal.

Salton Sea

During 1977, the average annual temperature around the Salton Sea was about 99% of the long-term average, while the annual precipitation recorded at Brawley, California was approximately 247% of the long-term mean of 2.48 inches. The water surface of the Salton Sea remained more or less the same during the year. The maximum stage, 228.4 feet below mean sea level, was recorded on August 21-23, 1977. The minimum stage, 229.4 feet below mean sea level, was recorded on January 1-2, 1977.

EMERGENCY DELIVERIES OF COLORADO RIVER WATERS FOR USE IN TIJUANA, BAJA CALIFORNIA

DESCRIPTION: Delivery of water is measured at a metering station located adjacent to the international boundary near Tijuana, and approximately 2.5 miles (4.0 km) east of the International Boundary Monument #253. The metering station consists of two venturi tubes, 20 inches (50.8 cm) and 18 inches (45.7 cm), and two BIF recorders.

RECORDS: Based on totalizer readings read at approximately 8:00 a.m. each day and on continuous chart readings furnished by the Otay Municipal Water District. Records available since August 13, 1972. These records reflect a 12% loss incurred in conveying the water from the point of diversion above Parker Dam to the international boundary.

REMARKS: Emergency deliveries of Colorado River waters for use in Tijuana began August 13, 1972 pursuant to Minute No. 240 of this Commission. The deliveries are conveyed approximately 323 miles (520 km) using the following conveyance works: The diversion works from Lake Havasu above Parker Dam and the Colorado River Aqueduct, the San Diego Aqueducts, the Otay Reservoir and facilities of the Otay Municipal Water District. Furthermore, the following additional facilities were constructed as provided in Minute 240; new pumps at the Otay Pumping Station, approximately 5,800 feet (1,768 m) of 24-inch (61.0 cm) pipe and various valves, meters and accessories near the international boundary. The facilities were developed to circumvent serious water shortages predicted for Tijuana.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	16.5	12.5	11.1	11.4	11.2	13.4	13.3	13.2	14.9	11.0	11.2	14.7
2	16.5	12.7	11.1	11.4	11.2	13.4	13.3	13.2	15.0	11.0	10.7	14.5
3	16.4	8.4	11.1	11.4	11.1	13.7	13.4	13.1	15.2	10.9	10.8	14.9
4	16.4	5.7	11.1	11.5	11.1	13.6	13.2	13.2	15.4	10.9	10.6	14.9
5	16.5	5.6	11.1	11.4	11.2	13.7	13.2	13.2	15.2	11.0	10.6	14.8
6	16.4	5.7	11.1	11.4	11.3	13.5	13.3	13.3	15.2	11.1	11.7	14.9
7	16.3	5.7	11.1	11.3	11.3	13.5	13.2	13.3	15.2	11.2	11.1	14.9
8	16.3	5.6	11.1	11.3	11.3	13.6	13.8	15.3	15.2	11.1	11.3	14.8
9	16.3	5.6	8.1	11.3	12.2	13.6	14.0	15.5	15.2	11.0	11.3	15.0
10	16.5	5.6	7.1	11.5	13.3	13.4	13.3	15.5	15.1	11.0	11.3	11.9
11	16.3	7.7	11.1	11.3	13.6	13.5	13.1	15.7	15.5	10.7	11.2	5.7
12	16.3	11.3	11.4	11.3	13.7	13.6	13.3	15.5	14.7	10.8	11.3	5.7
13	16.2	11.3	11.6	11.5	13.4	13.3	13.5	15.5	12.2	10.6	11.3	3.7
14	16.2	11.3	11.5	11.3	13.5	13.4	13.5	15.5	11.4	11.1	11.2	3.7
15	13.6	10.9	11.5	11.4	13.4	13.4	13.3	15.1	10.3	11.1	11.3	10.6
16	12.7	9.1	11.5	11.5	13.9	13.3	13.2	15.5	9.3	11.1	10.8	10.9
17	11.1	10.9	11.5	11.4	13.9	13.5	13.6	15.5	9.4	11.0	10.8	10.9
18	12.5	11.1	11.5	11.3	14.1	13.6	13.2	15.5	9.5	11.0	10.6	11.0
19	12.5	11.1	11.5	11.4	13.3	13.5	13.1	15.5	12.2	10.8	10.9	12.3
20	12.5	11.1	11.5	11.3	13.3	13.3	13.3	15.5	15.2	10.9	11.0	14.0
21	12.7	11.1	8.8	11.3	13.5	13.3	13.2	15.1	15.4	10.9	10.8	14.1
22	12.5	11.0	7.0	11.2	13.5	13.3	13.5	16.0	15.2	11.0	10.6	14.2
23	12.7	11.1	11.1	11.3	13.3	13.3	13.5	15.5	13.1	11.0	11.3	15.7
24	12.7	11.1	11.2	11.4	13.3	13.3	13.6	15.5	10.9	11.0	10.5	13.3
25	12.7	10.9	11.3	11.4	13.3	13.6	13.3	15.5	11.1	10.9	10.8	15.3
26	12.3	11.1	11.3	11.4	13.2	13.5	13.3	15.5	10.9	10.9	10.8	15.3
27	12.5	11.0	11.5	11.5	13.1	13.2	13.3	15.5	10.9	10.7	10.8	15.5
28	12.5	11.0	11.3	11.3	13.2	13.2	13.2	15.5	11.8	10.9	12.6	15.5
29	12.5		11.4	11.7	13.2	13.2	13.3	15.1	10.2	10.7	15.2	15.3
30	12.7		11.3	11.5	13.4	13.2	13.5	15.1	10.9	11.0	14.8	15.3
31	12.7		11.2		13.2		13.2	15.1		10.9		15.5
Sum	442.5	267.2	336.0	341.6	397.5	402.9	414.0	463.0	391.7	339.2	339.2	398.8

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	* ∅ Extreme Second-Feet High Day	High	Low Day	Low	Average Second-Feet	Total Acre-Feet	Period 1973-1977 Acre-Feet Average	Maximum	Minimum
Jan.			† 1	16.5	17	11.1	14.3	878	742	878	603
Feb.			2	12.7	† 5	5.6	9.5	530	666	767	530
Mar.			13	11.6	22	7.0	10.8	666	711	849	666
Apr.			29	11.7	22	11.2	11.4	678	744	857	591
May			18	14.1	† 3	11.1	12.8	788	805	887	698
June			† 3	13.7	†27	13.2	13.4	799	832	986	700
July			9	14.0	†11	13.1	13.4	821	874	1,021	783
Aug.			22	16.0	3	13.1	14.9	918	841	918	638
Sept.			11	15.5	16	9.3	13.1	777	759	904	599
Oct.			7	11.2	13	10.6	10.9	673	789	905	673
Nov.			29	15.2	24	10.5	11.3	673	775	902	673
Dec.			23	15.7	†13	3.7	12.9	791	783	993	610
				16.5		3.7	12.4	8,992	9,321	10,258	8,262
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				0.47		0.10	0.35	11,092	11,497	12,653	10,191

* Includes 12% losses ∅ Mean daily † And other days

RESERVATION MAIN DRAIN NO. 4 (CALIFORNIA DRAIN)

DESCRIPTION: Water-stage recorder (digital) located 500 feet (152 m) upstream from railroad culvert and one mile (1.6 km) northwest of Yuma, Arizona. Discharge measurements are made from a footbridge immediately below the gage. The drainage canal discharges into the outfall channel of the Yuma Main Canal Wasteway 200 feet (61.0 m) downstream from the spillway structure, and thence into the Colorado River on the right bank, 1,000 feet (305 m) upstream from Colorado River below Yuma Main Canal Wasteway, and 6.5 miles (10.5 km) upstream from the northerly international boundary. Prior to October 1955, published as "California Drainage Canal near Yuma, Arizona."

RECORDS: Based on current meter measurements and a continuous record of gage heights. Records are computed and furnished by the U. S. Geological Survey. Records available: Monthly discharge, January 1913 to April 1920, October 1921 to March 1925, and January 1934 to September 1947; daily and monthly discharge, October 1947 through 1977.

REMARKS: Reservation Main Drain No. 4 collects drainage and wastewater from the area east of the Yuma Main Canal on the Reservation Division of the Yuma Project, located in California. Since 1939, collection of seepage from the All-American Canal has caused large increases in drainage flows. Average annual flow prior to 1937 was 12,800 acre-feet (15,789,000 m^3). Monthly and annual averages since 1937 are shown in the table below.

EXTREMES: Prior to 1937: Maximum annual flow 20,190 acre-feet, (24,904,000 m^3), 1916; minimum annual flow 8,920 acre-feet (11,003,000 m^3), 1913.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	49	49	50	50	54	54	59	56	57	39	42	48
2	47	42	50	47	58	54	56	56	58	39	39	47
3	47	41	48	47	52	52	58	63	58	39	43	46
4	47	39	52	48	53	49	57	57	54	38	40	41
5	41	45	53	47	55	49	54	58	53	39	40	41
6	40	45	51	48	61	47	54	57	48	40	46	41
7	41	42	52	47	44	44	59	55	50	43	42	45
8	42	41	49	47	45	49	56	54	54	42	48	40
9	42	41	47	48	47	48	58	56	49	41	42	42
10	57	42	49	48	52	49	58	54	48	41	48	44
11	52	41	48	47	53	48	60	53	48	41	45	40
12	48	48	46	47	52	60	65	53	42	41	45	41
13	47	49	46	48	56	60	61	53	42	43	47	43
14	48	50	47	51	58	59	65	55	48	43	44	46
15	46	48	47	48	57	60	61	57	48	41	46	41
16	45	48	47	48	51	66	62	57	54	45	43	41
17	44	49	48	50	54	55	60	66	55	46	42	39
18	44	51	52	49	57	57	59	30	58	42	50	41
19	44	52	50	46	55	56	56	35	57	42	44	41
20	45	55	53	50	48	54	56	40	50	43	41	38
21	45	58	50	47	47	54	55	45	48	45	40	41
22	47	55	48	47	47	55	56	47	50	50	41	42
23	46	52	47	47	46	53	56	44	48	42	41	41
24	44	50	47	47	51	54	57	45	48	42	45	49
25	43	50	47	47	51	59	57	51	47	45	43	41
26	43	52	48	48	52	61	55	53	46	42	42	40
27	44	51	49	51	59	56	60	50	47	44	43	40
28	44	50	49	50	54	58	56	53	50	48	43	62
29	43		48	60	54	57	59	56	46	40	41	60
30	43		47	54	52	55	57	56	44	47	42	43
31	47		48		49		58	54		42		39
Sum	1,405	1,336	1,513	1,459	1,624	1,632	1,800	1,619	1,505	1,315	1,298	1,344

Month	Current Year 1977 — Extreme Gage Feet		Ø Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Period 1937-1977 — Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.			10	57	6	40	45.3	2,787	3,184	4,780	877
Feb.			21	58	4	39	47.7	2,650	3,021	4,320	563
Mar.			† 5	53	†12	46	48.8	3,001	3,672	5,240	1,240
Apr.			29	60	19	46	48.6	2,894	3,723	5,250	1,160
May			6	61	7	44	52.4	3,221	3,852	5,590	992
June			16	66	7	44	54.4	3,237	3,710	5,580	885
July			†12	65	† 5	54	58.1	3,570	3,976	6,550	816
Aug.			17	66	18	30	52.2	3,211	3,944	6,810	861
Sept.			† 2	58	†12	42	50.2	2,985	3,743	6,220	889
Oct.			22	50	4	38	42.4	2,608	3,764	5,740	1,040
Nov.			18	50	2	39	43.3	2,575	3,510	5,490	994
Dec.			28	62	20	38	43.4	2,666	3,397	4,960	966
				66		30	48.9	35,405	43,496	63,700	12,840
Yearly	Meters			Cubic Meters per Second					Thousands of Cubic Meters		
				1.87		0.85	1.38	43,672	53,652	78,573	15,838

Ø Mean daily † And other days

YUMA MAIN CANAL WASTEWAY TO COLORADO RIVER AT YUMA, ARIZONA

DESCRIPTION: The wasteway receives water from the Yuma Main Canal at the check structure on the canal, 1,645 feet (501 m) upstream from the intake of the Colorado River siphon, and 3.2 miles (5.1 km) downstream from the Siphon Drop Power Plant. This wasteway discharges into the Colorado River on the California side, 1,000 feet (305 m) upstream from Colorado River below Yuma Main Canal Wasteway, and 6.5 miles (10.5 km) upstream from the northerly international land boundary.

RECORDS: Discharge is computed as the difference between the measured discharge of the Yuma Main Canal at the Siphon Drop Power Plant upstream and that of the same canal below the Colorado River siphon, with deductions for small irrigation diversions from the canal between the two gaging stations. Records obtained and furnished by U. S. Geological Survey. Records available: April 1913 through 1977.

REMARKS: The wasteway discharges to the river the flow in excess of irrigation water in the Yuma Main Canal. This excess flow, in addition to the irrigation water, was diverted from the All-American Canal into the Yuma Main Canal and utilized for power purposes at the Siphon Drop Power Plant.

EXTREMES: Prior to 1935, when storage began in Lake Mead: Average annual flow, 297,800 acre-feet; (367,333,000 m^3); maximum annual flow, 913,700 acre-feet (1,127,040,000 m^3), 1932; minimum annual flow, 114,900 acre-feet (141,728,000 m^3), 1917. Since 1935: Maximum mean daily discharge, 2,020 second-feet (57.2 m^3/sec), December 24-25, 1948; minimum mean daily discharge, no flow on numerous occasions.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	36	387	26	13	18	220	19	12	128	128	284	640
2	33	347	27	15	22	269	14	12	452	177	282	806
3	26	363	22	14	15	349	19	12	255	169	46	14
4	94	615	19	14	15	571	15	12	216	95	25	14
5	512	372	19	14	17	609	15	11	218	112	26	114
6	489	309	20	14	117	635	15	11	220	99	70	14
7	395	340	22	14	634	736	16	10	157	106	5.8	14
8	291	403	18	14	476	628	16	10	239	137	2.9	14
9	286	408	21	14	361	619	13	11	233	131	4.9	15
10	111	380	15	17	137	647	23	12	235	134	96	15
11	94	472	13	16	142	664	15	11	109	127	205	15
12	118	459	13	17	187	759	13	11	15	188	199	16
13	141	23	14	17	216	18	16	11	12	169	190	16
14	144	23	13	18	183	19	12	15	12	191	262	17
15	105	23	14	18	173	22	12	26	40	206	313	17
16	106	25	14	18	27	21	12	11	193	149	291	17
17	110	31	14	16	232	22	17	14	219	153	324	18
18	141	26	15	16	158	23	12	15	232	211	246	18
19	192	26	15	15	276	22	13	14	214	208	70	18
20	181	24	15	15	565	21	12	14	217	233	99	21
21	239	25	14	16	735	21	12	16	164	235	305	17
22	173	26	14	16	732	22	12	16	180	268	386	16
23	153	28	14	15	777	21	15	14	193	296	386	16
24	151	29	13	15	423	19	12	14	201	354	363	16
25	175	25	13	15	286	18	16	15	209	381	369	16
26	187	25	13	15	288	26	15	15	233	361	278	16
27	272	27	13	15	192	19	22	15	246	413	157	16
28	269	27	12	21	208	19	15	14	190	383	362	17
29	226		12	18	247	19	12	14	138	359	390	17
30	236		12	16	244	19	12	15	128	365	421	21
31	351		12		274		12	14		286		21
Sum	6,037	5,268	491	471	8,377	7,077	454	417	5,498	6,824	6,458.6	1,922

Month	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
	Current Year 1977								**Period 1935-1977**		
Jan.			5	512	3	26	195	11,974	55,320	110,700	3,230
Feb.			4	615	†13	23	188	10,449	48,332	89,140	2,856
Mar.			2	27	†28	12	15.8	974	48,654	90,190	469
Apr.			28	21	1	13	15.7	934	49,161	86,580	934
May			23	777	† 3	15	270	16,616	57,967	88,280	5,480
June			12	759	†13	18	236	14,037	50,910	86,960	1,857
July			10	23	†14	12	14.6	900	48,160	91,220	452
Aug.			15	26	† 7	10	13.5	827	48,708	89,890	456
Sept.			2	452	†13	12	183	10,905	51,812	83,660	9,737
Oct.			27	413	4	95	220	13,535	48,873	90,050	2,176
Nov.			30	421	8	2.9	215	12,810	48,900	101,500	3,850
Dec.			2	806	† 3	14	62.0	3,812	53,585	108,800	918
				806		2.9	136	97,773	610,382	1,042,850	75,950
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				22.8		0.08	3.85	120,602	752,900	1,286,345	93,684

∅ Mean daily † And other days

COLORADO RIVER BELOW YUMA MAIN CANAL WASTEWAY AT YUMA, ARIZONA - DISCHARGES

DESCRIPTION: Water-stage recorder located in California on the right bank of the river, 1,000 feet (305 m) downstream from the mouth of the Yuma Main Canal Wasteway, 0.6 mile (1.0 km) downstream from the abandoned gaging station on the Colorado River at Yuma, 5.2 miles (8.4 km) downstream from the mouth of the Gila River, 19.6 miles (31.5 km) downstream from Imperial Dam, and 6.4 miles (10.3 km) upstream from the northerly international boundary. Zero of the gage is 101.99 feet (31.09 m) above mean sea level, U. S. C. & G. S. datum.
RECORDS: Based on current meter measurements and a continuous record of gage heights. Computations by shifting control methods. Records obtained and furnished by U. S. Geological Survey. Records available: October 1963 through 1977. Records from January 1951 through September 1963 deduced from "Colorado River at Yuma" plus flows from "Reservation Main Drain No. 4" and "Yuma Main Canal Wasteway."
REMARKS: Reservoirs on the Colorado River, power developments, transmountain diversions, reservoirs on the Gila River, irrigation diversions, and return flows modify the river flow at this station.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	531	1,180	495	605	775	1,170	547	615	684	643	664	948
2	517	1,170	501	579	733	1,200	667	603	1,380	666	682	1,190
3	500	1,170	485	574	590	1,190	556	612	1,340	666	660	482
4	661	1,230	491	586	554	1,340	558	569	1,320	652	651	444
5	1,380	1,220	730	567	491	1,310	546	565	1,330	662	642	441
6	1,370	1,210	705	572	609	1,340	547	545	1,340	659	744	442
7	1,330	1,290	678	627	1,550	1,460	571	550	1,250	656	630	453
8	1,280	1,290	548	871	1,400	1,440	576	554	1,250	659	654	418
9	1,250	1,340	520	765	1,380	1,470	538	561	1,250	668	628	432
10	1,060	1,330	496	647	1,300	1,520	547	566	1,220	658	688	424
11	1,020	1,400	550	615	1,290	1,470	543	660	1,430	663	653	415
12	1,020	1,300	590	606	1,320	1,440	547	682	1,750	685	661	454
13	1,040	616	583	615	1,320	631	585	737	2,090	665	662	587
14	1,040	575	584	617	1,310	552	830	598	1,510	666	694	589
15	1,010	550	584	610	1,420	548	804	673	1,120	679	714	571
16	1,010	536	584	596	1,500	518	698	2,010	1,160	660	705	535
17	989	510	565	600	1,260	504	608	3,010	1,150	666	708	550
18	978	511	549	585	1,240	527	605	4,090	1,160	663	711	485
19	991	505	528	597	1,150	760	607	5,160	1,160	655	710	478
20	978	500	543	615	1,180	682	577	3,890	1,160	660	735	478
21	993	502	548	609	1,240	540	578	1,740	1,130	678	783	482
22	1,030	514	551	883	1,210	516	580	855	1,140	694	790	477
23	1,010	521	551	786	1,230	507	556	733	1,140	687	783	463
24	1,010	508	534	614	1,230	497	562	666	1,130	736	781	468
25	1,010	446	534	602	1,240	535	552	638	1,140	754	774	458
26	993	452	548	584	1,220	604	555	616	1,120	763	774	450
27	1,050	449	568	593	1,190	584	564	620	1,130	756	757	418
28	1,060	459	577	594	1,190	558	661	602	1,160	745	777	1,110
29	1,040		574	590	1,200	548	891	580	1,130	721	766	1,300
30	1,050		575	567	1,220	534	725	580	1,010	730	776	507
31	1,130		577		1,250		634	558		669		462
Sum	31,331	23,284	17,446	18,871	35,792	26,495	18,915	35,438	37,284	21,184	21,357	17,411

Month	Current Year 1977								Period 1951-1977		
	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum
Jan.	11.32	9.47	5	1,540	3	492	1,011	62,144	201,607	979,890	29,857
Feb.	11.18	9.26	12	1,470	25	434	832	46,183	151,648	826,600	33,790
Mar.	10.00	9.34	5	760	4	466	563	34,604	164,450	1,073,270	34,604
Apr.	10.33	9.53	22	905	5	530	629	37,430	156,843	843,010	33,687
May	11.85	9.39	16	1,820	5	474	1,155	70,992	154,789	863,860	56,493
June	11.54	9.42	9	1,600	24	482	883	52,552	143,690	833,970	33,856
July	10.37	9.53	29	915	5	522	610	37,517	150,707	649,820	34,413
Aug.	17.28	9.54	19	5,310	6	526	1,143	70,290	156,948	670,050	36,426
Sept.	12.45	9.67	13	2,160	1	553	1,243	73,952	137,580	775,930	43,182
Oct.	10.16	9.67	26	780	31	566	683	42,018	112,065	802,210	34,965
Nov.	10.65	9.71	6	1,040	11	584	712	42,361	129,795	911,370	34,832
Dec.	11.92	9.26	29	1,780	27	394	562	34,534	162,614	1,114,550	33,023
	17.28	9.26		5,310		394	836	604,577	1,822,736	10,220,870	513,755
Yearly	Meters		Cubic Meters per Second						Thousands of Cubic Meters		
	5.27	2.82		150		11.2	23.7	745,740	2,248,327	12,607,341	633,712

COLORADO RIVER BELOW YUMA MAIN CANAL WASTEWAY AT YUMA, ARIZONA - STAGES

(See Preceding Page For Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.56	10.71	9.41	9.65	10.07	10.79	9.57	9.74	9.94	9.84	9.88	10.43
2	9.53	10.68	9.42	9.64	9.97	10.84	9.85	9.71	11.25	9.88	9.93	10.89
3	9.49	10.68	9.39	9.63	9.66	10.83	9.61	9.73	11.17	9.89	9.88	9.46
4	9.69	10.78	9.40	9.65	9.57	11.08	9.61	9.64	11.13	9.86	9.86	9.37
5	11.05	10.78	9.93	9.61	9.43	11.04	9.58	9.63	11.14	9.88	9.84	9.35
6	11.04	10.75	9.88	9.62	9.66	11.08	9.59	9.58	11.14	9.88	10.06	9.34
7	10.97	10.89	9.82	9.74	11.44	11.29	9.64	9.59	10.98	9.87	9.81	9.37
8	10.88	10.89	9.53	10.26	11.17	11.26	9.65	9.60	10.99	9.88	9.87	9.28
9	10.84	10.96	9.46	10.04	11.14	11.31	9.57	9.62	10.98	9.90	9.81	9.32
10	10.51	10.95	9.41	9.79	11.00	11.40	9.59	9.63	10.94	9.87	9.94	9.29
11	10.45	11.06	9.53	9.72	10.98	11.31	9.58	9.84	11.29	9.88	9.86	9.27
12	10.45	10.89	9.62	9.70	11.04	11.26	9.59	9.89	11.81	9.93	9.88	9.37
13	10.48	9.63	9.61	9.72	11.03	9.75	9.67	10.01	12.34	9.89	9.88	9.68
14	10.48	9.59	9.61	9.72	11.02	9.58	10.20	9.70	11.42	9.89	9.95	9.68
15	10.42	9.53	9.61	9.71	11.20	9.57	10.15	9.86	10.77	9.92	10.00	9.64
16	10.41	9.50	9.61	9.68	11.34	9.50	9.92	13.03	10.83	9.88	9.98	9.56
17	10.38	9.44	9.57	9.68	10.93	9.47	9.72	14.57	10.83	9.89	9.98	9.59
18	10.36	9.44	9.53	9.65	10.90	9.52	9.72	16.60	10.85	9.89	9.99	9.44
19	10.38	9.43	9.48	9.68	10.76	10.04	9.72	17.11	10.85	9.87	9.99	9.43
20	10.36	9.42	9.52	9.72	10.81	9.87	9.65	15.36	10.85	9.88	10.04	9.43
21	10.38	9.43	9.53	9.71	10.91	9.55	9.66	12.09	10.80	9.92	10.15	9.44
22	10.45	9.45	9.54	10.29	10.85	9.50	9.66	10.45	10.83	9.95	10.16	9.43
23	10.42	9.47	9.54	10.09	10.89	9.48	9.61	10.19	10.83	9.94	10.15	9.39
24	10.42	9.44	9.50	9.72	10.89	9.45	9.62	10.02	10.80	10.05	10.14	9.40
25	10.42	9.29	9.50	9.69	10.90	9.54	9.60	9.95	10.82	10.09	10.13	9.38
26	10.39	9.30	9.53	9.65	10.87	9.69	9.60	9.89	10.80	10.10	10.13	9.38
27	10.50	9.30	9.57	9.67	10.81	9.65	9.62	9.89	10.81	10.09	10.09	9.32
28	10.52	9.32	9.59	9.67	10.83	9.59	9.83	9.83	10.86	10.07	10.13	10.67
29	10.48		9.59	9.66	10.83	9.57	10.32	9.77	10.81	10.01	10.11	11.05
30	10.50		9.59	9.61	10.87	9.54	9.98	9.76	10.57	10.03	10.13	9.52
31	10.64		9.59		10.93		9.78	9.70		9.90		9.39
Avg.	10.41	10.04	9.56	9.75	10.73	10.21	9.72	10.77	10.98	9.93	9.99	9.60

YUMA MESA OUTLET DRAIN
TO COLORADO RIVER NEAR YUMA, ARIZONA

DESCRIPTION: Venturi meter with recorder 0.3 mile (0.5 km) from outlet to Colorado River, 0.5 mile (0.8 km) west of Joe Henry Memorial Park in Yuma, Arizona. Outlet is 1.7 miles (2.7 km) downstream from the mouth of Yuma Main Canal Wasteway.

RECORDS: Records are furnished by U. S. Geological Survey. Monthly discharge July 1970 through 1977. Prior to July 21, 1972, records furnished by U. S. Bureau of Reclamation.

REMARKS: Records show water pumped from wells on the Yuma Mesa and conveyed by underground conduit to Colorado River.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	75	70	68	67	60	68	60	55	55	49	48	43
2	74	70	69	67	60	68	61	58	55	49	48	43
3	73	70	68	67	60	68	61	40	54	49	48	48
4	72	69	68	67	62	68	62	51	54	52	48	48
5	72	69	69	67	65	68	61	55	54	53	48	47
6	72	69	68	67	65	68	61	55	54	52	47	47
7	71	69	68	67	65	68	61	55	54	52	47	46
8	71	69	68	67	65	54	61	55	54	50	47	47
9	71	69	65	67	65	53	61	55	54	54	47	47
10	71	69	68	67	55	68	61	52	54	54	47	47
11	71	69	68	67	65	68	61	52	54	42	49	47
12	71	69	68	66	63	68	61	55	21	36	53	47
13	71	69	68	66	63	68	61	54	0	43	53	47
14	70	69	68	66	65	68	60	54	0	49	53	47
15	71	69	63	66	28	68	61	33	28	48	53	47
16	71	66	62	66	0	67	61	0	54	48	50	46
17	71	69	68	66	32	67	60	0	54	48	48	47
18	71	69	68	66	64	66	61	0	54	48	47	47
19	71	68	68	66	62	66	61	0	52	48	49	46
20	70	68	68	65	66	66	61	0	53	48	49	46
21	71	68	65	66	68	65	60	0	55	48	49	46
22	71	68	68	63	68	65	59	25	54	48	47	46
23	71	68	67	60	66	65	61	47	54	48	49	47
24	71	69	68	60	64	64	61	47	54	48	49	47
25	70	69	67	60	64	64	57	50	54	30	49	46
26	70	69	68	60	63	64	55	55	52	18	48	46
27	70	68	68	60	61	64	55	56	49	26	48	17
28	70	68	67	60	61	62	55	56	49	48	48	0
29	70		67	60	61	60	54	56	47	48	48	0
30	68		67	60	61	59	55	55	49	48	47	0
31	69		67		63		54	54		48		0
Sum	2,201	1,925	2,087	1,939	1,840	1,955	1,844	1,280	1,429	1,430	1,461	1,225

Month	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
				Current Year 1977					Period 1971-1977		
Jan.			1	75	30	68	71.0	4,366	3,391	5,840	0
Feb.			† 1	70	16	66	68.8	3,818	3,100	4,830	0
Mar.			† 2	69	16	62	67.3	4,140	3,535	5,430	4
Apr.			† 1	67	†23	60	64.6	3,846	2,957	5,120	242
May			†21	68	16	0	59.4	3,650	3,117	4,933	0
June			† 1	68	9	53	65.2	3,878	3,187	4,828	0
July			4	62	†29	54	59.5	3,658	3,808	5,510	692
Aug.			2	58	†16	0	41.3	2,539	3,873	6,000	180
Sept.			† 1	55	†13	0	47.6	2,834	3,645	5,880	0
Oct.			† 9	54	26	18	46.1	2,836	3,745	5,360	157
Nov.			†12	53	† 6	47	48.7	2,898	3,836	5,290	313
Dec.			† 3	48	†28	0	39.5	2,430	4,016	5,970	0
				75		0	56.6	40,893	42,210	58,680	1,753
Yearly	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
				2.1		0	1.6	50,441	52,066	72,381	2,162

∅ Mean daily † And other days

DRAIN NO. 8-B (ARAZ DRAIN)

DESCRIPTION: This drain discharges into the Colorado River 4.0 miles (6.4 km) downstream from Colorado River below Yuma Main Canal Wasteway, and 2.5 miles (4.0 km) upstream from the northerly international boundary. Prior to October 1955, published as "Araz Drain".

RECORDS: Records are furnished by U. S. Geological Survey from current meter measurements during the year. Records available: May 1948 through 1977.

REMARKS: Drain 8-B, which was constructed in February 1948, collects seepage water in the westerly section of the Reservation Division of the Yuma Project which lies in California. Flow in the drain between the mouth and the U. S. Highway No. 80 culvert, about 3,200 feet (975 m) upstream, is affected by backwater from the river during ordinary high stages.

EXTREMES: Mean daily discharge: Maximum, 24 second-feet (0.68 m^3/sec) on September 1, 1953; minimum, 0.1 second-foot (0.003 m^3/sec) several days in February 1966.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.3	1.5	1.8	1.6	1.4	2.1	2.7	2.1	1.8	1.4	0.9
2	1.8	1.3	1.5	1.8	1.6	1.4	2.2	2.7	2.1	1.8	1.3	.9
3	1.8	1.3	1.5	1.8	1.5	1.5	2.3	2.7	2.1	1.8	1.3	.9
4	1.8	1.3	1.5	1.8	1.5	1.5	2.3	2.7	2.1	1.8	1.3	.9
5	1.7	1.3	1.5	1.8	1.5	1.5	2.4	2.7	2.0	1.8	1.3	.9
6	1.7	1.3	1.5	1.8	1.5	1.5	2.5	2.7	2.0	1.8	1.3	.9
7	1.7	1.3	1.6	1.7	1.4	1.6	2.6	2.7	2.0	1.8	1.3	.9
8	1.7	1.4	1.6	1.7	1.4	1.6	2.7	2.7	2.0	1.8	1.2	.9
9	1.7	1.4	1.6	1.7	1.4	1.6	2.7	2.7	2.0	1.8	1.2	.9
10	1.6	1.4	1.6	1.7	1.4	1.6	2.7	2.7	2.0	1.8	1.2	.9
11	1.6	1.4	1.6	1.7	1.4	1.6	2.7	2.7	2.0	1.8	1.2	.9
12	1.6	1.4	1.6	1.7	1.4	1.7	2.7	2.7	2.0	1.8	1.2	.9
13	1.6	1.4	1.7	1.7	1.4	1.7	2.7	2.6	2.0	1.8	1.2	.9
14	1.5	1.4	1.7	1.7	1.4	1.7	2.7	2.6	2.0	1.8	1.1	.9
15	1.5	1.4	1.7	1.7	1.4	1.7	2.7	2.6	2.0	1.8	1.1	.9
16	1.5	1.4	1.7	1.7	1.4	1.8	2.7	2.5	2.0	1.8	1.1	.9
17	1.5	1.4	1.7	1.7	1.4	1.8	2.7	2.5	2.0	1.8	1.1	.9
18	1.4	1.4	1.7	1.6	1.4	1.8	2.7	2.5	1.9	1.8	1.1	.9
19	1.4	1.4	1.8	1.6	1.4	1.8	2.7	2.5	1.9	1.7	1.1	.9
20	1.4	1.4	1.8	1.6	1.4	1.9	2.7	2.4	1.9	1.7	1.0	.9
21	1.4	1.4	1.8	1.6	1.4	1.9	2.7	2.4	1.9	1.6	1.0	.8
22	1.4	1.4	1.8	1.6	1.4	1.9	2.7	2.4	1.9	1.5	1.0	.8
23	1.3	1.4	1.8	1.6	1.4	1.9	2.7	2.3	1.9	1.5	1.0	.8
24	1.3	1.4	1.8	1.6	1.4	1.9	2.7	2.3	1.9	1.4	1.0	.8
25	1.3	1.4	1.8	1.6	1.4	2.0	2.7	2.3	1.9	1.4	.9	.8
26	1.3	1.4	1.8	1.6	1.4	2.0	2.7	2.2	1.9	1.4	.9	.8
27	1.3	1.4	1.8	1.6	1.4	2.0	2.7	2.2	1.9	1.4	.9	.8
28	1.3	1.4	1.8	1.6	1.4	2.0	2.7	2.2	1.9	1.4	.9	.8
29	1.3		1.8	1.6	1.4	2.0	2.7	2.2	1.9	1.4	.9	.8
30	1.3		1.8	1.6	1.4	2.0	2.7	2.2	1.9	1.4	.9	.8
31	1.3		1.8		1.4		2.7	2.2		1.4		.8
Sum	46.8	38.5	52.2	50.3	44.2	52.3	81.2	77.5	59.1	51.6	33.4	26.8

Month	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
			Current Year 1977						**Period 1948-1977**		
Jan.			† 1	1.8	†23	1.3	1.51	92.8	328	899	39.3
Feb.			† 8	1.4	† 1	1.3	1.38	76.4	283	746	40.5
Mar.			†19	1.8	† 1	1.5	1.68	104	346	853	73.8
Apr.			† 1	1.8	†18	1.6	1.68	99.8	364	1,000	66.8
May			† 1	1.6	† 7	1.4	1.43	87.7	366	966	61.5
June			†25	2.0	† 1	1.4	1.74	104	381	1,030	67.4
July			† 8	2.7	1	2.1	2.62	161	435	1,260	72.8
Aug.			† 1	2.7	†26	2.2	2.50	154	483	1,350	73.8
Sept.			† 1	2.1	†18	1.9	1.97	117	464	1,370	53.6
Oct.			† 1	1.8	†24	1.4	1.66	102	471	1,220	55.3
Nov.			1	1.4	†25	.9	1.11	66.2	427	1,240	57.7
Dec.			† 1	.9	†21	.8	.86	53.2	384	1,050	51.0
Yearly				2.7		0.8	1.68	1,218.1	4,732	12,429	334
	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				0.08		0.02	0.05	1,503	5,837	15,331	1,029

† And other days ∅ Mean daily

PILOT KNOB POWER PLANT AND WASTEWAY NEAR PILOT KNOB, CALIFORNIA

DESCRIPTION: The Pilot Knob Power Plant and Wasteway is located on the All-American Canal, 20.8 miles (33.5 km) downstream from the intake at Imperial Dam, 6 miles (9.7 km) west of Yuma, about one mile (1.6 km) north of the northerly international boundary and empties into the old Alamo Canal in the United States and thence into the Colorado River through Rockwood gates, about one mile (1.6 km) upstream from the northerly international boundary. Water-stage recorder is located in forebay on right bank of the All-American Canal, 550 feet (168 m) upstream from wasteway gates and 1,800 feet (549 m) from entrance to the power plant. Datum of gage is 150.00 feet (45.72 m) above mean sea level. Tailrace gage is on left bank, 680 feet (207 m) downstream from power plant with automatic recording equipment in control house. All bypass gates are equipped with calibrated openings which are read on all gate changes. Datum of tailrace gage is at mean sea level; elevation of sill of wasteway gates is 147.88 feet (45.07 m), U. S. C. & G. S. datum. Prior to October 1956, this station was published as "Pilot Knob Wasteway near Pilot Knob, California."

RECORDS: Daily discharge is computed from flowmeter equipment and head and openings on wasteway gates or from head and gate opening on wicket and wasteway gates. Records furnished by the U. S. Geological Survey. Records available: July 1944 through 1977. The wasteway was operated for the purpose of diverting Colorado River water to the Alamo Canal for use in Mexico from July 1944 to November 8, 1950, in accordance with arrangements between the United States and Mexico for emergency use of the All-American Canal facilities. Records since 1950 show water released through Pilot Knob Power Plant and Wasteway from the All-American Canal and returned to the Colorado River through Rockwood gates.

REMARKS: Pilot Knob Wasteway was completed in 1938 and the first flow occurred on February 5, 1939. Pilot Knob Power Plant was completed in January 1957 and the first flow occurred on January 14, 1957.

EXTREMES: Maximum mean daily discharge, 8,350 second-feet (236 m^3/sec) on January 26, 1958; minimum daily discharge, no flow during long periods.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,760	0	1,780	2,640	1,750	0	1,660	2,100	847	0	0	0
2	1,540	0	1,700	2,740	1,450	0	1,490	2,120	0	0	0	39
3	1,310	0	1,750	2,730	1,370	0	1,730	2,050	0	0	0	1,060
4	980	0	1,810	2,850	1,260	0	1,830	2,040	0	0	0	1,310
5	0	0	1,550	2,850	1,210	0	1,810	1,970	0	0	0	1,330
6	0	0	1,590	2,920	1,070	0	1,900	1,980	0	0	0	1,420
7	0	0	1,620	2,840	0	0	1,870	1,960	0	0	0	1,380
8	0	0	1,890	2,580	0	0	1,850	1,940	0	0	0	1,400
9	0	0	1,890	2,810	0	0	1,870	1,910	0	0	0	1,480
10	0	0	1,960	2,940	0	0	1,910	1,920	0	0	0	1,480
11	0	0	1,920	3,020	0	0	1,920	1,800	0	0	0	1,630
12	0	42	1,870	3,020	0	0	2,000	1,740	0	0	0	1,580
13	0	1,010	1,960	3,020	0	1,140	2,000	1,640	0	0	0	1,500
14	0	1,060	2,080	3,020	0	1,280	1,680	1,790	0	0	0	1,470
15	0	1,170	2,050	3,050	0	1,250	1,740	3,490	0	0	0	1,560
16	0	1,250	2,080	3,070	0	1,360	1,850	7,780	0	0	0	1,620
17	0	1,240	2,080	3,030	0	1,350	1,920	6,450	0	0	0	1,580
18	0	1,310	2,080	3,070	0	1,400	1,960	7,000	0	0	0	1,650
19	0	1,300	2,110	3,060	0	1,100	1,940	2,210	0	0	0	1,680
20	0	1,290	2,180	3,050	0	1,240	2,020	985	0	0	0	1,670
21	0	1,460	2,180	3,080	0	1,440	2,030	1,000	0	0	0	1,640
22	0	1,360	2,150	2,660	0	1,500	1,990	1,070	0	0	0	1,650
23	0	1,400	2,300	2,700	0	1,550	2,040	1,200	0	0	0	1,600
24	0	1,460	2,390	2,880	0	1,600	2,010	1,310	0	0	0	1,590
25	0	1,560	2,390	2,880	0	1,540	1,990	1,400	0	0	0	1,480
26	0	1,570	2,400	2,850	0	1,500	2,040	1,460	0	0	0	1,490
27	0	1,580	2,400	2,770	0	1,420	2,050	1,480	0	0	0	1,500
28	0	1,480	2,430	2,640	0	1,530	1,970	1,500	0	0	0	1,500
29	0		2,420	2,460	0	1,550	1,690	1,500	0	0	0	1,300
30	0		2,440	2,230	0	1,520	1,810	1,400	0	0	0	1,070
31	0		2,540		0		1,940	1,210		0		1,150
Sum	5,590	21,542	63,990	85,460	8,110	25,270	58,510	69,405	847	0	0	42,809

Month	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
			Current Year 1977						**Period 1944-1977**		
Jan.			1	1,760	† 5	0	180	11,088	39,505	400,200	0
Feb.			27	1,580	† 1	0	769	42,728	22,313	149,500	0
Mar.			31	2,540	5	1,550	2,064	126,922	77,356	279,300	0
Apr.			21	3,080	30	2,230	2,849	169,507	102,547	260,900	0
May			1	1,750	† 7	0	262	16,086	18,424	165,400	0
June			24	1,600	† 1	0	842	50,122	60,193	204,300	0
July			27	2,050	2	1,490	1,887	116,053	113,486	260,000	0
Aug.			16	7,780	20	985	2,239	137,663	115,670	270,100	0
Sept.			1	847	† 2	0	28.2	1,680	48,304	173,300	0
Oct.				0		0	0	0	9,531	51,460	0
Nov.				0		0	0	0	13,329	182,600	0
Dec.			19	1,680	1	0	1,381	84,910	41,971	319,700	0
				7,780		0	1,042	756,759	662,629	1,944,700	0
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				220		0	29.5	933,455	817,346	2,398,768	0

∅ Mean daily † And other days

COLORADO RIVER AT NORTHERLY INTERNATIONAL BOUNDARY - DISCHARGES

DESCRIPTION: Water-stage recorder on the left (Arizona) bank and cableway at the point where the northerly international land boundary (California-Baja California) intersects the Colorado River, about 6.4 miles (10.3 km) downstream from Colorado River below Yuma Main Canal Wasteway, 5 miles (8.0 km) west of Yuma, Arizona, 1.1 miles (1.8 km) upstream from Morelos Diversion Structure, and about one mile (1.6 km) downstream from Rockwood Gate. Zero of the gage is at mean sea level, U. S. C. & G. S. datum. Station is operated by the United States Section of the Commission.

RECORDS: Based on 273 current meter measurements during the year, 212 by the United States Section, 50 by the Mexican Section of the Commission, 11 by the U. S. Geological Survey, and a continuous record of gage heights. Discharges are computed on the basis of a water-stage recorder 1,680 feet (512 m) upstream from the northerly international boundary where the remains of an old weir serve as a partial controlling section. A continuous gage height record is available November 15, 1948 through 1977; daily discharge records available January 1, 1950 through 1977.

REMARKS: Reservoirs on the Colorado River, including Lake Mead above Hoover Dam, where storage began in 1935, reservoirs on the Gila River, and many irrigation diversions and return flows regulate the river flow at this station except for infrequent flood flows. During 1977, the flow at this point, and the emergency deliveries for Tijuana, Baja California shown on page 8, represented the total amount of the Colorado River water which crossed the northerly international boundary.

EXTREMES: Prior to January 1935: Maximum instantaneous discharge estimated about 250,000 second-feet, (7,080 m^3/sec), January 22, 1916; minimum discharge, no flow several days during August and September 1934; average annual flow 13,443,000 acre-feet (16,581,806,000 m^3); maximum annual flow 25,480,000 acre-feet (31,429,325,000 m^3), 1907; minimum annual flow 1,174,000 acre-feet (1,448,117,000 m^3), 1934. Since January 1935: Maximum mean daily discharge, about 33,000 second-feet (934 m^3/sec), February 7, 1942; minimum discharge, no flow during April 1935.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,560	1,380	2,380	3,360	2,610	1,340	2,310	2,850	1,580	748	773	1,170
2	2,310	1,370	2,380	3,510	2,290	1,340	2,300	2,880	1,420	764	800	1,460
3	2,060	1,350	2,380	3,480	2,030	1,340	2,470	2,770	1,460	776	798	1,730
4	1,790	1,410	2,470	3,650	1,820	1,430	2,460	2,760	1,420	764	764	1,900
5	1,460	1,440	2,490	3,650	1,670	1,420	2,460	2,680	1,440	776	752	1,930
6	1,490	1,400	2,490	3,740	1,610	1,450	2,540	2,660	1,450	776	878	2,000
7	1,460	1,470	2,500	3,750	1,620	1,560	2,540	2,630	1,380	764	729	2,020
8	1,410	1,490	2,620	3,750	1,520	1,580	2,540	2,600	1,360	752	764	1,990
9	1,390	1,560	2,620	3,830	1,520	1,580	2,520	2,590	1,390	776	729	2,100
10	1,210	1,520	2,620	3,810	1,450	1,660	2,550	2,580	1,360	764	812	2,070
11	1,130	1,580	2,630	3,890	1,440	1,660	2,550	2,590	1,480	764	752	2,230
12	1,130	1,580	2,620	3,890	1,440	1,650	2,620	2,550	1,740	788	788	2,230
13	1,170	1,750	2,680	3,890	1,440	1,850	2,640	2,560	2,110	776	788	2,290
14	1,160	1,800	2,770	3,890	1,460	1,870	2,630	2,540	1,740	764	848	2,290
15	1,130	1,840	2,770	3,870	1,470	1,850	2,670	3,760	1,250	776	848	2,360
16	1,120	1,890	2,810	3,890	1,660	1,920	2,680	9,510	1,300	788	860	2,370
17	1,110	1,880	2,800	3,840	1,350	1,920	2,680	9,530	1,340	788	860	2,360
18	1,100	1,970	2,780	3,860	1,400	1,970	2,670	11,330	1,330	788	860	2,360
19	1,120	1,980	2,780	3,870	1,310	1,980	2,690	7,910	1,340	797	848	2,360
20	1,110	1,940	2,860	3,870	1,340	2,030	2,710	5,410	1,340	764	896	2,360
21	1,110	2,160	2,860	3,890	1,380	2,060	2,710	3,470	1,320	788	956	2,360
22	1,200	2,140	2,860	3,760	1,380	2,070	2,680	2,200	1,330	812	956	2,360
23	1,170	2,150	3,010	3,720	1,390	2,110	2,680	2,150	1,320	812	956	2,290
24	1,180	2,140	3,020	3,680	1,400	2,160	2,690	2,150	1,320	884	968	2,280
25	1,190	2,160	3,030	3,660	1,380	2,120	2,680	2,200	1,330	872	956	2,160
26	1,170	2,170	3,050	3,560	1,360	2,150	2,720	2,230	1,300	896	968	2,150
27	1,230	2,170	3,100	3,480	1,350	2,150	2,750	2,240	1,330	896	956	2,090
28	1,250	2,130	3,120	3,320	1,340	2,200	2,750	2,230	1,350	896	948	2,550
29	1,220		3,130	3,110	1,340	2,230	2,730	2,250	1,320	872	944	3,100
30	1,220		3,130	2,870	1,360	2,160	2,710	2,110	1,260	872	980	1,900
31	1,300		3,220		1,390		2,720	1,870		814		1,850
Sum	41,660	49,820	85,980	110,340	47,520	54,810	81,050	109,790	42,410	24,867	25,735	66,670

Month	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	104.39	102.73	1	2,880	21	1,050	1,344	82,631	393,607	1,644,000	31,900
Feb.	104.01	102.99	28	2,280	12	1,210	1,779	98,817	331,578	1,378,000	60,400
Mar.	104.90	103.63	31	3,390	1	1,910	2,774	170,539	340,945	1,120,000	19,400
Apr.	105.33	104.36	22	3,980	30	2,820	3,678	218,856	272,646	823,850	0
May	104.39	102.83	1	2,860	19	1,240	1,533	94,255	265,734	1,151,000	71,405
June	103.80	102.86	29	2,250	† 1	1,300	1,827	108,714	253,382	1,175,000	8,500
July	104.28	103.65	30	2,810	1	2,100	2,615	160,760	251,674	763,800	24,400
Aug.	114.34	103.44	18	11,960	31	1,780	3,542	217,765	266,876	791,600	43,800
Sept.	103.80	102.51	13	2,140	30	872	1,414	84,119	233,918	1,029,000	53,851
Oct.	102.51	102.23	26	944	† 1	674	802	49,323	232,511	1,186,000	42,956
Nov.	102.68	102.25	6	1,080	11	685	858	51,045	289,980	1,422,000	41,403
Dec.	108.20	102.55	29	3,460	1	1,020	2,151	132,238	379,560	1,832,000	42,000
Yearly	114.34	102.23		11,960		674	2,026	1,469,062	3,512,411	10,596,900	722,100
	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	34.85	31.16		339		19.1	57.4	1,812,073	4,332,524	13,071,170	890,703

Current Year 1977 — Period 1935-1977

† And other days

COLORADO RIVER AT NORTHERLY INTERNATIONAL BOUNDARY - STAGES

(See Preceding Page for Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	104.21	103.08	104.01	104.86	104.17	102.92	103.86	104.31	103.22	102.30	102.34	102.72
2	104.04	103.08	104.01	104.97	103.89	102.91	103.86	104.32	103.06	102.31	102.37	103.02
3	103.87	103.10	104.02	104.92	103.67	102.90	104.00	104.23	103.06	102.32	102.37	103.33
4	103.67	103.20	104.08	105.05	103.48	103.00	104.00	104.22	103.04	102.31	102.33	103.52
5	103.39	103.25	104.09	105.05	103.36	103.00	103.99	104.15	103.05	102.32	102.33	103.55
6	103.30	103.19	104.10	105.12	103.29	103.02	104.05	104.12	103.05	102.32	102.46	103.62
7	103.28	103.24	104.11	105.14	103.20	103.11	104.05	104.10	102.98	102.31	102.29	103.63
8	103.25	103.24	104.23	105.14	103.12	103.15	104.06	104.07	102.95	102.30	102.33	103.61
9	103.23	103.34	104.23	105.21	103.12	103.15	104.05	104.05	102.99	102.32	102.29	103.71
10	103.02	103.25	104.22	105.20	103.04	103.23	104.07	104.04	103.00	102.30	102.39	103.69
11	102.93	103.30	104.23	105.25	103.03	103.24	104.06	104.05	103.11	102.31	102.33	103.82
12	102.90	103.31	104.22	105.24	103.02	103.24	104.12	104.02	103.34	102.32	102.36	103.83
13	102.98	103.46	104.29	105.24	103.04	103.43	104.14	104.02	103.74	102.33	102.36	103.90
14	102.96	103.52	104.36	105.25	103.06	103.44	104.12	104.01	103.37	102.31	102.41	103.91
15	102.93	103.54	104.36	105.23	103.11	103.42	104.17	105.25	102.94	102.32	102.40	103.99
16	102.88	103.61	104.40	105.24	103.34	103.49	104.18	112.68	102.91	102.34	102.43	103.94
17	102.84	103.66	104.39	105.21	102.99	103.49	104.19	113.16	102.95	102.34	102.42	103.93
18	102.82	103.72	104.36	105.21	103.00	103.55	104.16	114.02	102.94	102.34	102.43	103.93
19	102.84	103.66	104.37	105.22	102.89	103.55	104.18	111.74	102.97	102.36	102.41	103.93
20	102.81	103.64	104.44	105.21	102.93	103.60	104.19	109.36	102.96	102.33	102.46	103.94
21	102.81	103.82	104.43	105.22	102.96	103.61	104.19	106.25	102.94	102.35	102.51	103.96
22	102.91	103.93	104.43	105.12	102.97	103.64	104.16	103.78	102.94	102.38	102.51	103.98
23	102.87	103.82	104.56	105.10	103.06	103.68	104.16	103.73	102.93	102.37	102.51	103.91
24	102.87	103.80	104.58	105.07	103.04	103.71	104.18	103.73	102.93	102.45	102.52	103.90
25	102.91	103.82	104.58	105.06	102.96	103.68	104.16	103.77	102.93	102.43	102.50	103.78
26	102.86	103.85	104.61	104.97	102.95	103.70	104.20	103.79	102.91	102.46	102.52	103.70
27	102.95	103.84	104.65	104.90	102.94	103.71	104.22	103.80	102.92	102.45	102.50	104.34
28	103.00	103.81	104.67	104.78	102.94	103.75	104.22	103.79	102.93	102.46	102.48	106.03
29	102.99		104.67	104.61	102.93	103.77	104.22	103.82	102.90	102.44	102.49	107.81
30	102.96		104.67	104.41	102.95	103.72	104.19	103.70	102.85	102.45	102.52	105.61
31	103.01		104.75		102.97		104.20	103.49		102.39		105.41
Avg.	103.11	103.50	104.36	105.07	103.14	103.39	104.12	105.41	103.03	102.36	102.42	104.06

COOPER WASTEWAY (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorder and control weir on wasteway for discharging regulatory waste water from the Cooper Canal to the Colorado River. This wasteway is located 0.5 mile (0.8 km) downstream from the northerly international boundary and 0.6 mile (1.0 km) upstream from Morelos Diversion Dam. Prior to July 14, 1971, the wasteway was located 0.4 mile (0.6 km) downstream from Morelos Diversion Dam. This wasteway discharges waste water from the Valley Division of the Yuma Project in the United States into the Colorado River. Since July 14, 1971 zero of the gage is 117.64 feet (35.86 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Flow is computed from head on the weir measured by the water-stage recorder and weir rating determined by current meter measurements. Station operated by the United States Section of the Commission. Records available: Daily discharge, March 1950 through 1977, obtained by the United States Section; monthly discharge, January 1934 through March 1950, by the Bureau of Reclamation.

EXTREMES: Prior to March 1950, maximum monthly discharge 914 acre-feet (1,127,000 m^3) in January 1940; minimum monthly discharge, zero for various months. Since March 1950, maximum instantaneous discharge, 79.3 second-feet (2.25 m^3/sec) on June 19, 1965, at a maximum gage height of 114.13 feet (34.79 m) (old datum); minimum instantaneous discharge, zero during parts of each month.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.1	1.3	0.1	3.5	0.2	1.9	0	0	0	0	0.1	0
2	0	1.6	.7	.7	.1	1.2	0	0	0	0	.9	0
3	0	2.5	4.9	.6	0	.7	0	2.0	0	0	1.4	0
4	3.2	1.1	.8	.1	0	3.0	.6	3.8	0	0	2.3	0
5	.4	3.8	3.4	0	0	.2	.4	2.8	0	0	.1	0
6	0	1.7	1.7	0	0	.1	.1	3.2	0	0	0	0
7	0	.1	1.9	0	0	0	4.3	3.8	0	0	0	0
8	0	0	.1	0	0	0	9.1	.6	0	0	0	0
9	0	0	0	0	0	0	3.8	0	0	0	0	.3
10	0	.1	.1	4.0	4.8	0	1.8	0	0	0	1.2	0
11	0	3.5	2.3	1.4	7.1	3.4	.2	0	6.7	0	4.8	0
12	0	1.3	0	0	1.6	5.8	0	3.0	.4	0	1.0	0
13	5.2	1.1	0	2.4	8.0	.9	0	1.6	0	0	5.7	0
14	1.3	1.4	0	2.6	.3	0	0	.4	0	0	1.8	0
15	1.0	1.7	0	.8	0	0	0	13.0	0	0	1.4	0
16	3.1	3.2	0	.2	0	0	0	.6	0	0	.7	.4
17	2.4	2.9	4.7	0	.7	1.3	.4	.2	0	0	.1	0
18	3.3	2.7	3.4	0	4.1	6.0	0	.1	0	0	0	0
19	3.7	4.1	1.4	0	.2	5.5	2.9	0	0	0	.9	1.1
20	.2	1.6	0	0	.1	2.1	2.2	0	0	0	4.4	.8
21	.4	1.5	0	0	0	0	0	0	0	0	.2	0
22	.6	1.4	0	0	4.9	1.3	0	0	0	0	0	.3
23	.6	1.1	0	1.7	1.7	3.1	0	0	0	0	0	1.7
24	.6	4.1	0	6.1	2.4	.5	0	0	0	0	0	.9
25	.5	.2	0	2.2	.2	.3	3.2	0	0	0	0	.3
26	.2	.4	10.9	.5	0	4.6	2.9	0	0	4.5	9.8	0
27	3.0	.2	1.0	2.1	1.6	.3	1.0	0	0	.6	1.8	0
28	1.1	.2	.6	.7	3.7	0	1.6	0	0	.2	.6	0
29	.6		3.1	5.4	7.4	0	1.4	0	0	.1	.1	.3
30	.1		1.5	.8	2.0	0	.4	0	0	3.5	0	0
31	1.2		3.2		1.4		.1	0		.2		.8
Sum	32.8	44.8	45.8	35.8	52.5	42.2	36.4	35.1	7.1	9.1	39.3	6.9

Month	Current Year 1977 Extreme Gage Feet High	Low	Extreme Second-Feet High Day	High	Low Day	Low	Average Second-Feet	Total Acre-Feet	Period 1935-1977 Acre-Feet Average	Maximum	Minimum
Jan.	1.62	0	4	27.0	† 2	0	1.1	65.1	170	914	0
Feb.	1.38	0	5	22.0	† 7	0	1.6	88.9	151	400	6.0
Mar.	2.13	0	26	38.3	† 8	0	1.5	90.8	163	517	0
Apr.	1.48	0	24	24.1	† 4	0	1.2	71.0	171	425	27.8
May	1.61	0	22	26.8	† 2	0	1.7	104	168	440	40.3
June	1.90	0	17	33.2	† 3	0	1.4	83.7	156	595	43.8
July	1.63	0	8	27.3	† 1	0	1.2	72.2	144	516	0
Aug.	2.49	0	15	46.6	† 1	0	1.1	69.6	110	617	0
Sept.	1.71	0	11	29.0	† 1	0	.2	14.1	108	462	0
Oct.	1.27	0	30	19.7	† 1	0	.3	18.0	136	490	0
Nov.	1.82	0	26	31.4	† 6	0	1.3	78.0	159	462	9.0
Dec.	" 1.05	0	23	" 15.2	† 1	0	.2	13.7	180	592	13.7
	2.49	0		46.6		0	1.1	769.1	1,816	4,500	638
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	0.76	0		1.32		0	0.03	949	2.240	5.551	787

" Partly estimated † And other days

COLORADO RIVER IMMEDIATELY ABOVE MORELOS DAM - STAGES

DESCRIPTION: Water-stage recorder located on the right bank of the Colorado River in Mexico attached to the upstream abutment of the gates of the Intake Canal at Morelos Dam, 1.1 miles (1.8 km) downstream from the northerly international boundary, and about 7.5 miles (12.1 km) downstream from the Colorado River below Yuma Main Canal Wasteway. Since April 17, 1969, zero of the gage is at mean sea level, U. S. C. & G. S. datum; prior to that date zero of the gage was 0.16 foot (0.05 m) below mean sea level.

RECORDS: Records obtained and furnished by the Mexican Section of the Commission. Records available: Staff gage height records November 8, 1950 to June 3, 1951; a continuous record of gage heights June 4, 1951 through 1977.

REMARKS: Prior to June 4, 1951, when a continuous water-stage recorder was installed, mean daily gage height records were determined from hourly readings of a staff gage.

EXTREMES: Since November 8, 1950: Maximum mean daily elevation above mean sea level, 113.48 feet (34.59 m) on August 18, 1977; minimum mean daily elevation above mean sea level, 101.51 feet (30.94 m) on February 17, 1957.

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	103.35	102.40	103.05	103.74	103.28	102.36	103.05	103.31	102.56	101.90	101.94	102.23
2	103.25	102.40	103.08	103.81	103.08	102.36	103.05	103.31	102.43	101.90	101.97	102.43
3	103.15	102.46	103.08	103.77	102.92	102.36	103.15	103.22	102.43	101.90	101.97	102.66
4	103.02	102.59	103.15	103.84	102.79	102.43	103.15	103.22	102.43	101.90	101.94	102.76
5	102.79	102.62	103.15	103.84	102.69	102.43	103.15	103.18	102.43	101.90	101.94	102.79
6	102.59	102.56	103.15	103.87	102.66	102.46	103.18	103.18	102.43	101.90	102.03	102.85
7	102.59	102.56	103.15	103.90	102.59	102.49	103.18	103.15	102.40	101.90	101.90	102.85
8	102.59	102.56	103.22	103.94	102.49	102.53	103.18	103.15	102.36	101.90	101.94	102.82
9	102.56	102.66	103.22	104.00	102.49	102.53	103.18	103.15	102.36	101.90	101.90	102.89
10	102.43	102.53	103.22	104.04	102.43	102.59	103.18	103.15	102.36	101.90	101.97	102.85
11	102.33	102.56	103.25	104.04	102.43	102.59	103.18	103.15	102.46	101.94	101.94	102.99
12	102.26	102.56	103.22	104.04	102.43	102.59	103.22	103.12	102.62	101.94	101.97	103.02
13	102.40	102.66	103.28	104.04	102.43	102.72	103.22	103.12	102.99	101.94	101.97	103.05
14	102.40	102.72	103.31	104.07	102.43	102.79	103.22	103.12	102.66	101.94	102.00	103.08
15	102.33	102.76	103.31	104.04	102.53	102.76	103.25	104.59	102.30	101.94	101.97	103.15
16	102.26	102.82	103.38	104.04	102.72	102.82	103.25	112.24	102.33	101.94	102.00	103.05
17	102.23	102.92	103.38	104.00	102.46	102.82	103.25	112.80	102.36	101.94	102.00	103.02
18	102.20	102.92	103.35	104.00	102.43	102.82	103.25	113.48	102.33	101.94	102.00	103.02
19	102.20	102.82	103.31	104.00	102.33	102.82	103.25	111.35	102.36	101.97	102.00	103.02
20	102.20	102.79	103.35	104.00	102.36	102.89	103.28	109.02	102.36	101.94	102.03	103.02
21	102.20	102.95	103.38	103.97	102.40	102.89	103.28	105.64	102.36	101.94	102.07	103.08
22	102.26	103.25	103.38	104.00	102.40	102.89	103.25	102.89	102.36	101.97	102.07	103.12
23	102.23	102.92	103.44	103.97	102.56	102.92	103.22	102.99	102.36	101.97	102.07	103.05
24	102.23	102.95	103.48	103.94	102.49	102.95	103.22	102.89	102.33	102.03	102.10	103.02
25	102.30	102.95	103.48	103.94	102.40	102.92	103.25	102.92	102.33	102.00	102.07	102.92
26	102.23	102.95	103.51	103.87	102.36	102.92	103.25	102.95	102.33	102.03	102.10	102.76
27	102.33	102.95	103.54	103.81	102.36	102.95	103.25	102.95	102.30	102.03	102.07	103.81
28	102.40	102.92	103.54	103.71	102.36	102.99	103.25	102.95	102.30	102.03	102.07	105.77
29	102.40		103.54	103.61	102.36	102.99	103.25	102.99	102.26	102.00	102.07	107.61
30	102.36		103.54	103.44	102.40	102.95	103.22	102.92	102.26	102.03	102.07	105.48
31	102.36		103.61		102.40		103.22	102.76		101.97		105.25
Avg.	102.46	102.76	103.31	103.90	102.53	102.72	103.22	104.59	102.40	101.94	102.00	103.35

INTAKE CANAL AT MORELOS DIVERSION STRUCTURE - DISCHARGES

DESCRIPTION: Water-stage recorder and staff gage on left bank of Intake Canal, 200 feet (61.0 m) downstream from the intake at Morelos Dam, 1,350 feet (410 m) upstream from the point where it joins the old Alamo Canal, 2.2 miles (3.5 km) upstream from Matamoros Check, and about one mile (1.6 km) south of the northerly international boundary. The zero of the gage is 0.16 foot (0.05 m) below mean sea level, U. S. C. & G. S. datum.

RECORDS: The records are deduced from the flows arriving in the limitrophe section of the Colorado River at the northerly international boundary, the flows that pass downstream from the structure, and leakage through the structure. Records available: November 8, 1950 through 1977. Records obtained and furnished by the Mexican Section of the Commission.

REMARKS: The canal is operated with a minimum hydraulic slope to permit the maximum retention of silt above Matamoros Check, and the lower velocities in the canal do not permit measuring the flow with a current meter. Records for this station show the amounts of Colorado River water diverted at Morelos Diversion Dam to the Intake Canal and thence to the Alamo Canal for use in Mexico. Water for use in Mexico may also be diverted to the Alamo Canal in the United States directly from the river at Rockwood Heading or by means of Imperial Dam, the All-American Canal, and certain facilities of the Imperial Irrigation District under conditions set forth in the 1944 Water Treaty. No diversions of the above nature have been made during the years 1951 through 1977 and consequently the records reported below show the total water diverted from the Colorado River to the Alamo Canal during those years.

EXTREMES: Maximum mean daily discharge, 6,540 second-feet (185 m^3/sec), August 3, 1958; maximum mean daily gage height 107.05 feet (32.63 m) November 8, 1950. Minimum daily discharge, no flow on various occasions.

Mean Daily Discharge in Second-Feet 1977 —— Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,480	1,370	2,370	3,360	2,600	1,330	2,300	2,840	1,580	742	770	1,160
2	2,290	1,360	2,380	3,510	2,280	1,330	2,290	2,870	1,410	759	795	1,450
3	2,040	1,340	2,380	3,470	2,020	1,330	2,460	2,760	1,450	770	795	1,720
4	1,780	1,400	2,460	3,640	1,810	1,430	2,450	2,750	1,410	759	763	1,890
5	1,450	1,440	2,490	3,640	1,660	1,420	2,450	2,680	1,430	770	749	1,920
6	1,480	1,390	2,490	3,740	1,600	1,440	2,530	2,660	1,440	770	872	1,990
7	1,450	1,460	2,500	3,740	1,610	1,550	2,540	2,630	1,370	759	724	2,010
8	1,400	1,480	2,620	3,740	1,510	1,570	2,540	2,590	1,360	745	759	1,980
9	1,380	1,550	2,620	3,810	1,510	1,570	2,510	2,580	1,380	770	724	2,090
10	1,200	1,510	2,610	3,810	1,440	1,650	2,550	2,570	1,350	759	809	2,050
11	1,120	1,570	2,630	3,880	1,440	1,660	2,540	2,580	1,480	759	752	2,220
12	1,120	1,570	2,610	3,880	1,430	1,650	2,620	2,550	1,700	784	784	2,220
13	1,160	1,740	2,670	3,880	1,430	1,840	2,630	2,550	2,100	770	788	2,280
14	1,150	1,790	2,750	3,830	1,450	1,860	2,620	2,530	1,730	759	844	2,280
15	1,120	1,820	2,750	3,880	1,470	1,840	2,660	3,060	1,240	770	844	2,350
16	1,120	1,880	2,800	3,880	1,650	1,910	2,670	3,230	1,290	780	855	2,360
17	1,100	1,870	2,790	3,850	1,350	1,910	2,670	2,030	1,330	784	855	2,350
18	1,090	1,950	2,770	3,850	1,400	1,970	2,660	2,780	1,320	784	855	2,350
19	1,120	1,970	2,760	3,850	1,300	1,980	2,690	2,220	1,330	791	844	2,350
20	1,100	1,920	2,850	3,850	1,330	2,030	2,680	2,090	1,330	759	893	2,350
21	1,100	2,140	2,850	3,880	1,370	2,050	2,700	2,130	1,310	784	950	2,350
22	1,190	2,120	2,850	3,740	1,380	2,060	2,670	2,130	1,320	809	950	2,350
23	1,150	2,140	3,000	3,710	1,380	2,100	2,670	2,130	1,310	809	950	2,280
24	1,170	2,130	3,010	3,670	1,390	2,150	2,680	2,130	1,310	879	961	2,270
25	1,180	2,150	3,020	3,640	1,370	2,120	2,670	2,180	1,320	869	950	2,150
26	1,140	2,160	3,050	3,570	1,350	2,150	2,710	2,220	1,300	897	971	1,980
27	1,220	2,160	3,090	3,470	1,350	2,140	2,740	2,230	1,320	893	953	1,320
28	1,240	2,120	3,110	3,310	1,340	2,190	2,740	2,220	1,350	893	943	939
29	1,200		3,120	3,110	1,340	2,230	2,720	2,240	1,310	869	939	671
30	1,200		3,120	2,860	1,350	2,160	2,700	2,100	1,250	872	975	639
31	1,280		3,220		1,380		2,710	1,860		809		671
Sum	41,237	49,525	85,719	110,150	47,322	54,628	80,800	76,138	42,222	24,727	25,614	59,078

Month	Extreme Gage Feet		Ø Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
				High		Low					
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	103.15	101.38	1	2,480	†18	1,090	1,330	81,792	65,806	116,737	966
Feb.	103.12	101.18	†26	2,160	3	1,340	1,770	98,231	64,368	107,233	9,232
Mar.	103.28	101.74	31	3,220	1	2,370	2,770	170,021	168,213	216,994	97,902
Apr.	103.71	102.92	†11	3,880	30	2,860	3,670	218,478	193,788	264,127	153,792
May	102.95	101.25	1	2,600	19	1,300	1,530	93,861	94,004	159,010	66,207
June	102.33	101.02	29	2,230	† 1	1,330	1,820	108,353	152,911	269,632	95,177
July	102.59	102.17	†27	2,740	2	2,290	2,610	160,264	217,457	304,263	135,153
Aug.	103.74	101.21	16	3,230	31	1,860	2,450	151,017	215,329	341,044	130,298
Sept.	102.76	100.69	13	2,100	15	1,240	1,410	83,746	121,137	198,095	53,633
Oct.	101.71	100.23	26	897	1	742	798	49,046	50,184	90,639	10,453
Nov.	100.69	100.13	30	975	† 7	724	855	50,804	40,505	103,954	7,516
Dec.	102.92	100.75	16	2,360	30	639	1,910	117,179	72,054	144,230	8,825
Yearly	103.74	100.13		3,880		639	1,910	1,382,792	1,458,466	1,961,556	1,272,332
	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	31.62	30.52		110		18.1	54.1	1,705,656	1,798,999	2,419,553	1,569,404

Current Year 1977 — Period 1950-1977

Ø Mean daily † And other days

INTAKE CANAL AT MORELOS DIVERSION STRUCTURE - STAGES

(See Preceding Page for Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	103.08	101.94	102.26	103.38	102.76	101.15	102.40	102.33	101.57	101.15	100.26	100.62
2	102.99	101.97	102.46	103.41	102.49	101.12	102.36	102.36	100.93	101.15	100.26	100.92
3	102.92	102.13	102.46	103.35	102.30	101.08	102.46	102.26	101.05	101.12	100.30	101.31
4	102.79	102.30	102.40	103.44	102.17	101.12	102.49	102.26	101.05	101.12	100.23	101.90
5	102.62	102.36	102.30	103.41	102.07	101.21	102.43	102.17	101.02	101.15	100.26	101.97
6	102.36	102.30	102.36	103.51	101.94	101.41	102.49	102.13	101.02	100.95	100.39	102.10
7	102.36	102.26	102.53	103.51	101.84	101.54	102.49	102.10	100.95	100.79	100.23	102.00
8	102.36	102.20	102.56	103.51	101.64	101.61	102.49	102.07	100.89	100.66	100.26	101.77
9	102.36	102.33	102.56	103.58	101.48	101.64	102.49	102.03	100.92	100.62	100.20	101.51
10	102.20	101.87	102.49	103.64	101.48	101.74	102.53	102.03	100.89	100.92	100.33	101.61
11	102.10	101.71	102.49	103.64	101.61	101.84	102.46	102.03	100.89	100.72	100.26	102.17
12	102.00	101.44	102.43	103.64	101.67	101.80	102.49	102.00	101.44	100.62	100.30	102.59
13	102.17	101.71	102.46	103.64	101.71	102.03	103.53	101.97	102.56	100.62	100.30	102.72
14	102.17	102.30	102.56	103.64	101.74	102.13	102.49	101.94	101.87	100.62	100.33	102.76
15	102.10	102.23	102.62	103.64	102.03	102.00	102.36	102.10	101.28	100.69	100.33	102.85
16	101.94	102.40	102.85	103.64	102.46	102.03	102.40	102.33	101.02	100.72	100.33	102.17
17	101.87	102.66	102.89	103.61	101.97	101.97	102.43	101.90	101.12	100.72	100.33	102.13
18	101.71	102.59	102.72	103.61	101.54	102.07	102.36	102.46	101.28	100.72	100.33	102.10
19	101.48	102.00	102.62	103.61	101.44	102.07	102.40	102.40	101.54	101.28	100.33	102.10
20	101.48	102.03	102.66	103.58	101.41	102.17	102.40	102.36	101.54	101.28	100.33	102.43
21	101.57	102.40	102.66	103.58	101.44	102.17	102.43	102.40	101.51	100.62	100.39	102.72
22	101.84	102.99	102.62	103.61	101.80	102.20	102.40	102.23	101.48	100.66	100.46	102.79
23	101.80	102.46	102.76	103.61	102.26	102.23	102.36	102.17	101.31	100.79	100.46	102.69
24	101.87	102.07	102.82	103.58	102.17	102.26	102.40	102.20	101.31	100.85	100.46	102.66
25	102.00	101.94	102.82	103.58	101.77	102.23	102.33	102.26	101.28	100.82	100.46	102.26
26	101.77	102.03	102.85	103.51	101.48	102.20	102.33	102.30	101.28	100.85	100.56	101.87
27	101.97	102.03	102.99	103.41	101.48	102.20	102.30	102.26	101.28	100.95	100.69	101.38
28	102.10	102.03	103.02	103.31	101.41	102.23	102.33	102.26	101.28	100.85	100.69	101.25
29	102.13		103.02	103.18	101.31	102.30	102.30	102.33	100.92	100.75	100.69	101.02
30	102.07		103.02	102.99	101.31	102.26	102.26	102.30	101.57	100.66	100.66	101.02
31	101.94		103.15		101.35		102.23	102.07		100.36		100.95
Avg.	102.13	102.17	102.66	103.51	101.80	101.87	102.40	102.20	101.28	100.82	100.39	101.94

COLORADO RIVER IMMEDIATELY BELOW MORELOS DAM - STAGES

DESCRIPTION: Water-stage recorder located on the right bank of the Colorado River in Mexico immediately downstream from Morelos Dam, 1.1 miles (1.8 km) downstream from the northerly international boundary, and about 7.5 miles (12.1 km) downstream from the Colorado River below Yuma Main Canal Wasteway. Since April 17, 1969, zero of the gage is at mean sea level, U. S. C. & G. S. datum; prior to that date zero of the gage was 0.16 foot (0.05 m) below mean sea level.

RECORDS: Records obtained and furnished by the Mexican Section of the Commission. Records available: Staff gage heights, February 20, 1951 to June 6, 1966; continuous record of gage heights June 7, 1966 through 1977.

REMARKS: On June 7, 1966 a continuous water-stage recorder was installed; prior to this date mean daily gage heights were determined from hourly readings of staff gage.

EXTREMES: Maximum mean daily gage height, 113.42 feet (34.57 m) on August 18, 1977; minimum mean gage height, 98.13 feet (29.91 m) several days during March and April 1967.

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	101.67	101.08	101.02	100.75	100.98	101.08	99.70	98.62	99.15	98.49	98.62	98.62
2	101.25	101.12	101.02	100.95	100.98	101.12	99.02	98.62	98.72	98.49	98.62	98.65
3	101.21	101.08	101.05	101.02	100.98	101.18	98.95	98.65	98.65	98.52	98.65	98.65
4	101.15	101.08	101.02	101.02	100.92	101.18	98.95	98.65	98.62	98.52	98.62	98.65
5	101.15	101.08	100.98	100.98	100.98	101.21	98.92	98.62	98.62	98.52	98.62	98.69
6	101.15	101.12	101.02	101.02	100.98	101.25	98.88	98.62	98.62	98.56	98.62	98.69
7	101.18	101.12	101.05	101.02	100.92	101.31	98.88	98.62	98.62	98.52	98.65	98.69
8	101.21	101.12	101.05	100.98	100.92	101.31	98.85	98.62	98.62	98.52	98.65	98.69
9	101.18	101.12	101.03	100.92	100.92	101.31	98.82	98.62	98.85	98.52	98.62	98.69
10	101.18	101.05	101.05	100.92	100.92	101.31	98.82	98.62	98.69	98.56	98.62	98.69
11	101.21	101.05	101.02	100.92	100.92	101.28	98.82	98.62	98.62	98.56	98.65	98.69
12	101.21	101.05	100.98	100.95	100.92	101.28	99.57	98.62	99.28	98.56	98.72	98.69
13	101.25	101.02	100.98	101.02	100.79	101.25	98.85	98.59	98.69	98.56	98.69	98.69
14	101.21	101.05	100.98	101.02	100.82	101.28	98.79	98.59	98.69	98.59	98.69	98.75
15	101.15	101.08	100.98	100.98	100.85	101.31	98.75	100.98	98.62	98.56	98.69	98.72
16	101.18	101.02	101.05	100.98	100.85	101.38	98.72	112.17	98.56	98.59	98.69	98.75
17	101.21	101.02	101.05	101.02	100.82	101.48	98.72	112.70	98.56	98.62	98.65	98.72
18	101.18	101.05	100.89	101.05	100.89	101.51	98.72	113.42	98.56	98.62	98.65	98.75
19	101.18	101.03	99.41	101.02	100.92	101.51	99.21	111.29	98.56	98.62	98.65	98.75
20	101.21	101.08	99.08	101.02	101.02	101.48	100.52	108.99	98.59	98.62	98.65	98.72
21	101.18	101.08	99.05	101.02	101.05	101.48	98.79	105.58	98.59	98.59	98.65	98.72
22	101.18	101.08	98.95	101.02	101.05	101.51	98.75	99.80	98.59	98.59	98.65	98.72
23	101.18	101.08	98.92	101.05	101.02	101.41	98.72	99.15	98.56	98.59	98.65	98.72
24	101.15	101.05	98.88	101.02	100.98	101.05	98.69	99.02	98.59	98.62	98.62	98.69
25	101.15	101.02	98.82	100.98	101.02	100.85	98.69	98.92	98.52	98.62	98.62	98.72
26	101.18	101.02	98.82	100.98	101.08	100.89	98.69	98.82	98.52	98.65	98.62	100.39
27	101.18	100.98	98.82	101.02	101.05	100.75	98.69	98.82	98.52	98.62	98.62	103.71
28	101.18	101.02	98.85	100.98	101.05	100.33	98.65	98.82	98.49	98.62	98.62	105.64
29	101.15		98.82	101.05	101.05	100.20	98.62	98.79	98.49	98.62	98.62	107.45
30	101.15		98.79	101.02	100.98	100.20	98.62	98.79	98.49	98.62	98.62	105.28
31	101.08		98.92		101.02		98.62	98.72		98.62		105.05
Avg.	101.18	101.05	100.13	100.98	100.95	101.15	98.92	101.15	98.65	98.59	98.65	99.84

WELLTON-MOHAWK DRAINAGE WATER DISCHARGED TO COLORADO RIVER BELOW MORELOS DAM

DESCRIPTION: Water-stage recorder located on downstream end of the Wellton-Mohawk Drainage Extension Channel on the Arizona bank of the Colorado River at the east end of the weir section of Morelos Dam, 1.1 miles (1.8 km) downstream from the northerly international boundary. The elevation of the zero of the gage has not been determined.

RECORDS: Based on discharge measurements and a continuous record of gage heights. Station is operated by the United States Section of the Commission. Records available: November 16, 1965 through 1977.

REMARKS: Pursuant to Minute 218 of the Commission, an extension to the Wellton-Mohawk Drainage Conveyance Channel was constructed along the left bank of the Colorado River to a point immediately below Morelos Dam, a distance of about 12 miles (19.3 km), and placed in operation on November 16, 1965. Drainage flows may be discharged on an emergency basis to the Gila Giver and thence to the Colorado River at the diversion structure, Main Outlet Drain Extension No. 1, at the upstream end of the extension; directly to the Colorado River at Main Outlet Drain Extension No. 2, 1.9 miles (3.1 km) upstream from Morelos Dam; and directly to the Colorado River immediately below Morelos Dam at this station, Main Outlet Drain Extension No. 3. On July 14, 1972, Minute No. 241 of the Commission became effective. The Minute called for discharge of all Wellton-Mohawk drainage waters to be made below Morelos Dam. On August 30, 1973, Minute No. 242 of the Commission became effective. The Minute called for construction of a concrete-lined bypass drain from Morelos Dam to the Santa Clara Slough in Mexico. On June 23, 1977, the first flow was recorded in the bypass drain. Drainage flows through Main Outlet Extension No. 3 will be only on an emergency basis.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	316	298	293	283	295	285	76.9	0	50.8	0	0.8	0.1
2	309	305	293	298	295	287	19.1	0	6.0	0	.4	.1
3	302	298	290	300	290	295	18.2	0	5.4	0	.4	.4
4	300	300	290	305	285	293	17.8	0	4.8	0	.4	..4
5	300	304	290	298	288	298	16.8	2.6	4.8	.2	.4	.2
6	297	305	295	305	285	300	15.5	2.5	4.8	.2	.4	0
7	302	305	300	302	276	305	15.1	2.2	4.5	0	.4	0
8	304	305	304	302	273	304	15.1	2.5	4.5	0	.4	0
9	302	304	307	298	276	304	14.7	2.5	20.1	0	.4	0
10	304	295	302	298	268	298	14.7	2.5	2.0	0	.4	0
11	304	293	300	295	270	293	14.7	2.2	1.4	.1	.4	0
12	307	293	292	304	271	295	102	2.2	79.8	.4	.4	0
13	307	292	293	309	243	290	10.8	2.2	3.0	.4	.4	0
14	298	298	290	307	255	292	4.8	2.0	2.2	0	.6	0
15	295	300	293	305	259	292	3.8	2.0	2.0	0	.6	0
16	304	292	302	309	257	293	3.0	38.1	2.0	0	.6	0
17	305	288	300	314	257	310	2.8	2.8	1.6	2.8	.4	0
18	301	293	266	309	262	312	2.5	2.8	1.6	3.2	.2	0
19	301	298	42.8	305	265	310	69.7	2.8	1.6	2.8	.4	0
20	303	300	3.7	302	282	309	208	2.5	1.6	2.8	.4	0
21	297	302	0	305	283	304	3.6	2.2	1.4	2.5	.2	0
22	300	300	0	304	280	302	.6	2.0	1.2	2.2	.2	0
23	297	300	0	307	276	283	.6	2.0	1.0	2.2	.2	0
24	300	295	0	298	273	232	.4	2.0	1.0	2.2	.2	0
25	302	292	0	292	280	216	.6	2.0	.8	2.2	.2	0
26	302	292	0	300	282	220	.6	3.3	.6	1 9	.2	0
27	307	285	0	300	282	197	.2	5.4	.6	1.8	.4	0
28	305	292	0	298	278	150	.1	5.4	.6	1.8	.4	.1
29	304		0	302	276	141	0	5.7	.2	1.6	.4	0
30	302		0	297	270	141	0	5.1	0	1.6	.3	0
31	298		27.6		278		0	3.0		1.6		.2
Sum	9,375	8,324	5,374.1	9,051	8,510	8,151	652.7	112.5	211.9	34.5	11.5	1.5

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1966-1977 Acre-Feet Average	Maximum	Minimum
Jan.	3.34	3.08	17	331	15	287	302	18,595	16,176	18,718	11,029
Feb.	3.21	3.05	8	310	27	283	297	16,510	12,453	16,992	6,978
Mar.	3.21	0	9	310	†21	0	173	10,659	8,789	18,506	6.9
Apr.	3.24	2.57	†14	316	1	212	302	17,952	7,318	18,061	247
May	3.15	2.71	1	300	13	231	275	16,879	11,983	19,091	3,160
June	3.31	1.98	17	326	28	139	272	16,167	9,303	18,756	2,098
July	3.14	0	†12	297	†28	0	21.1	1,295	8,523	18,946	0
Aug.	3.21	0	16	309	† 1	0	3.6	223	8,803	19,188	34.9
Sept.	3.07	.01	1	285	30	0	7.1	420	12,301	18,474	420
Oct.	2.30	0	17	175	† 1	0	1.1	68.4	16,952	19,200	68.4
Nov.	.10	0	1	1.6	†18	0	.4	22.8	16,521	18,478	22.8
Dec.	.04	0	† 3	.4	† 1	0	0	3.0	15,007	19,121	3.0
Yearly	3.34	0		331		0	138	98,794	144,129	214,781	98,794
	Meters			Cubic Meters per Second					Thousands of Cubic Meters		
	1.02	0		9.37		0	3.91	121,861	177,782	264,930	121,861

† And other days

COLORADO RIVER AT MORELOS GAGING STATION - DISCHARGES

DESCRIPTION: Water-stage recorder on the left (Arizona) bank of the river, and cableway 1.8 miles (2.9 km) downstream from the northerly international boundary, 0.7 mile (1.1 km) downstream from Morelos Diversion Dam, and about 9 miles (14.5 km) downstream from Yuma, Arizona, along the river levee. Zero of gage is at mean sea level, U. S. C. & G. S. datum.

RECORDS: Based on current meter measurements and a continuous record of gage heights. Computations by shifting control methods. Records available: Daily discharges, January 1, 1954 through 1977; continuous record of gage heights, July 20, 1952 through 1977.

REMARKS: Reservoirs, diversions in the United States and Mexico, drainage returns, and waste flows modify the river flow at this station. The record at this station, less Main Outlet Drain Extension No. 3, represents the river flow passing Morelos Diversion Dam.

EXTREMES: Maximum instantaneous discharge, 22,240 second-feet (630 m^3/sec) on January 4, 1955; maximum gage height, 112.85 feet (34.40 m) on August 18, 1977. Minimum discharge, no flow on various occasions.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	401	314	299	201	304	291	* 92.2	* 9.5	* 57.3	* 5.9	* 5.5	* 7.4
2	330	319	299	301	302	292	* 31.2	* 9.4	* 13.7	* 5.9	* 5.8	* 6.7
3	319	312	299	308	299	301	* 29.6	* 9.5	* 11.4	* 5.9	* 5.8	* 6.4
4	314	312	295	311	294	299	* 29.0	* 9.6	* 10.7	* 5.9	* 5.5	* 6.7
5	312	309	295	304	296	304	* 26.2	* 10.0	* 10.5	* 6.0	* 5.2	* 7.4
6	309	314	302	311	296	308	* 24.9	* 9.8	* 10.0	* 6.3	* 5.2	* 7.7
7	314	314	307	311	287	314	* 23.6	* 10.1	* 9.8	* 6.2	* 5.5	* 8.0
8	316	312	306	311	280	313	* 23.3	* 10.5	* 9.6	* 6.1	* 5.5	* 7.7
9	312	311	312	306	282	314	* 23.0	* 10.6	* 26.0	* 6.1	* 5.2	* 7.4
10	318	306	309	306	277	308	* 22.2	* 10.8	* 12.5	* 6.1	* 5.5	* 7.0
11	316	304	306	306	280	299	* 21.6	* 10.8	* 12.0	* 6.1	* 5.8	* 7.0
12	318	306	302	313	282	302	* 102	* 10.7	* 89.0	* 6.2	* 5.8	* 7.7
13	319	302	304	316	263	296	* 15.9	* 10.6	* 11.9	* 6.2	* 6.1	* 8.0
14	307	311	304	314	263	299	* 12.1	* 10.5	* 11.2	* 6.2	* 6.4	* 9.1
15	302	314	309	309	264	301	* 11.7	* 712	* 10.4	* 6.1	* 6.1	* 9.0
16	311	307	316	313	264	302	* 11.3	6,320	* 9.3	* 6.2	* 6.4	9.8
17	314	304	314	318	263	316	* 11.3	7,500	* 8.6	* 6.6	* 6.1	9.2
18	311	312	283	318	269	320	* 11.4	8,550	* 8.2	* 7.0	* 6.1	8.9
19	307	316	68.0	314	275	316	* 49.8	5,690	* 8.0	* 7.5	* 5.8	8.9
20	314	318	* 18.4	313	291	316	* 239	3,320	* 7.6	* 7.3	* 5.8	8.3
21	311	319	* 12.3	320	291	314	* 13.5	1,340	* 7.8	* 6.9	* 6.4	8.6
22	311	318	* 11.8	316	289	314	* 12.1	* 70.9	* 7.5	* 6.6	* 6.7	8.6
23	312	312	* 11.6	320	282	299	* 11.5	* 27.2	* 7.2	* 6.5	* 6.4	8.6
24	311	306	* 11.6	311	279	243	* 11.2	* 22.6	* 6.9	* 6.3	* 6.4	8.0
25	314	302	* 11.6	306	286	219	* 11.2	* 19.6	* 6.7	* 6.1	* 6.4	8.0
26	314	299	* 11.6	* 311	289	223	* 11.1	* 17.5	* 6.4	* 5.9	* 6.4	166
27	323	292	* 11.6	309	289	208	* 10.8	* 17.0	* 6.4	* 5.9	* 6.4	767
28	321	299	* 11.6	306	282	160	* 10.4	* 15.8	* 6.2	* 5.8	* 6.1	1,610
29	319		* 11.5	308	280	141	* 10.0	* 15.5	* 6.0	* 5.7	* 6.1	2,430
30	321		* 11.4	306	279	143	* 9.8	* 14.3	* 5.9	* 5.8	* 6.7	1,260
31	316		* 12.0		284		* 9.5	* 13.4		* 5.8		1,180
Sum	9,837	8,664	5,676.0	9,217	8,761	8,375	932.4	33,808.2	414.7	193.1	179.1	7,613.1

Month	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Period 1954-1977 Acre-Feet		
			High		Low						
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum
Jan.	102.67	100.64	1	679	15	300	317	19,511	134,190	969,540	949
Feb.	100.78	100.58	2	330	27	288	309	17,185	69,608	414,310	977
Mar.	100.76	97.94	†16	328	†30	11.4	183	11,258	45,955	630,230	659
Apr.	100.79	98.13	21	342	1	13.7	307	18,282	36,505	532,320	804
May	100.76	100.43	5	308	13	251	283	17,377	43,367	375,970	460
June	101.18	99.82	17	330	29	140	279	16,612	13,222	119,980	834
July	100.70	97.87	20	303	31	9.5	30.1	1,849	12,709	89,430	654
Aug.	112.85	97.84	18	9,000	† 2	9.0	1,091	67,058	21,793	125,590	702
Sept.	100.71	98.13	12	287	30	5.9	13.8	823	19,396	87,830	113
Oct.	98.28	98.12	19	8.4	29	5.7	6.2	383	41,191	172,940	383
Nov.	98.39	98.18	3	11.5	9	4.9	6.0	355	69,344	356,390	355
Dec.	107.46	98.18	29	2,670	† 3	6.4	246	15,100	93,715	643,850	1,111
	112.85	97.84		9,000		4.9	256	185,793	600,995	3,957,730	101,758
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	34.40	29.82		255		0.14	7.2	229,174	741,321	4,881,820	125,517

Current Year 1977

‼ Estimated * Partly estimated † And other days

COLORADO RIVER AT MORELOS GAGING STATION - STAGES

(See Preceding Page For Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	101.36	100.69	100.65	99.85	‼100.59	100.75	* 99.25	* 97.88	* 99.07	* 98.13	* 98.20	* 98.21
2	100.76	100.72	100.64	100.60	‼100.60	100.76	* 98.40	* 97.88	* 98.66	* 98.12	* 98.21	* 98.19
3	100.70	100.59	100.64	100.64	‼100.60	100.82	* 98.36	* 97.98	* 98.55	* 98.14	* 98.21	* 98.18
4	100.67	100.70	100.62	100.66	*100.60	100.82	* 98.34	* 97.88	* 98.49	* 98.13	* 98.20	* 98.19
5	100.67	100.69	100.61	100.62	100.62	100.86	* 98.28	* 97.90	* 98.48	* 98.13	* 98.19	* 98.21
6	100.66	100.72	100.65	100.65	100.63	100.90	* 98.26	* 97.86	* 98.44	* 98.15	* 98.19	* 98.22
7	100.69	100.73	100.68	100.64	100.59	100.95	* 98.24	* 97.87	* 98.42	* 98.14	* 98.20	* 98.23
8	100.71	100.72	100.66	100.63	100.56	100.95	* 98.24	* 97.90	* 98.40	* 98.12	* 98.20	* 98.22
9	100.69	100.71	100.70	100.58	100.57	100.98	* 98.23	* 97.90	* 98.66	* 98.12	* 98.19	* 98.21
10	100.72	100.67	100.67	100.56	100.55	100.96	* 98.22	* 97.91	* 98.50	* 98.13	* 98.19	* 98.20
11	100.72	100.66	100.65	100.55	100.58	100.93	* 98.21	* 97.91	* 98.46	* 98.13	* 98.20	* 98.20
12	100.73	100.66	100.62	100.59	100.60	100.95	* 99.09	* 97.90	* 99.22	* 98.13	* 98.20	* 98.22
13	100.75	100.64	100.63	100.61	100.50	100.92	* 98.23	* 97.89	* 98.41	* 98.13	* 98.20	* 98.22
14	100.68	100.68	100.62	100.60	100.51	100.94	* 98.04	* 97.88	* 98.38	* 98.13	* 98.21	* 98.25
15	100.65	100.70	100.65	100.57	100.52	100.96	* 98.00	* 99.98	* 98.34	* 98.12	* 98.20	* 98.25
16	100.71	100.65	100.69	100.60	100.53	100.98	* 97.96	111.42	* 98.28	* 98.12	* 98.21	98.27
17	100.73	100.63	100.68	100.63	100.52	101.08	* 97.96	111.91	* 98.25	* 98.14	* 98.20	98.25
18	100.71	100.67	100.53	100.64	100.57	101.12	* 97.97	112.55	* 98.24	* 98.15	* 98.20	98.24
19	100.69	100.69	99.03	100.62	100.61	101.12	* 98.37	110.47	* 98.25	* 98.16	* 98.19	98.24
20	100.73	100.70	* 98.30	100.62	100.71	101.14	*100.21	108.36	* 98.25	* 98.16	* 98.19	98.22
21	100.70	100.71	* 98.02	100.66	100.71	101.13	* 98.10	105.17	* 98.29	* 98.14	* 98.21	98.23
22	100.70	100.70	* 97.98	100.65	100.71	101.13	* 98.01	* 99.55	* 98.27	* 98.13	* 98.21	98.23
23	100.70	100.68	* 97.96	100.67	100.67	101.04	* 97.96	* 98.94	* 98.25	* 98.14	* 98.20	98.23
24	100.69	100.65	* 97.96	100.63	100.56	100.70	* 97.94	* 98.84	* 98.23	* 98.14	* 98.20	98.21
25	100.71	100.64	* 97.96	100.60	100.70	100.54	* 97.95	* 98.76	* 98.21	* 98.14	* 98.20	98.21
26	100.70	100.63	* 97.96	*100.63	100.72	100.54	* 97.95	* 98.70	* 98.18	* 98.12	* 98.20	99.63
27	100.75	100.60	* 97.96	‼100.62	100.72	*100.40	* 97.93	* 98.69	* 98.17	* 98.13	* 98.20	102.99
28	100.73	100.65	* 97.96	‼100.60	100.69	* 99.98	* 97.90	* 98.65	* 98.16	* 98.13	* 98.18	105.14
29	100.72		* 97.95	‼100.61	100.68	* 99.83	* 97.88	* 98.65	* 98.13	* 98.12	* 98.18	107.03
30	100.72		* 97.94	‼100.60	100.68	* 99.84	* 97.88	* 98.60	* 98.13	* 98.13	* 98.19	104.83
31	100.69		* 97.99		100.71		* 97.87	* 98.55		* 98.13		104.60
Avg.	100.72	100.68	99.57	100.59	100.62	100.80	98.23	100.59	98.39	98.13	98.20	99.35

‼ Estimated * Partly estimated

ELEVEN MILE WASTEWAY (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorder and control weir on wasteway for discharging water from the West Main Canal to the Colorado River. This wasteway is located in Arizona, 4.3 miles (6.9 km) downstream from the northerly international boundary and 3.2 miles (5.1 km) downstream from Morelos Diversion Dam. It is the largest of three wasteways discharging waste water from the Valley Division of the Yuma Project in the United States into the limitrophe section of the Colorado River.

RECORDS: Flow is computed from head on the weir measured by the water-stage recorder and weir rating determined by current meter measurements. Station operated by the United States Section of the Commission. Records available: Daily discharge, January 1951 through 1977, obtained by the United States Section; monthly discharge, January 1924 through 1950, by Bureau of Reclamation.

EXTREMES: Prior to January 1951, maximum monthly discharge, 9,740 acre-feet (12,014,000 m^3) in August 1940; minimum monthly discharge, zero in April 1941. Since January 1, 1951, maximum instantaneous discharge, 800 second-feet (22.7 m^3/sec) on December 3, 1961, at a maximum gage height of 117.60 feet (35.84 m); minimum instantaneous discharge, zero during parts of most years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0.2	0	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4
2	0	0	.2	.4	5.8	.2	.2	.3	.2	.2	.2	.4
3	0	0	.2	66.8	.3	.1	.2	.3	.2	.2	.2	.3
4	0	0	.2	26.2	2.5	0	.3	.3	.4	.2	.2	54.2
5	0	0	.2	4.5	0	12.4	.3	.3	.3	.2	.9	68.0
6	0	54.4	53.1	1.9	0	6.8	.3	.3	.2	.2	61.6	6.9
7	0	33.3	42.9	.2	0	3.4	.3	.3	.4	.2	46.6	4.4
8	0	5.0	5.6	.3	0	1.2	.2	.3	.4	.3	6.0	.2
9	0	2.0	4.2	.3	0	.3	.2	.2	.2	.2	3.5	.2
10	0	.2	.3	.3	0	.3	.3	.2	.2	.2	.3	.2
11	0	.2	.3	.3	0	.3	.3	.2	.4	.3	.4	.2
12	0	.2	.2	.2	0	.3	.3	.3	.3	.3	.3	.2
13	0	.2	.3	.2	0	.2	.3	.3	.4	.3	.2	.2
14	0	.2	.3	.3	0	.3	.3	.4	.3	.3	.2	.2
15	0	.2	.3	.3	0	.4	.3	28.3	.2	.4	.2	.3
16	0	.2	.3	.4	0	.4	.4	2.8	.2	.4	.3	.3
17	0	4.5	.3	.4	0	.4	.3	.3	.2	.3	.3	.3
18	0	.4	.3	.3	0	.5	.3	49.4	.2	.2	.6	.4
19	0	.4	.3	.4	0	.5	.3	6.8	.3	.2	.4	.2
20	0	.3	.3	.4	0	.4	.3	2.2	.2	.2	.4	.2
21	0	.3	.2	.4	0	.3	.3	1.1	.2	.2	.4	.3
22	0	.2	.2	.3	0	.3	.3	.1	.3	.4	.4	.2
23	0	.2	.2	.3	0	.4	.3	.2	.3	.3	.4	.4
24	0	.2	.2	.3	0	.3	.3	.2	.3	.1	.4	.3
25	0	.1	.2	.3	0	.3	.2	.2	.3	.2	.3	.3
26	0	.1	.3	.3	0	.3	.2	.2	.3	.2	.2	.2
27	0	.3	.4	.3	0	.3	.3	.3	.2	.2	.2	.3
28	0	.2	.6	.2	0	.3	.3	.3	.2	.3	.2	.5
29	0		0	.2	0	4.6	.3	.2	.2	.2	.3	.3
30	0		0	.2	0	.2	.3	.4	.2	.2	.3	.2
31	0		0		.1		.3	.3		.2		.2
Sum	0	103.3	112.3	106.9	8.9	35.9	8.7	97.3	7.9	7.5	126.1	140.9

Month	Current Year 1977 Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Period 1935-1977 Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	111.72	111.72		0		0	0	0	3,115	9,570	0
Feb.	115.75	111.72	6	272	† 1	0	3.7	205	2,513	8,430	14.5
Mar.	116.04	111.72	6	316	†28	0	3.6	223	2,372	6,230	59.1
Apr.	115.72	111.72	3	268	† 1	0	3.6	212	2,190	6,300	0
May	112.99	111.72	4	80.8	† 4	0	.3	17.7	2,613	9,320	3.3
June	114.05	111.72	5	131	† 4	0	1.2	71.2	2,489	7,440	71.2
July	111.78	111.75	16	.4	† 1	.2	.3	17.3	2,506	8,320	13.9
Aug.	115.46	111.74	15	237	†21	.1	3.1	193	2,154	9,740	120
Sept.	111.79	111.74	† 4	.5	9	.1	.3	15.7	1,564	6,140	6.0
Oct.	111.78	111.74	22	.4	24	.1	.2	14.9	2,132	5,680	14.9
Nov.	115.37	111.75	6	227	† 1	.2	4.2	250	2,547	8,220	18.8
Dec.	115.54	111.75	4	245	† 7	.2	4.5	279	3,372	9,430	61.9
Yearly	116.04	111.72		316		0	2.1	1,499	29,572	82,900	943
	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	35.37	34.05		8.95		0	0.06	1,849	36,477	102,256	1,163

† And other days

COLORADO RIVER AT ELEVEN MILE GAGE - STAGES

DESCRIPTION: Water-stage recorder on the left (Arizona) bank of the river, 4.3 miles (6.9 km) downstream from northerly international boundary, 3.2 miles (5.1 km) downstream from Morelos Diversion Dam, about 50 feet (15 m) downstream from the mouth of Eleven Mile Wasteway of the Yuma Project, and 11 miles (17.7 km) downstream from Yuma, Arizona, along the river levee. The zero of the gage is at mean sea level, U. S. C. & G. S. datum.

RECORDS: Mean daily gage heights based on continuous water-stage records. Records available: Continuous record of gage heights, November 1947 through 1977; once weekly readings obtained by the U. S. Bureau of Reclamation, January 1940 through October 1947.

REMARKS: This station is maintained by the United States Section of the Commission as part of the continuing study of channel conditions in the limitrophe section of the river.

EXTREMES: Since November 1947, maximum mean daily gage height, 108.20 feet (32.98 m) on January 2, 1958; minimum mean daily gage height, 94.95 feet (28.94 m) on June 22, 1968.

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	98.09	97.62	97.58	97.29	97.51	97.67	96.77	95.63	96.01	95.44	95.34	95.50
2	97.68	97.65	97.58	97.51	97.54	97.69	96.32	95.64	95.71	95.44	95.34	95.50
3	97.65	97.63	97.57	97.73	97.49	97.74	96.27	95.65	95.67	95.43	* 95.34	95.51
4	97.63	97.63	97.55	97.67	97.47	97.74	96.26	95.63	95.65	95.41	* 95.34	95.88
5	97.62	97.63	97.55	97.54	97.49	97.82	96.13	95.65	95.65	95.38	* 95.34	96.16
6	97.63	97.84	97.76	97.54	97.50	97.84	95.92	95.63	95.62	95.39	#	95.74
7	97.65	97.81	97.81	97.53	97.47	97.86	95.90	95.62	95.60	95.38	#	95.70
8	97.67	97.67	97.63	97.52	97.46	97.85	95.89	95.62	95.59	95.37	* 95.60	95.64
9	97.65	97.65	97.64	97.51	97.48	97.86	95.89	95.61	95.74	95.37	95.56	95.63
10	97.66	97.60	97.61	97.51	97.46	97.85	95.88	95.62	95.56	95.37	95.50	95.62
11	97.66	97.59	97.61	97.50	97.47	97.83	95.88	95.61	95.55	95.37	95.50	95.62
12	97.67	97.59	97.58	97.52	97.50	97.85	96.48	95.60	96.09	95.36	95.51	95.62
13	97.68	97.58	97.58	97.54	97.41	97.84	95.94	95.59	95.62	95.37	95.50	95.62
14	97.65	97.59	97.57	97.53	97.42	97.85	95.88	95.58	95.58	95.37	95.51	95.63
15	97.62	97.61	97.57	97.51	97.45	97.87	95.80	96.72	95.55	95.36	95.50	95.64
16	97.65	97.58	97.61	97.53	97.45	97.89	95.72	106.15	95.53	95.36	95.50	95.65
17	97.66	97.58	97.61	97.54	97.45	97.96	95.70	107.17	95.50	95.38	95.50	95.64
18	97.65	97.58	97.53	97.54	97.48	98.00	95.70	107.84	95.49	95.38	95.50	95.64
19	97.64	97.60	96.95	97.52	97.50	98.00	95.88	106.32	95.49	95.38	95.50	95.63
20	97.66	97.61	96.45	97.52	97.57	98.01	97.24	104.32	95.48	95.38	95.49	95.62
21	97.65	97.60	95.83	97.54	97.58	97.99	95.83	101.73	95.48	95.37	95.50	95.62
22	97.64	97.61	95.78	97.54	97.58	98.01	95.71	96.97	95.48	95.36	95.50	95.62
23	97.64	97.59	95.76	97.55	97.56	97.95	95.67	96.19	95.46	95.35	95.49	95.63
24	97.63	97.58	95.76	97.52	97.58	97.70	95.67	96.19	95.45	95.35	95.50	95.62
25	97.65	97.57	95.75	97.49	97.60	97.54	95.67	96.19	95.45	95.35	95.49	95.64
26	97.65	97.57	95.74	97.52	97.62	97.56	95.67	95.99	95.45	95.35	95.49	96.42
27	97.67	97.54	95.73	97.53	97.62	97.47	95.66	95.86	95.45	95.36	95.49	98.97
28	97.66	97.56	95.72	97.52	97.62	97.15	95.64	95.87	95.45	95.35	95.49	100.74
29	97.65		95.72	97.53	97.62	97.07	95.63	95.88	95.44	95.34	95.49	102.74
30	97.65		95.70	97.52	97.61	97.03	95.62	95.79	95.44	95.34	95.49	101.04
31	97.62		95.74		97.63		95.63	95.70		95.34		100.69
Avg.	97.66	97.62	96.89	97.53	97.52	97.75	95.93	97.73	95.57	95.37		96.51

* Partly estimated # Missing record

TWENTY-ONE MILE WASTEWAY (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorder and control weir on wasteway for discharging water from the West Main Canal to the Colorado River. On September 27, 1977 recorder moved upstream to site used prior to May 1, 1971. The site used from May 1, 1971 to September 20, 1977 was located 200 feet (61 m) downstream on wasteway. This wasteway is located in Arizona 18.5 miles (29.8 km) downstream from the northerly international boundary, 17.4 miles (28.0 km) downstream from Morelos Diversion Dam, and 2.2 miles (3.5 km) upstream from the southerly international boundary. It is the farthest downstream of the two wasteways discharging waste water from the Valley Division of the Yuma Project in the United States into the limitrophe section of the Colorado River. The elevation of the zero of the gage at the new location has not been determined.

RECORDS: Flow is computed from head on the weir measured by the water-stage recorder and weir rating determined by current meter measurements. Station operated by the United States Section of the Commission. Records available: Daily discharge, January 1951 through 1977, obtained by the United States Section; monthly discharge, March 1939 through 1950, by Bureau of Reclamation.

REMARKS: This wasteway was completed and flow began March 14, 1939. Since May 13, 1944, waste water from the West Main Canal which previously discharged across the southerly land boundary has been returned to the Colorado River through this wasteway.

EXTREMES: Prior to January 1951, maximum monthly discharge, 2,860 acre-feet (3,528,000 m^3) in January 1946; minimum monthly discharge, 122 acre-feet (150,000 m^3) in September 1950. Since January 1, 1951, maximum instantaneous discharge, 102 second-feet (2.89 m^3/sec) on January 24, 1954, at a maximum gage height of 95.46 feet (29.10 m) (old datum); minimum instantaneous discharge, zero during a part of most months.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Sum	0	0	0	0	0	0	0	0	0	0	0	0

Month	Current Year 1977								Period 1939-1977		
	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
				High		Low					
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	0	0		0		0	0	0	773	2,860	0
Feb.	0	0		0		0	0	0	666	2,510	0
Mar.	0	0		0		0	0	0	613	1,660	0
Apr.	0	0		0		0	0	0	660	1,940	0
May	0	0		0		0	0	0	803	2,470	0
June	0	0		0		0	0	0	701	2,350	0
July	0	0		0		0	0	0	605	1,950	0
Aug.	0	0		0		0	0	0	636	2,530	0
Sept.	0	0		0		0	0	0	571	2,180	0
Oct.	0	0		0		0	0	0	692	2,100	0
Nov.	0	0		0		0	0	0	799	2,380	0
Dec.	0	0		0		0	0	0	881	2,680	0
	0	0		0		0	0	0	8,400	24,370	0
Yearly	Meters		Cubic Meters per Second						Thousands of Cubic Meters		
	0	0		0		0	0	0	10,361	30,060	0

EAST MAIN CANAL WASTEWAY (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorder and control weir located about 300 feet (91.4 m) north of the international boundary near San Luis, Arizona and 1.5 miles (2.4 km) east of the Colorado River. On September 28, 1977, recorder moved west 100 feet (30.5 m) to a temporary bypass channel until completion of a new concrete channel and weir.

RECORDS: Wasteway discharges computed by United States Section of the Commission beginning November 1, 1953, from head on control weir as measured by water-stage recorder and weir ratings as determined by current meter measurements. Records available: October 1946 through 1977. Records of monthly discharges also are available for the periods January 1924 through June 1928, January 1932 through 1933, and April 1935 through September 1946.

REMARKS: Wasteway discharges from the East Main Canal comprise regulatory waste and drainage waters from the eastern half of the Valley Division of the Yuma Project and are considered as part of the volumes arriving at the limitrophe section of the Colorado River.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.3	12.6	14.6	13.6	2.7	2.2	7.7	6.5	0.5	6.6	6.3	0.9
2	.6	10.1	11.5	14.7	17.5	21.2	11.2	1.2	14.3	11.7	8.1	2.6
3	.2	9.8	9.4	3.2	10.1	16.6	8.8	7.2	4.4	8.5	11.7	.7
4	0	1.5	4.8	.3	2.4	18.6	15.5	1.0	.5	4.8	12.0	2.7
5	5.5	1.9	14.5	2.5	7.2	9.5	16.7	.3	15.7	8.3	5.2	1.5
6	5.8	.3	1.9	10.6	16.4	3.9	1.3	0	10.3	10.3	12.5	2.4
7	2.6	.1	4.1	17.0	5.8	6.7	.4	0	4.2	4.0	11.4	.3
8	11.5	7.5	1.0	17.9	5.1	1.9	.4	.1	11.4	9.3	1.9	1.7
9	17.2	6.2	6.8	15.7	9.3	.9	1.6	5.1	15.4	8.3	.3	8.7
10	2.6	11.7	7.7	6.2	20.7	9.1	2.9	6.6	6.7	4.9	0	8.8
11	1.2	13.2	19.5	8.4	19.3	6.0	4.6	7.9	2.8	4.9	3.1	9.1
12	11.8	19.3	20.7	4.1	3.1	12.0	15.6	1.5	5.7	10.4	8.9	7.5
13	14.3	19.8	5.0	6.3	6.8	4.4	6.9	1.9	18.6	6.8	8.1	10.3
14	2.0	7.2	6.2	9.4	2.6	7.7	6.2	1.1	12.8	3.3	.3	1.4
15	3.8	6.5	19.7	5.4	6.0	1.4	2.6	10.0	4.2	6.6	0	6.8
16	1.1	8.2	11.3	14.7	2.8	11.1	3.4	19.5	10.8	3.7	.1	9.8
17	2.4	6.8	1.6	16.5	.4	11.2	1.7	16.9	14.1	3.0	1.9	3.0
18	.4	10.4	.7	19.1	.6	10.7	.7	4.6	7.7	6.5	3.7	.1
19	2.6	7.3	13.5	1.7	.4	13.5	.7	1.3	3.4	7.4	3.0	8.2
20	11.4	.5	17.2	.7	5.2	4.8	11.7	.8	12.2	2.4	5.5	3.3
21	16.1	2.2	21.3	.5	8.0	.6	5.9	1.7	3.7	6.9	3.3	.3
22	1.5	3.3	5.7	4.6	12.2	0	6.3	5.4	17.3	10.4	1.0	0
23	15.0	.7	.7	18.5	2.8	.2	3.1	4.7	16.5	9.2	0	2.3
24	12.3	.3	.2	12.0	3.9	2.2	1.9	2.1	12.1	3.0	1.4	2.1
25	9.0	15.3	13.2	23.2	2.2	3.3	3.0	9.7	7.1	4.8	1.0	2.5
26	20.4	25.6	14.6	16.4	13.2	3.2	6.8	1.1	2.3	9.3	6.2	5.1
27	21.9	16.9	13.5	12.8	2.9	0	6.0	.5	5.6	7.1	1.3	5.6
28	20.6	7.3	13.4	11.4	.2	0	3.7	12.6	8.0	14.6	6.9	10.7
29	17.5		13.8	5.2	1.5	1.3	.4	11.9	3.9	8.3	1.5	4.1
30	11.6		8.8	1.8	.8	2.6	0	1.1	11.8	6.8	1.5	1.8
31	4.8		6.2		4.9		2.9	1.9		11.2		0
Sum	260.0	232.5	303.1	294.4	197.0	186.8	160.6	146.2	264.0	223.3	128.1	124.3

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1935-1977 Acre-Feet Average	Maximum	Minimum
Jan.	23.04	22.15	20	40.6	† 4	0	8.4	516	1,144	3,360	280
Feb.	23.08	22.15	26	43.5	† 8	0	8.3	461	958	3,170	298
Mar.	22.92	22.16	19	32.0	24	.1	9.8	601	1,110	2,920	190
Apr.	23.10	22.15	12	45.0	5	0	9.8	584	1,075	3,170	197
May	22.98	22.15	5	36.3	†28	0	6.4	391	1,187	3,040	245
June	23.09	22.15	10	44.3	†21	0	6.2	371	1,012	3,660	175
July	22.98	22.15	20	36.3	† 6	0	5.2	319	1,093	3,590	182
Aug.	22.85	22.15	†15	27.2	† 6	0	4.7	290	1,111	3,960	169
Sept.	22.99	22.18	†13	37.0	† 1	.2	8.8	524	1,036	3,170	159
Oct.	1.87	.72	28	20.7	8	0	7.2	443	1,081	3,280	357
Nov.	1.77	.72	6	18.7	† 9	0	4.3	254	1,179	3,570	254
Dec.	1.81	.72	19	19.5	† 6	0	4.0	247	1,147	3,080	247
	23.10	22.15		45.0		0	6.9	5,001	13,133	38,310	3,967
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	7.04	6.75		1.27		0	0.20	6,169	16,199	47,255	4,893

† And other days

YUMA MAIN DRAIN (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorders located in the forebay and afterbay, with flow meters in the four discharge pipes at the Boundary Pumping Plant on the Main Drain about 200 feet (61 m) north of the international boundary near San Luis, Arizona, 1.3 miles (2.1 km) east of the Colorado River.

RECORDS: Main Drain discharges are lifted 10 (3.05) to 12 feet (3.66 m) at the pumping plant. Prior to April 1, 1969, discharges were computed from pump ratings and the differential head measured by the two gages. Beginning April 1, 1969, discharges were computed from flow meter charts. Pump ratings and flow meter discharges are checked by current meter measurements. Records obtained and computed by the United States Section of the Commission. Records available: Monthly discharges, June 1919 through 1951; daily discharges January 1952 through 1977.

REMARKS: Flows in the Main Drain are principally drainage waters from the Valley Division of the Yuma Project. The Main Drain, the East Main Canal Wasteway, and West Main Canal Wasteway discharge into Mexico at the international land boundary near San Luis, Sonora. The water is used for irrigation in Mexico on the left (Sonora) bank of the Colorado River and is considered as part of the volumes arriving at the limitrophe section of the river.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	95.5	107	117	125	123	98.0	119	123	99.5	135	115	87.6
2	84.6	114	123	123	124	90.7	119	124	107	114	110	81.7
3	79.3	110	121	115	116	110	120	114	122	95.6	117	94.4
4	105	110	111	118	129	122	111	129	127	126	112	95.7
5	111	110	118	112	126	128	114	123	129	120	125	96.1
6	115	124	121	134	124	110	121	129	126	127	125	96.3
7	115	113	118	114	132	107	119	141	126	144	122	94.5
8	112	118	120	110	126	102	118	138	121	124	103	87.1
9	93.8	117	118	124	121	85.5	115	121	127	109	101	94.4
10	85.9	121	114	118	125	111	135	125	119	93.0	101	94.3
11	106	122	111	111	113	117	126	119	98.6	114	104	94.5
12	113	111	118	113	121	112	121	119	104	115	124	99.8
13	99.0	109	102	122	114	120	116	116	111	117	123	88.1
14	116	108	110	127	113	123	120	99.2	123	123	108	97.5
15	95.3	120	110	130	96.9	124	118	107	120	110	92.5	91.7
16	108	116	128	125	83.0	121	119	236	125	113	102	96.0
17	106	118	120	128	105	116	117	201	134	113	105	103
18	110	116	125	107	121	116	110	144	125	113	101	98.0
19	98.6	121	131	116	116	121	121	115	123	112	96.0	100
20	107	134	149	103	125	102	129	111	119	109	99.6	88.8
21	89.9	138	135	115	115	115	134	97.7	125	122	99.8	90.2
22	99.3	114	118	126	103	122	139	96.0	132	119	93.5	85.9
23	99.8	112	113	120	106	113	117	106	137	120	102	102
24	110	96.1	106	124	123	114	119	121	121	118	110	96.3
25	91.0	134	121	119	133	120	107	127	124	106	102	94.9
26	97.9	124	126	124	124	115	116	128	125	91.2	89.0	88.0
27	98.9	128	115	129	122	112	130	129	121	94.6	93.7	94.8
28	111	122	125	124	124	120	126	123	137	116	94.6	84.2
29	109		114	135	143	121	117	117	132	115	93.9	96.2
30	96.2		126	123	133	117	116	114	133	117	87.4	90.2
31	67.8		118		116		122	127		122		84.9
Sum	3,126.8	3,287.1	3,702	3,624	3,695.9	3,405.2	3,731	3,919.9	3,673.1	3,567.4	3,152.0	2,887.1

Month	Current Year 1977							Period 1935-1977		
	Extreme Gage Feet		ø Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
	High	Low	High Day	High	Low Day	Low			Average	Maximum	Minimum
Jan.			14	116	31	67.8	101	6,202	7,801	11,203	1,740
Feb.			21	138	24	96.1	117	6,520	7,697	11,988	1,640
Mar.			20	149	13	102	119	7,343	8,305	12,430	1,940
Apr.			29	135	18	107	121	7,138	8,616	11,890	1,920
May			29	143	16	83.0	119	7,331	8,817	13,140	1,950
June			5	128	9	85.5	114	6,754	8,168	12,040	2,290
July			22	139	25	107	120	7,400	8,036	11,830	2,530
Aug.			16	236	22	96.0	126	7,775	7,973	11,960	2,560
Sept.			†23	137	11	98.6	122	7,285	7,989	11,568	2,280
Oct.			7	144	26	91.2	115	7,076	8,923	12,385	2,940
Nov.			† 5	125	30	87.4	105	6,252	8,547	12,010	2,800
Dec.			17	103	2	81.7	93.1	5,726	8,233	11,480	2,450
				236		67.8	114	82,852	99,605	139,380	27,040
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				6.68		1.92	3.23	102,197	122,862	171,924	33,354

ø Mean daily † And other days

WEST MAIN CANAL WASTEWAY (VALLEY DIVISION, YUMA PROJECT)

DESCRIPTION: Water-stage recorder located about 0.3 mile (0.5 km) upstream from outlet to Yuma Main Drain, which is 175 feet (53.3 m) upstream from East Main Canal Wasteway and 0.4 mile (0.6 km) west of San Luis, Arizona. Prior to August 1, 1975, the recorder was located about 150 feet (45.7 m) upstream from outlet to Yuma Main Drain.
RECORDS: Wasteway discharges computed by United States Section of the Commission beginning February 23, 1971, from water-stage recorder and ratings as determined by current meter measurements.
REMARKS: Wasteway discharges from West Main Canal Wasteway comprise regulatory waste from the West Main Canal.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	25.5	25.3	6.8	27.8	2.2	1.8	1.6	3.3	0.2	1.2	0.9	0.5
2	19.0	12.8	1.2	6.6	6.2	4.0	1.5	0	.1	1.3	1.3	.6
3	11.0	11.9	2.0	38.6	1.0	1.6	.4	1.9	.8	3.1	.7	7.1
4	.9	4.5	11.9	35.5	.5	.8	2.1	.8	5.6	2.3	3.0	16.7
5	3.8	1.0	23.1	2.6	1.2	.1	5.1	1.1	7.6	1.9	1.9	27.3
6	1.3	44.6	41.4	1.1	5.2	3.3	3.2	.6	.4	.5	18.2	3.9
7	2.4	49.8	42.6	.5	1.8	1.4	1.8	2.6	2.6	4.9	25.0	1.3
8	6.9	3.8	5.9	13.8	.1	.2	.1	2.4	2.5	3.6	2.8	.4
9	8.5	.6	2.4	20.0	0	.1	2.0	2.1	9.8	2.0	1.0	.4
10	6.9	3.0	8.1	9.1	2.8	0	3.5	.7	.9	.8	.4	1.3
11	5.5	13.3	27.9	6.9	0	.3	1.3	.5	3.2	3.8	.3	.2
12	4.4	19.3	13.0	3.3	5.3	1.0	3.1	1.3	11.1	1.8	.4	.2
13	4.9	3.3	26.9	9.2	2.6	2.1	3.3	.3	3.7	7.0	.4	3.6
14	26.4	6.9	14.7	16.4	.3	1.1	1.8	.3	.4	.7	.3	5.1
15	6.5	10.6	12.0	.7	6.6	.9	2.5	7.4	1.1	.9	.3	12.0
16	2.9	24.6	19.4	5.4	2.9	.2	.9	13.4	5.1	.8	4.5	1.7
17	1.1	14.5	23.9	3.0	.2	2.1	2.0	.5	14.0	.7	1.5	.4
18	2.8	3.8	12.4	2.1	.7	1.7	7.3	.4	1.4	.9	2.6	.6
19	10.0	5.6	11.8	4.6	1.9	8.8	.3	.4	3.5	2.7	5.9	1.9
20	3.3	6.6	5.1	2.5	4.0	4.5	.2	.3	4.7	2.8	4.4	2.0
21	14.2	7.0	11.1	7.7	.2	2.6	2.0	.2	1.4	5.2	3.1	1.6
22	12.2	7.4	11.9	2.8	.6	2.6	.8	.3	5.4	4.4	2.3	.2
23	25.4	.8	12.9	2.5	1.7	2.5	1.1	1.0	1.2	5.7	1.4	5.2
24	4.3	8.6	13.8	5.0	11.1	1.2	2.2	1.5	1.7	2.5	.8	2.1
25	1.1	20.4	10.6	3.9	2.3	2.2	.3	1.9	1.6	1.6	1.3	6.5
26	12.1	12.8	11.8	6.4	1.0	1.3	.7	.7	7.2	.2	.5	8.0
27	1.9	10.7	14.9	11.5	3.3	1.1	7.0	.9	2.1	0	1.5	9.9
28	6.3	10.0	5.7	6.2	3.9	.6	1.7	.6	1.4	.5	.4	9.9
29	12.5		2.7	4.1	1.9	.5	2.6	.6	.7	1.2	.7	7.8
30	5.1		5.7	12.0	1.9	3.4	2.9	.5	3.6	1.0	.6	11.6
31	14.7		14.5		1.4		1.1	.9		1.1		8.2
Sum	263.8	343.5	428.1	271.8	74.8	54.0	66.4	49.4	105.0	67.1	88.4	158.2

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1971-1977 Acre-Feet Average	Maximum	Minimum
Jan.	3.25	0.31	23	42.8	13	0.4	8.5	523	418	565	237
Feb.	3.00	0	7	65.0	†13	0	12.3	681	531	681	429
Mar.	2.87	0	17	63.8	8	0	13.8	849	576	939	203
Apr.	2.83	0	3	62.2	23	0	9.1	539	442	664	175
May	1.68	0	† 2	23.2	† 3	0	2.4	148	319	434	148
June	1.68	0	19	23.2	† 4	0	1.8	107	347	480	107
July	1.79	0	26	26.4	† 8	0	2.1	132	351	556	132
Aug.	2.08	0	15	35.2	† 2	0	1.6	98.0	339	536	98.0
Sept.	1.73	0	17	24.6	† 1	0	3.5	208	430	768	190
Oct.	1.30	0	13	14.8	†26	0	2.2	133	420	728	133
Nov.	1.98	0	7	32.1	† 3	0	2.9	175	436	541	175
Dec.	2.09	0	15	35.5	1	0	5.1	314	421	610	188
	3.25	0		65.0		0	5.4	3,907	5,030	6,229	# 3,070
Yearly	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
	0.99	0		1.84		0	0.15	4,819	6,204	7,683	# 3,787

† And other days # Not for full year

TOTAL FLOWS CROSSING INTERNATIONAL BOUNDARY INTO MEXICO NEAR SAN LUIS, SONORA

DESCRIPTION: The tabulated data below are the combined flows of the East Main Canal Wasteway, West Main Canal Wasteway, and the Yuma Main Drain and represent the total water crossing the international land boundary into the Sanchez Mejorada Canal near San Luis, Arizona. The Mexican Section maintains a water-stage recorder in Mexico on right bank of Sanchez Mejorada Canal and obtains check measurements on a bridge located 0.2 mile (0.3 km) downstream from the international boundary, 1.2 miles (1.9 km) east of the Colorado River and 0.6 mile (1.0 km) west of San Luis, Sonora.

RECORDS: Records obtained and computed by the United States Section of the Commission. Records available: East Main Canal Wasteway and Yuma Main Drain from January 1935 through 1977. West Main Canal Wasteway from February 23, 1971 through 1977.

REMARKS: Descriptions and flows of the individual stations, East Main Canal Wasteway, West Main Canal Wasteway, and the Yuma Main Drain, are published separately in this bulletin on pages 29, 31, and 30.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	133	145	138	166	128	102	128	133	100	143	122	89.0
2	104	137	136	144	148	116	132	125	121	127	119	84.9
3	90.5	132	132	157	127	128	129	123	127	107	129	102
4	106	116	128	154	132	141	129	131	133	133	127	115
5	120	113	156	117	134	138	136	124	152	130	132	125
6	122	169	164	146	146	117	126	130	137	138	156	103
7	120	163	165	132	140	115	121	144	133	153	158	96.1
8	130	129	127	142	131	104	118	140	135	137	108	89.2
9	120	124	127	160	130	86.5	119	128	152	119	102	104
10	95.4	136	130	133	148	120	141	132	127	98.7	101	104
11	113	148	158	126	132	123	132	127	105	123	107	104
12	129	150	152	120	129	125	140	122	121	127	133	108
13	118	132	134	138	123	126	126	118	133	131	132	102
14	144	122	131	153	116	132	128	101	136	127	109	104
15	106	137	142	136	110	126	123	124	125	118	92.8	110
16	112	149	159	145	88.7	132	123	269	141	118	107	108
17	110	139	146	148	106	129	121	218	162	117	108	106
18	113	130	138	128	122	128	118	149	134	120	107	98.7
19	111	134	156	122	118	143	122	117	130	122	105	110
20	122	141	171	111	134	111	141	112	136	114	110	94.1
21	120	147	167	123	123	118	142	99.6	130	134	106	92.1
22	113	125	136	133	116	125	146	102	155	134	96.8	86.1
23	140	114	127	141	110	116	121	112	155	135	103	110
24	127	105	120	141	138	117	123	125	135	124	112	100
25	101	170	145	146	138	126	110	139	133	112	104	104
26	130	162	152	147	138	120	124	130	134	101	95.7	101
27	123	156	143	153	128	113	143	130	129	102	96.5	110
28	138	139	144	142	128	121	131	136	146	131	102	105
29	139		130	144	146	123	120	130	137	124	96.1	108
30	113		140	142	136	123	119	116	148	125	89.5	104
31	87.3		139		122		126	130		134		93.1
Sum	3,650.2	3,864.0	4,433	4,190	3,965.7	3,644.5	3,958	4,116.6	4,042	3,858.7	3,366.4	3,170.3

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Ø Extreme Second-Feet High Day	High	Low Day	Low	Average Second-Feet	Total Acre-Feet	Period 1935-1977 Acre-Feet Average	Maximum	Minimum
Jan.			14	144	31	87.3	118	7,241	9,363	12,131	* 2,123
Feb.			25	170	24	105	138	7,662	9,186	12,970	* 2,023
Mar.			20	171	24	120	143	8,793	10,491	13,704	* 2,322
Apr.			1	166	20	111	140	8,311	10,133	12,982	2,117
May			† 2	148	16	88.7	128	7,870	10,323	13,900	2,473
June			19	143	9	86.5	122	7,232	9,527	12,570	2,525
July			22	146	25	110	128	7,851	9,480	12,420	2,927
Aug.			16	269	21	99.6	133	8,163	9,423	12,657	2,989
Sept.			17	162	1	100	135	8,017	9,455	12,450	2,602
Oct.			7	153	10	98.7	124	7,652	10,424	13,898	3,444
Nov.			7	158	30	89.5	112	6,681	10,162	12,712	3,407
Dec.			5	125	2	84.9	102	6,287	9,801	12,050	2,888
				269		84.9	127	91,760	117,768	149,010	31,840
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				7.62		2.40	3.60	113,185	145,266	183,802	39,274

Ø Mean daily * Partly estimated † And other days

COLORADO RIVER AT SOUTHERLY INTERNATIONAL BOUNDARY - DISCHARGES

DESCRIPTION: Water-stage recorder located in Mexico on the right bank of the river about 1,000 feet (305 m) upstream from the southerly international boundary, 2 miles (3.2 km) west of San Luis, Arizona, and 21.9 miles (35.2 km) downstream from Morelos Dam. The zero of the gage is at mean sea level, U. S. C. & G. S. datum.
RECORDS: Records obtained and furnished by the United States Section of the Commission. Computations by shifting control methods. Records available: Daily discharges, January 1950 through 1977; continuous record of gage heights, January 1947 through 1977. Monthly flows for this station have been derived for the period January 1935 through 1949 based on the computed records of monthly flows of the Colorado River at the northerly international boundary combined with the measured monthly flows from the wasteways discharging into the boundary section of the river from the Yuma Project in Arizona.
REMARKS: Reservoirs, diversions in the United States and Mexico, drainage returns, and waste flows modify the river flow at this station.
EXTREMES: Since January 1950: Maximum instantaneous discharge, 28,610 second-feet (810 m^3/sec) on December 18, 1952; maximum gage height, 84.84 feet (25.86 m) on November 29, 1957. Minimum discharge, no flow on several occasions since September 1, 1956.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	316	230	211	24.1	197	181	74.0	0	39.5	0	0	0
2	287	230	211	147	200	183	39.9	0	52.2	0	0	0
3	248	230	209	176	197	183	2.7	0	31.2	0	0	0
4	236	226	209	233	190	186	0	0	25.8	0	0	0
5	230	226	204	213	188	186	0	0	21.4	0	0	0
6	228	226	206	204	190	195	0	0	17.4	0	0	0
7	226	262	249	202	188	195	0	0	13.8	0	0	0
8	230	247	238	198	186	191	0	0	11.0	0	0	0
9	232	240	224	195	181	188	0	0	8.6	0	0	0
10	232	232	220	195	183	184	0	0	13.5	0	0	0
11	232	228	217	193	181	184	0	0	5.4	0	0	0
12	232	226	217	191	178	184	0	0	1.7	0	0	0
13	232	228	219	195	179	183	6.5	0	30.8	0	0	0
14	234	228	213	202	165	183	0	0	3.3	0	0	0
15	226	230	213	200	171	183	0	0	0	0	0	0
16	224	228	215	202	171	181	0	176	0	0	0	0
17	224	224	219	204	168	181	0	2,040	0	0	0	0
18	224	226	220	206	174	190	0	4,480	0	0	0	0
19	226	224	167	206	179	193	0	5,530	0	0	0	0
20	226	224	36.4	198	183	191	17.1	4,580	0	0	0	0
21	230	228	25.4	200	191	188	41.5	2,730	0	0	0	0
22	230	224	21.0	202	193	186	0	1,340	0	0	0	0
23	232	224	13.7	202	191	186	0	301	0	0	0	0
24	232	220	8.6	202	184	173	0	152	0	0	0	0
25	232	219	4.6	198	188	136	0	120	0	0	0	0
26	234	217	3.2	197	191	126	0	99.1	0	0	0	0
27	236	215	.2	198	191	124	0	83.0	0	0	0	34.0
28	238	209	0	200	188	104	0	71.2	0	0	0	242
29	238		0	200	186	81.5	0	60.8	0	0	0	732
30	238		0	200	183	77.0	0	52.4	0	0	0	1,290
31	236		0		178		0	45.8		0		887
Sum	7,321	6,371	4,194.1	5,783.1	5,713	5,106.5	181.7	22,861.3	275.6	0	0	3,185.0

	Current Year 1977								Period 1935-1977		
Month	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum
Jan.	76.82	76.04	1	356	16	222	236	14,521	358,018	1,672,000	1,821
Feb.	76.34	75.89	7	282	28	209	228	12,637	297,898	1,385,000	2,040
Mar.	76.21	73.47	7	272	†27	0	135	8,319	239,762	1,127,000	798
Apr.	75.98	73.47	4	252	1	0	193	11,471	153,348	700,900	36.7
May	75.76	75.46	2	207	14	160	184	11,332	210,297	1,160,000	1,045
June	75.76	74.75	6	202	30	76.0	170	10,129	161,810	1,180,000	143
July	74.95	73.51	21	95.2	† 3	0	5.9	360	118,541	772,800	0
Aug.	84.23	73.51	19	6,880	† 1	0	737	45,345	132,999	796,000	0
Sept.	74.74	73.36	2	73.0	†14	0	9.2	547	160,675	1,033,000	0
Oct.				0		0	0	0	204,753	1,192,000	0
Nov.				0		0	0	0	268,317	1,428,000	0
Dec.	79.39	73.36	30	1,420	† 1	0	103	6,317	337,855	1,839,000	2,320
	84.23	73.36		6,880		0	167	120,978	2,644,273	10,688,800	83,792
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	25.67	22.36		195		0	4.73	149,225	3,261,684	13,184,528	103,357

† And other days

COLORADO RIVER AT SOUTHERLY INTERNATIONAL BOUNDARY - STAGES

(See Preceding Page For Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	76.63	76.03	75.90	73.93	75.70	75.62	74.73	73.51	74.24	73.36	73.36	73.36
2	76.46	76.03	75.90	75.44	75.72	75.63	74.27	73.51	74.45	73.36	73.36	73.36
3	76.26	76.03	75.89	75.60	75.70	75.64	73.67	73.51	74.09	73.36	73.36	73.36
4	76.20	76.02	75.89	75.88	75.66	75.66	73.62	73.51	73.98	73.36	73.36	73.36
5	76.16	76.02	75.86	75.78	75.65	75.66	73.62	73.51	73.88	73.36	73.36	73.36
6	76.14	76.02	75.87	75.73	75.65	75.72	73.62	73.51	73.79	73.36	73.36	73.36
7	76.12	76.23	76.10	75.73	75.64	75.72	73.62	73.51	73.70	73.36	73.36	73.36
8	76.13	76.14	76.03	75.71	75.62	75.70	73.62	73.51	73.63	73.36	73.36	73.36
9	76.13	76.09	75.96	75.70	75.59	75.68	73.62	73.51	73.57	73.36	73.36	73.36
10	76.12	76.05	75.93	75.70	75.59	75.66	73.62	73.51	73.69	73.36	73.36	73.36
11	76.12	76.02	75.91	75.70	75.58	75.66	73.62	73.51	73.49	73.36	73.36	73.36
12	76.12	76.01	75.91	75.69	75.57	75.65	73.62	73.51	73.39	73.36	73.36	73.36
13	76.12	76.01	75.91	75.71	75.58	75.64	73.73	73.51	74.09	73.36	73.36	73.36
14	76.13	76.01	75.88	75.74	75.49	75.64	73.62	73.51	73.45	73.36	73.36	73.36
15	76.09	76.01	75.88	75.72	75.53	75.65	73.62	73.51	73.36	73.36	73.36	73.36
16	76.08	76.00	75.89	75.72	75.53	75.65	73.62	75.01	73.36	73.36	73.36	73.36
17	76.08	75.98	75.90	75.72	75.52	75.66	73.62	80.05	73.36	73.36	73.36	73.36
18	76.08	75.99	75.91	75.73	75.56	75.72	73.62	82.90	73.36	73.36	73.36	73.36
19	76.08	75.98	75.57	75.72	75.59	75.75	73.62	84.10	73.36	73.36	73.36	73.36
20	76.08	75.98	74.29	75.68	75.61	75.75	73.88	83.14	73.36	73.36	73.36	73.36
21	76.09	75.99	74.05	75.69	75.67	75.74	74.21	81.45	73.36	73.36	73.36	73.36
22	76.09	75.97	73.94	75.70	75.68	75.73	73.51	79.32	73.36	73.36	73.36	73.36
23	76.09	75.97	73.77	75.71	75.67	75.73	73.51	76.29	73.36	73.36	73.36	73.36
24	76.08	75.95	73.65	75.71	75.64	75.65	73.51	75.41	73.36	73.36	73.36	73.36
25	76.07	75.94	73.56	75.69	75.66	75.38	73.51	75.16	73.36	73.36	73.36	73.36
26	76.07	75.93	73.53	75.68	75.68	75.30	73.51	74.96	73.36	73.36	73.36	73.36
27	76.07	75.92	73.47	75.70	75.68	75.29	73.51	74.80	73.36	73.35	73.36	73.95
28	76.07	75.89	73.47	75.71	75.66	75.10	73.51	74.68	73.35	73.35	73.35	75.91
29	76.07		73.47	75.72	75.65	74.82	73.51	74.56	73.36	73.36	73.36	77.59
30	76.06		73.47	75.72	75.63	74.76	73.51	74.45	73.36	73.36	73.36	79.17
31	76.05		73.47		75.60		73.51	74.35		73.36		78.32
Avg.	76.13	76.01	75.04	75.65	75.62	75.57	73.67	75.59	73.57	73.36	73.36	73.95

WELLTON-MOHAWK BY PASS DRAIN AT SOUTHERLY INTERNATIONAL BOUNDARY

DESCRIPTION: Water-stage recorder and Parshall Flume located 80 feet (24.4 m) upstream from the southerly land boundary, 550 feet (168 m) east of the Colorado River and 1.8 miles (2.9 km) west of San Luis, Arizona. The zero of the gage has not been determined.
RECORDS: Based on current meter measurements and a continuous record of gage heights. Station is operated by United States Section of the Commission. Records available: June 23, 1977 through 1977.
REMARKS: Pursuant to Minute No. 242 of the Commission, a bypass drain of the Wellton-Mohawk extension channel was constructed from Morelos Dam to the Santa Clara Slough in Mexico along the left bank of the Colorado River.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1							228	302	247	285	310	292
2							291	308	296	285	312	291
3							291	308	300	285	314	310
4							291	312	296	274	310	304
5							287	306	283	287	291	298
6							285	300	283	291	306	302
7							293	300	285	306	312	300
8							287	300	291	310	304	298
9							289	300	279	308	300	289
10							285	300	296	306	300	291
11							287	304	306	304	304	296
12							198	310	207	302	304	298
13							289	312	283	300	308	302
14							274	312	296	298	304	302
15							283	342	308	298	298	304
16							285	280	308	298	308	307
17							283	250	312	300	308	291
18							289	258	306	306	296	298
19							267	279	306	308	306	296
20							38.1	281	298	310	304	296
21							293	283	298	308	300	293
22							291	285	302	306	302	296
23						14.0	281	285	302	303	253	289
24						52.9	287	289	304	310	165	291
25						84.0	289	293	306	310	172	296
26						88.1	298	296	304	308	238	296
27						96.8	316	296	298	312	240	296
28						144	308	296	293	308	238	298
29						167	310	296	295	306	254	302
30						164	306	293	296	306	300	293
31							293	298		305		289
Sum						810.8	8,582.1	9,174	8,784	9,349	8,561	9,204

Month	Current Year 1977								Period		
	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum
Jan.											
Feb.											
Mar.											
Apr.											
May											
June								# 1,608			
July	2.38	0.07	27	345	20	2.8	277	17,022			
Aug.	2.36	1.09	15	450	16	99.6	296	18,196			
Sept.	2.28	.38	15	323	12	21.4	293	17,423			
Oct.	2.33	2.05	21	329	4	272	302	18,543			
Nov.	2.53	1.52	6	367	25	162	285	16,980			
Dec.	2.47	2.13	16	349	† 1	281	297	18,256			
								108,028			
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
								133,251			

Not a full month † And other days

WASTEWAY TO COLORADO RIVER AT KILOMETER 27 IN MEXICO

DESCRIPTION: Water-stage recorder and cableway located on the left bank of the canal wasteway immediately upstream from where it discharges into the Colorado River, 0.6 mile (1.0 km) downstream from the wasteway gates on Canal de Conexion on the right bank of the Colorado River, 16.8 miles (27.0 km) downstream from Morelos Dam, and 820 feet (250 m) south of the junction of the Mexicali-San Luis and Algodones-Pescaderos highways.

RECORDS: Data obtained and computed by the Colorado River Irrigation District of the Ministry of Agriculture and Hydraulic Resources and furnished by the Mexican Section of the Commission. Records shown in table below are waste returns to the Colorado River. Records available: April 1956 through 1977.

REMARKS: The Colorado River Irrigation District transports water for irrigation of land on the left bank of the Colorado River by the Canal de Conexion to a point called Kilometer 27. At this point, flows may be returned to the river through the wasteway or diverted to the Bacanora-Monumentos Canal system through the Sanchez Mejorada Siphon, which was placed in operation on June 28, 1963. As part of the rehabilitation works, started in 1968, of the Colorado River Irrigation District, the Canal de Conexion was enlarged and lined, and is now known as the Central Feeder Canal.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1956-1977		
		Average	Maximum	Minimum
January	5,517	5,420	69,527	0
February	0	1,913	14,279	0
March	0	5,506	35,492	0
April	3,027	12,424	68,714	0
May	303	5,209	22,072	0
June	0	8,294	28,915	0
July	0	13,003	46,139	0
August	6,912	14,486	55,497	0
September	4,069	9,236	37,194	0
October	0	3,664	20,512	0
November	63.2	7,312	69,415	0
December	2,911	5,107	70,213	0
Yearly	22,803	85,356	346,339	0
	Thousands of Cubic Meters			
	28,127	105,285	427,205	0

COLORADO RIVER AT MIGUEL C. RODRIGUEZ IN MEXICO - DISCHARGES

DESCRIPTION: Water-stage recorder and cableway located in Mexico on the left bank of the Colorado River about 24.5 miles (39.4 km) downstream from the southerly international boundary, 44.5 miles (71.6 km) downstream from Morelos Dam and 4.5 miles (7.2 km) upstream from the Sonora-Baja California railroad bridge. The zero of the gage is at mean sea level, U. S. C. & G. S. datum.

RECORDS: Based on 27 double and 3 single current meter measurements made during the year and a continuous record of gage heights. Data obtained and furnished by the Mexican Section of the Commission. From June 1951 to July 1954, discharges were computed from gage height records based on daily gage readings at 8:00 a.m., Pacific Standard Time. A continuous record of gage heights obtained since July 21, 1954. Records available: June 1951 through 1977.

REMARKS: Because of the discharge of drainage waters to the Colorado River immediately below Morelos Dam, the diversion by pumps along both banks of the river has been suspended. Better utilization of irrigation waters has reduced the waste returns to a minimum, and the flow at Rodriguez station consists mostly of the drainage waters mentioned above and seepage from canals which run parallel and adjacent to the river at higher elevations. Because of a tropical disturbance which occurred in the basin during the month of August, the normal flow of the river increased, and the discharges were estimated from the rating curve extended to a stage of 50.1 feet (15.28 m) and a maximum measured discharge of 2,250 second-feet (63.6 m^3/sec). The rest of the year, the low flows were measured by wading.

EXTREMES: Since January 1, 1952: Maximum mean daily gage height, 53.28 feet (16.24 m) on January 4, 1958 with a discharge of 18,500 second-feet (524 m^3/sec); minimum mean daily gage height, 37.73 feet (11.50 m) on July 18 and 19, 1970 with a discharge of 2.8 second-feet (0.08 m^3/sec); maximum mean daily discharge, 20,200 second-feet (571 m^3/sec) on December 19, 1952 with a gage height of 52.30 feet (15.94 m); minimum mean daily discharge, no flow on various occasions.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	153	142	118	33.5	160	73.5	34.3	4.6	94.3	8.1	3.5	3.2
2	157	140	117	35.7	166	74.2	31.4	4.6	75.6	7.8	3.5	3.2
3	161	139	115	37.4	159	75.2	28.6	4.6	56.9	7.4	3.2	3.2
4	166	138	114	39.6	152	75.9	25.4	4.6	38.1	7.4	3.2	3.2
5	170	136	113	43.1	145	77.0	22.6	4.2	19.4	7.1	3.2	3.2
6	174	135	112	46.6	138	77.7	19.8	4.2	19.1	7.1	2.8	3.2
7	178	133	111	50.1	132	78.4	17.0	4.2	18.7	7.1	2.8	3.2
8	182	133	105	53.7	125	79.5	14.1	4.2	18.0	6.7	2.8	3.2
9	186	132	97.8	57.2	118	80.2	10.9	4.2	17.7	6.7	2.8	3.2
10	190	132	91.5	60.7	111	81.2	8.1	4.6	17.3	6.4	2.8	3.5
11	188	132	84.8	64.3	105	81.9	5.3	4.6	17.0	6.4	2.8	3.5
12	185	131	78.4	68.2	97.8	83.0	5.3	4.9	16.2	6.4	2.8	3.5
13	182	131	72.0	71.7	91.1	83.7	5.3	4.9	15.9	6.0	2.8	3.2
14	179	130	65.3	75.2	84.0	80.9	5.3	5.3	15.5	6.0	2.8	3.2
15	177	130	59.0	78.8	77.3	78.4	5.3	5.3	15.2	6.0	2.8	3.2
16	174	129	52.3	82.3	70.6	75.6	5.3	5.7	14.8	5.7	2.8	3.2
17	171	129	45.9	85.8	70.6	72.7	5.3	5.7	14.1	5.7	2.8	3.2
18	169	128	39.6	89.3	70.6	70.3	4.9	32.5	13.8	5.3	2.8	3.5
19	166	128	32.8	94.6	71.0	67.5	4.9	227	13.4	5.3	2.8	3.5
20	164	127	26.5	100	71.0	64.6	4.9	738	13.1	5.3	2.8	3.5
21	161	127	19.8	106	71.0	62.2	4.9	1,416	12.7	4.9	2.8	3.5
22	158	126	13.4	111	71.0	59.3	4.9	2,077	12.0	4.9	2.8	3.5
23	155	125	15.5	117	71.0	56.9	4.9	1,850	11.7	4.9	2.8	4.2
24	153	123	17.3	122	71.3	54.0	4.9	1,162	11.3	4.6	2.8	4.2
25	151	122	19.4	127	71.3	51.2	4.9	650	10.9	4.6	2.8	4.2
26	150	121	21.5	133	71.3	48.7	4.9	420	10.2	4.2	2.8	4.9
27	148	120	23.3	138	71.3	45.9	4.9	336	9.9	4.2	2.8	6.0
28	147	119	25.4	144	71.7	43.1	4.9	221	9.5	4.2	2.8	8.5
29	146		27.5	149	71.7	40.3	4.6	155	9.2	3.9	2.8	10.9
30	144		29.7	155	71.7	37.1	4.6	133	8.8	3.9	2.8	38.8
31	143		31.4		72.4		4.6	113		3.9		98.5
Sum	5,128	3,637	1,894.6	2,570.2	3,001.0	2,029.9	317.5	9,610.5	630.4	178.0	87.2	253.2

Month	Current Year 1977								Period 1951-1977		
	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low				Average	Maximum	Minimum
	High	Low	Day		Day						
Jan.	44.75	41.96	10	190	31	143	165	10,172	187,382	1,047,732	426
Feb.	41.99	41.73	1	142	28	119	130	7,214	118,246	696,461	317
Mar.	41.93	39.83	1	118	22	13.4	61.1	3,758	83,458	807,342	0
Apr.	42.98	39.96	30	155	1	33.5	85.8	5,093	55,211	588,983	0
May	43.04	41.54	2	166	†16	70.6	96.8	5,952	76,157	732,815	0
June	41.90	40.29	13	83.7	30	37.1	67.8	4,026	33,817	555,460	0
July	40.29	39.57	1	34.3	†29	4.6	10.2	630	18,350	264,561	0
Aug.	50.13	39.50	22	* 2,250	† 5	4.2	310	19,062	27,570	309,320	0
Sept.	41.34	39.50	1	94.3	30	8.8	21.2	1,250	42,221	572,551	0
Oct.	39.86	39.40	1	8.1	†29	3.9	5.7	353	69,455	769,939	0
Nov.	39.44	39.37	† 1	3.5	† 6	2.8	2.8	173	114,073	909,399	173
Dec.	41.40	39.44	31	98.5	† 1	3.2	8.1	502	153,617	1,060,767	502
	50.13	39.37		* 2,250		2.8	80.5	58,189	947,317	7,923,600	25,036
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	15.28	12.00		63.6		0.08	2.28	71,775	1,168,503	9,773,655	30,882

∅ Mean daily † And other days * Instantaneous

COLORADO RIVER AT MIGUEL C. RODRIGUEZ IN MEXICO - STAGES

(See Preceding Page For Description)

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	44.23	41.99	41.73	39.99	43.04	41.80	40.22	39.57	41.21	39.86	39.37	39.44
2	44.55	41.96	41.70	39.99	42.68	41.80	40.06	39.57	40.85	39.70	39.37	39.44
3	44.75	41.93	41.73	40.06	41.96	41.83	39.99	39.53	40.52	39.47	39.37	39.44
4	44.62	41.93	41.73	40.65	41.77	41.83	39.93	39.53	40.29	39.44	39.37	39.44
5	44.32	41.90	41.67	41.11	41.67	41.83	39.90	39.53	40.35	39.44	39.37	39.44
6	44.03	41.90	41.67	41.17	41.63	41.80	39.86	39.53	40.32	39.44	39.37	39.44
7	43.73	41.96	41.70	41.14	41.63	41.83	39.86	39.50	40.22	39.44	39.37	39.44
8	43.27	42.03	41.83	41.14	41.67	41.86	39.83	39.53	40.09	39.44	39.37	39.44
9	42.81	42.09	41.90	41.14	41.67	41.86	39.83	39.53	39.96	39.44	39.37	39.44
10	42.49	41.99	41.73	41.14	41.60	41.80	39.80	39.53	39.83	39.44	39.37	39.47
11	42.29	41.96	41.70	41.14	41.63	41.77	39.83	39.53	39.83	39.44	39.44	39.47
12	42.19	41.90	41.70	41.21	41.60	41.77	39.80	39.53	39.70	39.47	39.44	39.47
13	42.13	41.86	41.73	41.24	41.60	41.70	39.80	39.53	39.57	39.44	39.44	39.44
14	42.13	41.83	41.67	41.27	41.67	41.67	39.80	39.53	39.63	39.44	39.44	39.44
15	42.09	41.83	41.63	41.27	41.57	41.67	39.80	39.57	39.57	39.44	39.44	39.44
16	42.03	41.83	41.63	41.34	41.60	41.67	39.80	39.53	39.57	39.44	39.44	39.44
17	42.06	41.83	41.63	41.34	41.90	41.67	39.80	39.53	39.57	39.44	39.44	39.44
18	41.96	41.83	41.63	41.34	42.03	41.63	39.76	40.03	39.57	39.40	39.44	39.47
19	41.99	41.83	41.63	41.37	41.77	41.67	39.76	42.49	39.50	39.40	39.44	39.47
20	42.03	41.83	41.44	41.34	41.70	41.73	39.76	45.54	39.83	39.40	39.40	39.47
21	42.03	41.90	40.68	41.34	41.73	41.73	39.73	48.10	39.83	39.44	39.40	39.47
22	42.03	41.86	40.22	41.34	41.80	41.70	39.73	49.34	39.67	39.40	39.37	39.47
23	41.99	41.83	39.99	41.40	41.83	41.67	39.73	49.34	40.16	39.40	39.37	39.50
24	42.03	41.86	39.93	41.40	41.83	41.63	39.70	47.24	40.68	39.44	39.37	39.50
25	41.99	41.83	39.90	41.40	41.83	41.54	39.73	45.21	40.38	39.44	39.37	39.50
26	41.99	41.80	39.86	41.70	41.86	41.24	39.70	44.00	41.01	39.44	39.37	39.53
27	41.99	41.73	39.86	42.09	41.90	41.04	39.70	43.44	40.68	39.44	39.44	39.57
28	41.99	41.73	39.96	42.39	41.90	40.94	39.70	42.52	40.35	39.40	39.44	39.63
29	42.03		39.99	42.72	41.86	40.75	39.70	41.90	40.22	39.40	39.44	39.70
30	42.03		39.99	42.95	41.80	40.42	39.70	41.63	40.22	39.40	39.44	40.35
31	41.99		39.99		41.83		39.60	41.40		39.40		41.40
Avg.	42.65	41.90	41.11	41.31	41.83	41.60	39.80	41.77	40.12	39.44	39.40	39.57

WASTEWAY TO COLORADO RIVER AT KILOMETER 38 IN MEXICO

DESCRIPTION: Wasteway to the Colorado River on the left bank of new Barrote Canal at old dam and bridge at Kilometer 18+251 (old Kilometer 38+000). The wasteway is located in the Colonia Bojorquez 0.8 mile (1.3 km) upstream from the Sonora-Baja California railroad bridge, 3.7 miles (5.9 km) downstream from the Miguel C. Rodriguez gaging station, and 28.1 miles (45.3 km) downstream from the southerly international boundary.
RECORDS: The records are computed by the Ministry of Agriculture and Hydraulic Resources and based upon gate openings. Records available: January 1964 through 1977.
REMARKS: The wasteway structure on the left bank of the Colorado River has two manually operated radial gates 9.8 feet (3.0 m) wide. It discharges into a dirt canal 656 feet (200 m) long with a total capacity of 459 second-feet (13.0 m^3/sec) which discharges to the river.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1964-1977		
		Average	Maximum	Minimum
January	105	142	1,453	0
February	0	116	953	0
March	0	88.4	572	0
April	0	0	0	0
May	0	32.8	378	0
June	0	0	0	0
July	0	0	0	0
August	0	6.1	85.1	0
September	0	64.4	901	0
October	1,719	279	1,719	0
November	0	154	800	0
December	0	48.4	655	0
Yearly	1,823	931	3,853	0
	Thousands of Cubic Meters			
	2,249	1,148	4,753	0

COLORADO RIVER AT EL MARITIMO IN MEXICO - STAGES

DESCRIPTION: Water-stage recorder and cableway in Mexico, 47.6 miles (76.6 km) downstream from the southerly international boundary, 18.6 miles (30.0 km) downstream from the Sonora-Baja California railroad bridge and 3.7 miles (6.0 km) east of Kilometer 70 of the Mexicali-San Felipe highway. The recorder is located on the right bank of the Colorado River. The zero of the gage is 9.84 feet (3.00 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Records obtained and computed by the Mexican Section of the Commission. Records available: Mean daily discharges from January 1960 through 1968. Incomplete record of gage heights, March 1, 1946 through November 1947; twice daily readings of gage heights, January 1, 1948 through December 1949; continuous record of gage heights since installation of water-stage recorder February 8, 1956. Mean daily gage heights, January 1960 through 1977.

REMARKS: In former years the flow past this station was affected by the tides in the Gulf of California. After July 1968, measurement by current meter was suspended; beginning in 1969, twice daily readings of gage heights and no record of mean daily discharges.

EXTREMES: January 1960 through 1968: Maximum daily discharge, 4,380 second-feet (124 m^3/sec), January 21, and December 7 and 8, 1960; minimum discharge, no flow on various occasions. Maximum monthly discharge, 225,224 acre-feet (277,811,000 m^3) January 1960; minimum monthly discharge, zero during various months of several years. Annual maximum discharge, 503,260 acre-feet (620,765,000 m^3) during 1960; minimum 59,335 acre-feet (73,189,000 m^3) in 1968. January 1960 through 1977: Maximum instantaneous gage height, 18.73 feet (5.71 m) on January 21, 1960; minimum gage height, 12.47 feet (3.80 m) on August 31 and September 1, 1960.

Mean Daily Gage Height in Feet 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	15.29	15.29	15.16	14.86	15.22	14.83	14.57	14.57	15.29	14.63	14.44	14.60
2	15.42	15.29	15.16	14.90	15.22	14.83	14.63	14.57	15.29	14.63	14.44	14.60
3	15.52	15.29	15.16	14.90	15.22	14.83	14.63	14.57	15.26	14.63	14.44	14.60
4	15.62	15.29	15.16	14.90	15.22	14.83	14.63	14.57	15.22	14.63	14.50	14.63
5	15.68	15.29	15.16	14.86	15.19	14.83	14.60	14.57	15.22	14.63	14.44	14.63
6	15.72	15.29	15.16	14.86	15.19	14.83	14.57	14.57	15.16	14.63	14.44	14.63
7	15.72	15.26	15.16	14.83	15.19	14.80	14.57	14.57	15.16	14.63	14.44	14.67
8	15.72	15.26	15.12	14.83	15.16	14.80	14.57	14.57	15.09	14.63	14.44	14.67
9	15.68	15.26	15.12	14.83	15.16	14.76	14.57	14.57	15.09	14.63	14.37	14.70
10	15.65	15.26	15.12	14.90	15.16	14.76	14.57	14.57	15.03	14.63	14.40	14.70
11	15.62	15.26	15.12	14.90	15.16	14.76	14.57	14.57	14.96	14.63	14.40	14.70
12	15.62	15.22	15.12	14.90	15.16	14.76	14.57	14.57	14.93	14.63	14.44	14.73
13	15.62	15.22	15.16	14.93	15.09	14.76	14.53	14.57	14.90	14.63	14.44	14.76
14	15.55	15.22	15.16	14.93	15.09	14.76	14.53	14.57	14.86	14.63	14.44	14.76
15	15.55	15.22	15.09	14.93	15.09	14.76	14.53	14.60	14.83	14.63	14.44	14.76
16	15.52	15.22	15.09	14.96	15.09	14.76	14.53	14.70	14.83	14.63	14.44	14.76
17	15.49	15.22	15.09	14.99	15.03	14.73	14.50	14.80	14.83	14.63	14.44	14.76
18	15.49	15.19	15.09	14.99	15.03	14.70	14.50	14.83	14.83	14.63	14.47	14.76
19	15.45	15.19	15.06	15.03	15.03	14.70	14.50	14.90	14.80	14.63	14.47	14.83
20	15.42	15.19	15.03	15.03	14.96	14.67	14.50	14.96	14.76	14.60	14.47	14.83
21	15.42	15.16	15.03	15.09	14.96	14.63	14.50	15.16	14.76	14.60	14.50	14.90
22	15.35	15.16	14.99	15.09	14.93	14.63	14.50	15.35	14.73	14.60	14.50	14.90
23	15.35	15.16	14.96	15.16	14.90	14.60	14.50	15.52	14.70	14.60	14.53	14.93
24	15.32	15.16	14.96	15.16	14.90	14.60	14.50	15.81	14.70	14.60	14.57	14.96
25	15.29	15.16	14.96	15.19	14.86	14.63	14.50	15.94	14.70	14.60	14.57	14.96
26	15.29	15.16	14.93	15.19	14.90	14.63	14.50	16.01	14.67	14.60	14.57	15.03
27	15.29	15.16	14.90	15.22	14.90	14.57	14.50	16.21	14.63	14.60	14.57	15.03
28	15.29	15.16	14.90	15.22	14.86	14.57	14.47	16.34	*14.63	14.57	14.60	15.06
29	15.29		14.90	15.22	14.86	14.57	14.47	16.27	*14.63	14.57	14.60	15.09
30	15.29		14.90	15.22	14.86	14.57	14.47	16.14	*14.63	14.57	14.60	15.12
31	15.29		14.90		14.86		14.47	15.91		14.53		15.12
Avg.	15.49	15.22	15.06	14.99	15.06	14.73	14.53	15.09	14.90	14.60	14.47	14.80

* Estimated

STORED WATER IN LARGE RESERVOIRS OF THE COLORADO RIVER

Data are presented below for all large storage reservoirs in the Colorado River basin below Lee's Ferry, all of which are located in the United States. The monthly figures represent usable contents on the last day of the month, in thousands of acre-feet. The capacities indicated are usable capacities at the top of the spillway gates in closed position, for those dams having controlled spillways; for all others, capacities indicated are at spillway level. Records furnished by the U. S. Geological Survey.

In Thousands of Acre-Feet

	LAKE MEAD (Capacity 26,159.0)		LAKE MOHAVE (Capacity 1,810.0)		HAVASU LAKE (Capacity 619.4)		TOTAL IN UNITED STATES RESERVOIRS (Capacity 28,588.4)	
Month	1977	Average 1935-1977	1977	Average 1951-1977	1977	Average 1939-1977	1977	Estimated Average
Jan.	21,918	16,945	1,675	1,646	546.7	554.0	24,139.7	19,145.0
Feb.	21,773	16,676	1,671	1,675	553.5	557.9	23,997.5	18,908.9
Mar.	21,360	16,394	1,707	1,672	571.6	572.8	23,638.6	18,638.8
Apr.	20,555	16,514	1,755	1,681	598.6	603.2	22,908.6	18,798.2
May	19,987	17,444	1,747	1,736	612.8	603.7	22,346.8	19,783.7
June	19,638	18,748	1,589	1,626	604.8	605.3	21,831.8	20,979.3
July	19,532	18,937	1,441	1,493	588.7	592.9	21,561.7	21,022.9
Aug.	19,796	18,711	1,538	1,429	570.3	575.5	21,904.3	20,715.5
Sept.	20,205	18,432	1,465	1,414	568.8	570.8	22,238.8	20,416.8
Oct.	20,189	18,177	1,442	1,432	563.3	572.7	22,194.3	20,181.7
Nov.	20,048	17,952	1,494	1,511	556.7	561.2	22,098.7	20,024.2
Dec.	20,250	17,692	1,638	1,602	549.7	556.5	22,437.7	19,850.5
Avg.	20,438	17,718	1,597	1,576	573.8	577.2	22,608.2	19,871.2
Max.	21,918	27,780	1,755	1,808	612.8	688.7	24,139.7	28,235.0
Min.	19,532	* 10,727	1,441	1,186	546.7	76.9	21,561.7	13,062.6

* Minimum since 1940

SUSPENDED SILT

The following tables are based on determinations of gravimetric percentages of dry silt in water samples taken at each station by one of the following methods:

A. By lowering a D-48 depth integrating sampler at verticals located at centers of sections of equal discharge in the river cross section, being careful to approach but not strike the bottom. The samples obtained in the section are combined to comprise a composite sample for that date.

B. By lowering a D-43 depth integrating sampler at verticals located at centers of each span of the service bridge across the Alamo Canal, being careful to approach but not strike the bottom. The samples obtained in the section are combined to comprise a composite sample for that date.

C. By sampling at the stream surface with a separate bottle at each of three points, spaced 1/6, 1/2, and 5/6 of the stream width. The gravimetric percentage in each sample is determined, a coefficient of 1.10 is applied to the average of the three, and the product applied to the volume of the stream flow represented by that set of samples.

For ease of comparison, the assumption is made that 1,847 tons of deposited silt would occupy a volume of one acre-foot, or one cubic foot of deposited silt would weigh 85 pounds.

Month	1977							Period of Record		
	Tons		No. of Samples	Gravimetric Percentages			Acre-Feet at 1,847 Tons Per Acre Foot			
	Water	Silt		Average	Maximum Sample	Minimum Sample		Average	Maximum	Minimum

Colorado River at Northerly International Boundary

Period 1956-1977

Jan.	112,296,000	4,000	4	0.0036	0.0061	0.0021	2.2	26.7	336	1.4
Feb.	134,292,000	7,300	4	.0054	.0072	.0030	4.0	12.9	116	1.6
Mar.	231,763,000	21,400	5	.0092	.0106	.0073	11.6	41.7	499	8.8
Apr.	297,425,000	35,000	4	.0117	.0143	.0076	18.9	39.0	434	7.9
May	128,093,000	4,800	4	.0037	.0066	.0028	2.6	13.8	201	2.3
June	147,742,000	6,600	5	.0045	.0061	.0030	3.6	14.1	92.6	2.8
July	218,473,000	11,000	4	.0050	.0059	.0044	6.0	19.5	89.3	3.4
Aug.	295,943,000	35,400	5	.0119	.0255	.0041	19.2	19.9	103	3.8
Sept.	114,318,000	6,000	4	.0052	.0077	.0041	3.3	8.2	43.6	1.6
Oct.	67,030,000	1,800	4	.0027	.0041	.0021	1.0	3.8	20.0	.5
Nov.	69,370,000	1,500	5	.0022	.0027	.0019	.8	9.8	89.9	.5
Dec.	179,711,000	5,600	4	.0031	.0047	.0011	3.0	19.4	174	.6
Yearly	1,996,455,000	140,400	52	0.0070	0.0255	0.0011	76.2	228.8	2.198	59.2

Samples by U. S. Section and analyses by United States Bureau of Reclamation, Method A

Intake Canal at Morelos Diversion Structure

Period 1952-1977

Jan.	111,211,000	4,662	4	0.0042	0.0047	0.0037	2.5	5.2	22.3	0.2
Feb.	133,564,000	7,194	4	.0054	.0076	.0043	3.9	5.5	19.4	.9
Mar.	231,176,000	37,548	5	.0162	.0417	.0042	20.3	39.7	154	5.3
Apr.	297,062,000	16,567	4	.0056	.0084	.0044	8.9	36.1	121	7.5
May	127,621,000	5,289	5	.0041	.0071	.0027	2.8	9.9	51.2	1.5
June	147,326,000	5,668	4	.0038	.0044	.0034	3.1	27.1	109	3.1
July	217,908,000	8,818	4	.0040	.0050	.0034	4.8	39.1	156	4.1
Aug.	205,336,000	31,377	5	.0153	.0303	.0032	16.9	36.6	135	3.8
Sept.	113,869,000	15,172	5	.0133	.0312	.0039	8.2	15.2	64.7	1.9
Oct.	66,687,000	2,220	4	.0033	.0041	.0024	1.2	3.9	12.0	.3
Nov.	69,077,000	2,186	5	.0032	.0039	.0026	1.2	2.1	9.3	.2
Dec.	159,327,000	34,498	4	.0217	.1106	.0027	18.6	5.2	18.6	1.1
Yearly	1,880,155,000	171,199	53	0.0083	0.1106	0.0024	92.5	226	696	51.4

Samples and analyses by Mexican Section, Method B

Colorado River at Southerly International Boundary

Period 1946-1977

Jan.	19,734,000	1,630	1	0.0082	0.0096	0.0058	0.9			
Feb.	17.174,000	876	1	.0051	.0057	.0049	.5			
Mar.	11,306,000	596	1	.0053	.0068	.0049	.3			
Apr.	15,589,000	1,230	1	.0079	.0088	.0070	.7			
May	15,400,000	932	1	.0060	.0069	.0054	.5			
June	13,765,000	706	1	.0051	.0054	.0051	.4			
July	489,000	24	0	.0051	.0051	.0051	0			
Aug.	61,624,000	5,700	1	.0092	.0102	.0050	3.1			
Sept.	743,000	40	0	.0054	.0056	.0050	0			
Oct.	0	0	0				0			
Nov.	0	0	0				0			
Dec.	8,585,000	525	0	.0061	.0070	.0050	.3			
Yearly	164,409,000	12.259	7	0.0075	0.0102	0.0049	6.7			

Samples by U. S. Section and analyses by United States Bureau of Reclamation, Method A

SUSPENDED SILT

Colorado River at Miguel C. Rodriguez Gaging Station

Period 1960-1977

Month	1977							Period of Record		
	Tons		No. of Samples	Gravimetric Percentages			Acre-Feet at 1,847 Tons Per Acre Foot			
	Water	Silt		Average	Maximum Sample	Minimum Sample		Average	Maximum	Minimum
Jan.	13,831,000	572	2	0.0041	0.0050	0.0030	0.3	15.8	251	0
Feb.	9,803,000	355	2	.0036	.0044	.0030	.2	2.4	13.9	0
Mar.	5,109,000	160	2	.0031	.0040	.0010	.1	.5	4.1	0
Apr.	6,931,000	241	2	.0035	.0040	.0025	.2	.2	1.1	0
May	8,093,000	211	3	.0026	.0031	.0020	.1	.3	1.5	0
June	5,474,000	141	2	.0026	.0033	.0020	.1	.1	.7	0
July	856,000	30.9	2	.0036	.0041	.0033	0	.1	.2	0
Aug.	25,919,000	3,244	8	.0125	.0141	.0040	1.8	.2	.2	0
Sept.	1,700,000	137	1	.0080	.0103	.0037	.1	.4	4.5	.1
Oct.	480,000	14.3	1	.0030	.0034	.0030	0	1.9	20.8	0
Nov.	235,000	0	1	0	0	0	0	2.8	36.0	0
Dec.	682,000	80.5	1	.0118	.0151	.0030	.1	2.7	13.0	0
Yearly	79,118,000	5,186	27	0.0049	0.0151	0	2.8	27.2	289	1.6

Samples and analyses by Mexican Section, Method C

CHEMICAL ANALYSES OF WATER SAMPLES
1977

The table below is based on chemical analyses of weekly samples from the Colorado River at the Northerly International Boundary taken by the United States Section of the Commission and analyzed by the U.S. Geological Survey.

To convert milligram equivalents to parts per million by weight, multiply each ion by its appropriate conversion factor. These factors are: Ca, 20.04; Mg, 12.16; Na, 22.99; (CO_3 plus HCO_3) expressed as CO_3, 30.00; SO_4, 48.03; Cl, 35.45; NO_3, 62.00. To convert tons per acre-foot to parts per million, multiply tons per acre-foot by 735.5. Electrical conductivity, reported in the tables as ECx10^6 at 25°C, is a relative measure of the total salt concentration.

Colorado River at Northerly International Boundary

Month	No. of Samples	Dissolved Solids: Tons Per Acre-Foot	Dissolved Solids: Total Tons	ECx10^6 @25°C	Boron p.p.m.	pH	% Na **	% Cl ***	Mean Milligram Equivalents per Liter: Ca	Mg	Na	CO_3 + HCO_3	SO_4	Cl	NO_3	
Jan.	5	1.43	118,000	1,664		8.0	50	32	5.61	2.80	8.50	3.47	8.06	5.54		
Feb.	4	1.35	133,000	1,582		8.1	50	32	5.33	2.78	8.07	3.29	7.72	5.24		
Mar.	4	1.26	215,000	1,471		8.1	48	30	5.17	2.64	7.20	3.16	7.41	4.54		
Apr.	4	1.20	263,000	1,401		8.2	47	29	4.97	2.66	6.66	3.09	7.14	4.16		
May	5	1.32	124,000	1,534		8.2	49	31	5.17	2.88	7.63	3.35	7.54	4.89		
June	4	1.30	141,000	1,529		8.1	49	31	5.17	2.84	7.66	3.26	7.54	4.89		
July	4	1.23	197,000	1,420		8.0	47	30	4.95	2.74	6.81	3.05	7.19	4.35		
Aug.	5	1.20	262,000	1,468		7.9	48	30	5.04	2.75	7.21	3.18	7.32	4.57		
Sept.	4	1.31	110,000	1,530		7.9	49	32	5.14	2.77	7.66	3.26	7.29	5.07		
Oct.	5	1.50	74,100	1,753		8.0	51	34	5.69	3.16	9.18	3.63	8.30	6.19		
Nov.	4	1.47	75,000	1,711		7.9	51	34	5.43	3.22	8.97	3.57	8.20	5.93		
Dec.	4	1.31	173,000	1,582		7.9	49	32	5.24	3.05	7.94	3.38	7.67	5.27		
Mean ⊕	Ø52	1.32	Ø1,885,100	1,554		8.0	49	31	5.24	2.86	7.79	3.31	7.62	5.05		
Period Avg.		1.59	2,300,888	1,920		8.0			5.87	3.54	9.93	3.32	8.32	7.73		
Tons of Constituents				1977					209,000	69,500	358,000	198,000	731,000	358,000		
Avg. Tons				Period 1962-1977					231,000	84,800	451,000	194,000	782,000	548,000		

** Percent of total cations *** Percent of total anions ⊕ Weighted mean Ø Total

ELECTRICAL CONDUCTIVITY OF WATER SAMPLES
1977

The following tables show electrical conductivity, expressed in mhos per centimeter x 10^6 at 25°C, of individual water samples taken at Colorado River stations and in Mexican canals. Samples were taken at the northerly international boundary by both Sections of the Commission and at the southerly international boundary by the United States Section. Conductivity determinations were made by the United States Geological Survey. Samples for the Intake Canal at Morelos Dam and Miguel C. Rodriguez Gaging Station were taken by the Mexican Section of the Commission, and determinations were made by the Ministry of Agriculture and Hydraulic Resources of Mexico.

Electrical conductivity is a relative indication of the concentration of dissolved solids in the water samples.

Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C

Colorado River at Northerly International Boundary

January		February		April		May		July		August		October		November	
1	1,510	15	1,610	1	1,430	16	1,510	1	1,410	16	1,300	1	1,750	16	1,700
2	1,590	16	1,610	2	1,450	17	1,540	2	1,460	17	1,220	2	1,800	17	1,680
3	1,630	17	1,580	3	1,450	18	1,600	3	1,420	18	1,240	3	1,820	18	1,670
4	1,670	18	1,590	4	1,420	19	1,630	4	1,420	19	1,240	4	1,770	19	1,660
5	1,660	19	1,610	5	1,420	20	1,650	5	1,420	20	1,300	5	1,790	20	1,650
6	1,690	20	1,590	6	1,400	21	1,660	6	1,420	21	1,510	6	1,780	21	1,710
7	1,710	21	1,570	7	1,400	22	1,640	7	1,420	22	1,660	7	1,770	22	1,730
8	1,650	22	1,570	8	1,400	23	1,630	8	1,420	23	1,790	8	1,780	23	1,710
9	1,640	23	1,550	9	1,390	24	1,600	9	1,430	24	1,840	9	1,760	24	1,670
10	1,670	24	1,540	10	1,430	25	1,530	10	1,430	25	1,730	10	1,750	25	1,680
11	1,710	25	1,500	11	1,400	26	1,530	11	1,420	26	1,640	11	1,750	26	1,670
12	1,740	26	1,500	12	1,390	27	1,520	12	1,420	27	1,600	12	1,790	27	1,640
13	1,740	27	1,490	13	1,410	28	1,530	13	1,420	28	1,590	13	1,760	28	1,690
14	1,770	28	1,470	14	1,400	29	1,570	14	1,440	29	1,610	14	1,780	29	1,690
15	1,750	March		15	1,400	30	1,610	15	1,420	30	1,550	15	1,780	30	1,700
16	1,700	1	1,490	16	1,390	31	1,550	16	1,420	31	1,530	16	1,780	December	
17	1,710	2	1,510	17	1,410	June		17	1,430	September		17	1,790	1	1,680
18	1,750	3	1,520	18	1,390	1	1,530	18	1,410	1	1,570	18	1,840	2	1,650
19	1,770	4	1,520	19	1,380	2	1,520	19	1,440	2	1,540	19	1,770	3	1,650
20	1,690	5	1,560	20	1,380	3	1,540	20	1,430	3	1,470	20	1,760	4	1,560
21	1,700	6	1,500	21	1,390	4	1,550	21	1,440	4	1,480	21	1,770	5	1,570
22	1,650	7	1,580	22	1,420	5	1,570	22	1,440	5	1,490	22	1,710	6	1,520
23	1,640	8	1,510	23	1,370	6	1,550	23	1,430	6	1,500	23	1,720	7	1,490
24	1,670	9	1,490	24	1,400	7	1,540	24	1,470	7	1,520	24	1,690	8	1,470
25	1,670	10	1,480	25	1,380	8	1,520	25	1,440	8	1,520	25	1,700	9	1,470
26	1,670	11	1,500	26	1,360	9	1,480	26	1,430	9	1,510	26	1,660	10	1,470
27	1,630	12	1,520	27	1,360	10	1,510	27	1,430	10	1,540	27	1,640	11	1,490
28	1,610	13	1,470	28	1,380	11	1,530	28	1,420	11	1,570	28	1,670	12	1,510
29	1,590	14	1,460	29	1,400	12	1,530	29	1,410	12	1,300	29	1,680	13	1,490
30	1,600	15	1,450	30	1,420	13	1,530	30	1,420	13	1,300	30	1,700	14	1,490
31	1,650	16	1,440	May		14	1,530	31	1,430	14	1,340	31	1,700	15	1,490
February		17	1,440	1	1,460	15	1,550	August		15	1,510	November		16	1,500
1	1,620	18	1,450	2	1,470	16	1,550	1	1,380	16	1,590	1	1,710	17	1,480
2	1,600	19	1,440	3	1,470	17	1,550	2	1,410	17	1,610	2	1,730	18	1,480
3	1,600	20	1,450	4	1,460	18	1,580	3	1,420	18	1,630	3	1,730	19	1,530
4	1,630	21	1,440	5	1,480	19	1,550	4	1,420	19	1,620	4	1,690	20	1,500
5	1,690	22	1,450	6	1,490	20	1,560	5	1,420	20	1,620	5	1,670	21	1,490
6	1,620	23	1,400	7	1,510	21	1,520	6	1,440	21	1,570	6	1,680	22	1,490
7	1,600	24	1,410	8	1,510	22	1,500	7	1,420	22	1,580	7	1,720	23	1,490
8	1,580	25	1,420	9	1,520	23	1,500	8	1,380	23	1,590	8	1,720	24	1,520
9	1,550	26	1,420	10	1,500	24	1,500	9	1,390	24	1,580	9	1,730	25	1,580
10	1,540	27	1,450	11	1,490	25	1,520	10	1,380	25	1,630	10	1,770	26	1,610
11	1,570	28	1,420	12	1,490	26	1,510	11	1,390	26	1,630	11	1,780	27	1,690
12	1,570	29	1,430	13	1,500	27	1,480	12	1,390	27	1,620	12	1,750	28	1,620
13	1,610	30	1,410	14	1,510	28	1,430	13	1,430	28	1,620	13	1,750	29	1,400
14	1,620	31	1,410	15	1,550	29	1,410	14	1,420	29	1,560	14	1,730	30	1,490
						30	1,410	15	1,370	30	1,580	15	1,740	31	1,520

ELECTRICAL CONDUCTIVITY OF WATER SAMPLES

1977

Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C

Intake Canal at Morelos Diversion Structure

January		February		April		May		July		August		October		November	
1	1,520	15	1,570	1	1,410	16	1,510	1	1,420	16	1,300	1	1,750	16	1,710
2	1,600	16	1,570	2	1,460	17	1,550	2	1,460	17	1,220	2	1,800	17	1,690
3	1,620	17	1,570	3	1,450	18	1,610	3	1,430	18	1,240	3	1,830	18	1,670
4	1,680	18	1,560	4	1,430	19	1,640	4	1,430	19	1,230	4	1,750	19	1,680
5	1,670	19	1,580	5	1,440	20	1,660	5	1,420	20	1,300	5	1,800	20	1,650
6	1,690	20	1,570	6	1,400	21	1,670	6	1,430	21	1,500	6	1,780	21	1,720
7	1,710	21	1,550	7	1,390	22	1,640	7	1,420	22	1,660	7	1,790	22	1,740
8	1,650	22	1,540	8	1,420	23	1,640	8	1,420	23	1,780	8	1,770	23	1,720
9	1,630	23	1,530	9	1,400	24	1,600	9	1,440	24	1,830	9	1,790	24	1,680
10	1,680	24	1,510	10	1,420	25	1,540	10	1,440	25	1,730	10	1,760	25	1,690
11	1,720	25	1,510	11	1,400	26	1,530	11	1,420	26	1,640	11	1,770	26	1,680
12	1,760	26	1,490	12	1,410	27	1,510	12	1,430	27	1,600	12	1,790	27	1,640
13	1,740	27	1,430	13	1,400	28	1,540	13	1,430	28	1,600	13	1,760	28	1,700
14	1,770	28	1,470	14	1,420	29	1,560	14	1,440	29	1,620	14	1,820	29	1,700
15	1,770	March		15	1,410	30	1,600	15	1,440	30	1,550	15	1,800	30	1,700
16	1,700	1	1,490	16	1,390	31	1,550	16	1,420	31	1,530	16	1,800	December	
17	1,700	2	1,520	17	1,410	June		17	1,440	September		17	1,810	1	1,680
18	1,680	3	1,530	18	1,400	1	1,540	18	1,410	1	1,560	18	1,850	2	1,650
19	1,750	4	1,520	19	1,410	2	1,530	19	1,450	2	1,550	19	1,800	3	1,660
20	1,670	5	1,570	20	1,380	3	1,550	20	1,440	3	1,470	20	1,790	4	1,640
21	1,630	6	1,510	21	1,380	4	1,560	21	1,440	4	1,480	21	1,780	5	1,580
22	1,620	7	1,580	22	1,410	5	1,560	22	1,440	5	1,490	22	1,730	6	1,530
23	1,600	8	1,510	23	1,370	6	1,530	23	1,440	6	1,500	23	1,740	7	1,520
24	1,610	9	1,500	24	1,410	7	1,550	24	1,470	7	1,520	24	1,700	8	1,470
25	1,650	10	1,500	25	1,350	8	1,530	25	1,450	8	1,520	25	1,710	9	1,490
26	1,650	11	1,510	26	1,360	9	1,490	26	1,440	9	1,520	26	1,680	10	1,470
27	1,630	12	1,530	27	1,390	10	1,520	27	1,430	10	1,550	27	1,680	11	1,480
28	1,600	13	1,480	28	1,390	11	1,530	28	1,430	11	1,570	28	1,670	12	1,520
29	1,560	14	1,480	29	1,410	12	1,540	29	1,410	12	1,300	29	1,670	13	1,500
30	1,570	15	1,460	30	1,420	13	1,540	30	1,430	13	1,300	30	1,730	14	1,490
31	1,610	16	1,450	May		14	1,520	31	1,430	14	1,330	31	1,720	15	1,500
February		17	1,440	1	1,460	15	1,550	August		15	1,520	November		16	1,510
1	1,620	18	1,450	2	1,480	16	1,540	1	1,380	16	1,590	1	1,730	17	1,490
2	1,570	19	1,440	3	1,480	17	1,540	2	1,420	17	1,620	2	1,740	18	1,500
3	1,580	20	1,460	4	1,470	18	1,580	3	1,430	18	1,620	3	1,790	19	1,540
4	1,610	21	1,450	5	1,490	19	1,560	4	1,430	19	1,630	4	1,730	20	1,500
5	1,670	22	1,440	6	1,500	20	1,560	5	1,440	20	1,630	5	1,710	21	1,500
6	1,610	23	1,390	7	1,500	21	1,530	6	1,430	21	1,570	6	1,740	22	1,500
7	1,600	24	1,410	8	1,500	22	1,510	7	1,430	22	1,590	7	1,720	23	1,510
8	1,590	25	1,420	9	1,510	23	1,500	8	1,400	23	1,600	8	1,740	24	1,520
9	1,550	26	1,430	10	1,500	24	1,510	9	1,400	24	1,570	9	1,740	25	1,590
10	1,520	27	1,450	11	1,500	25	1,530	10	1,380	25	1,620	10	1,760	26	1,600
11	1,560	28	1,430	12	1,510	26	1,510	11	1,400	26	1,640	11	1,790	27	1,700
12	1,530	29	1,440	13	1,500	27	1,490	12	1,400	27	1,630	12	1,770	28	1,610
13	1,560	30	1,410	14	1,520	28	1,440	13	1,430	28	1,630	13	1,740	29	1,410
14	1,600	31	1,420	15	1,550	29	1,410	14	1,430	29	1,580	14	1,740	30	1,490
						30	1,420	15	1,390	30	1,580	15	1,750	31	1,520

Colorado River at Southerly International Boundary

January		February		March		April		May		June		August		September	
11	5,290	8	5,360	8	5,150	5	4,960	3	5,110	7	5,080	18	1,210	13	2,900
28	5,300	22	5,300	22	3,900	12	5,120	17	5,100	July		23	1,580	December	
						26	5,100			21	5,220	30	2,920	30	1,420

Colorado River at Miguel C. Rodriguez Gaging Station

January		February		April		May		July		August		August		October	
10	4,910	21	4,510	4	5,020	31	5,210	11	4,060	17	4,000	23	1,240	3	4,150
24	4,240	March		18	5,040	June		24	4,010	18	4,500	25	1,220	November	
February		7	4,860	May		13	5,050	August		19	1,500	26	1,260	7	4,270
7	4,600	22	4,390	2	5,150	27	5,100	8	4,070	20	1,300	September		December	
				16	5,020			15	5,090	22	1,280	6	3,200	6	4,010

RAINFALL ON THE COLORADO RIVER WATERSHED IN INCHES

Tabulated below are monthly records of rainfall at stations located in California and Arizona in the United States and in Baja California and Sonora in Mexico, with averages for their periods of record. Records of daily rainfall amounts, where available, are on file in the offices of the United States or Mexican Sections of the Commission. For location, elevation, period of record, and the observer, see alphabetical listings of these stations on page 51 in this bulletin.

In United States

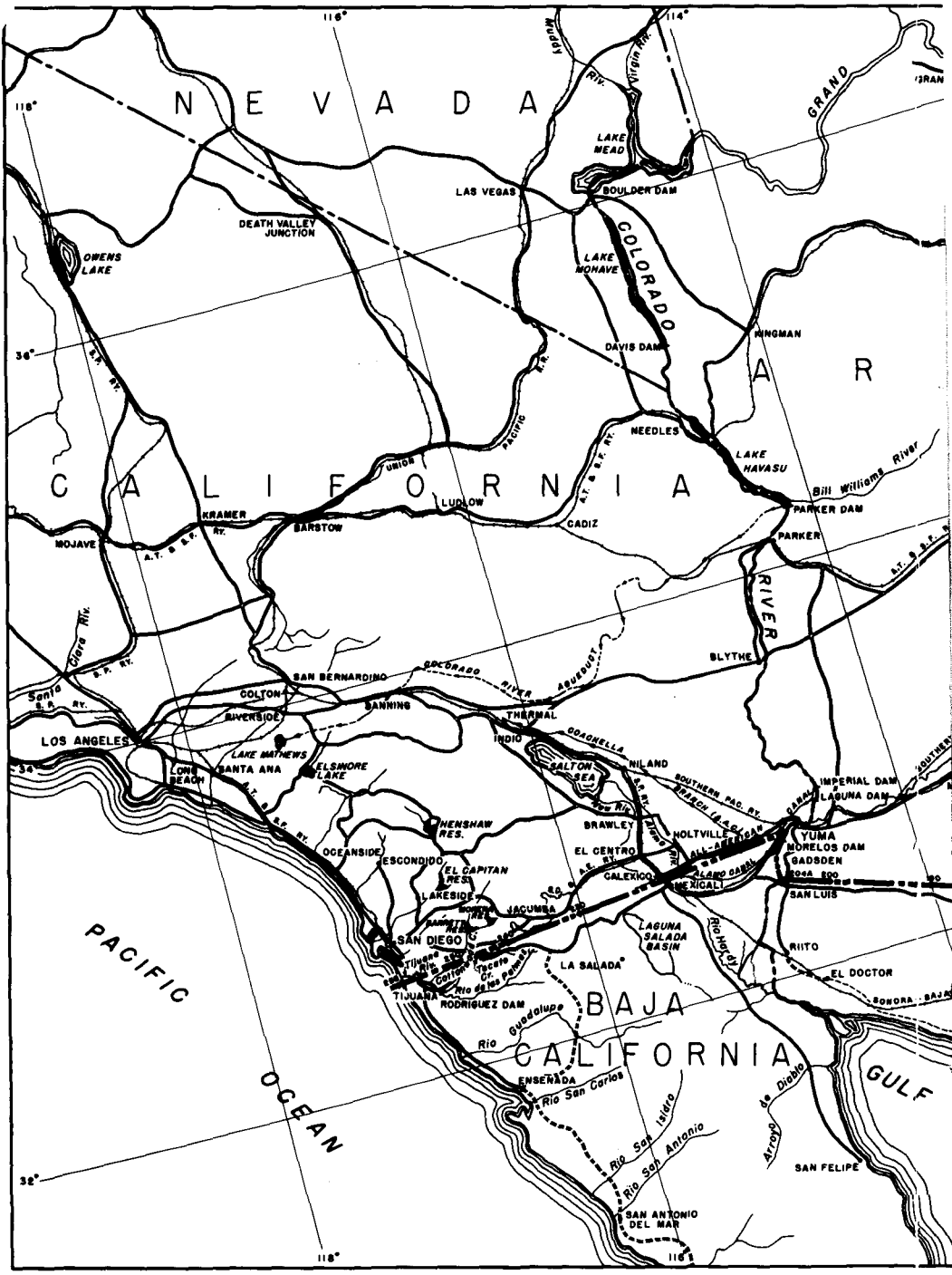
Month	Brawley, California		El Centro, California		Blythe, California		Davis Dam No. 2, Arizona		Yuma Citrus Station, Arizona	
	1977	Average 1931-1977	1977	Average 1931-1977	1977	Average 1931-1977	1977	Average 1955-1977	1977	Average 1931-1977
Jan.	0.12	0.30	0.11	0.32	0.16	0.41	0.60	0.38	0.79	0.36
Feb.	.02	.30	0	.32	.01	.42	0	.48	.03	.35
Mar.	.06	.16	0	.16	.08	.38	.22	.43	.04	.23
Apr.	0	.10	0	.11	0	.14	.10	.29	0	.12
May	0	.01	T	0	.14	.02	.32	.12	.03	.01
June	T	.01	0	.01	0	.04	0	.05	T	.02
July	0	.05	T	.09	.02	.18	#		T	.15
Aug.	4.89	.38	2.98	.34	1.46	.75			5.47	.51
Sept.	0	.36	0	.29	.87	.38			.49	.37
Oct.	.26	.24	.37	.24	.12	.29			.34	.43
Nov.	0	.16	0	.17	0	.25			0	.18
Dec.	.77	.41	1.08	.42	.32	.49			.73	.38
Yearly	6.12	2.48	4.54	2.47	3.18	3.75			7.92	3.11

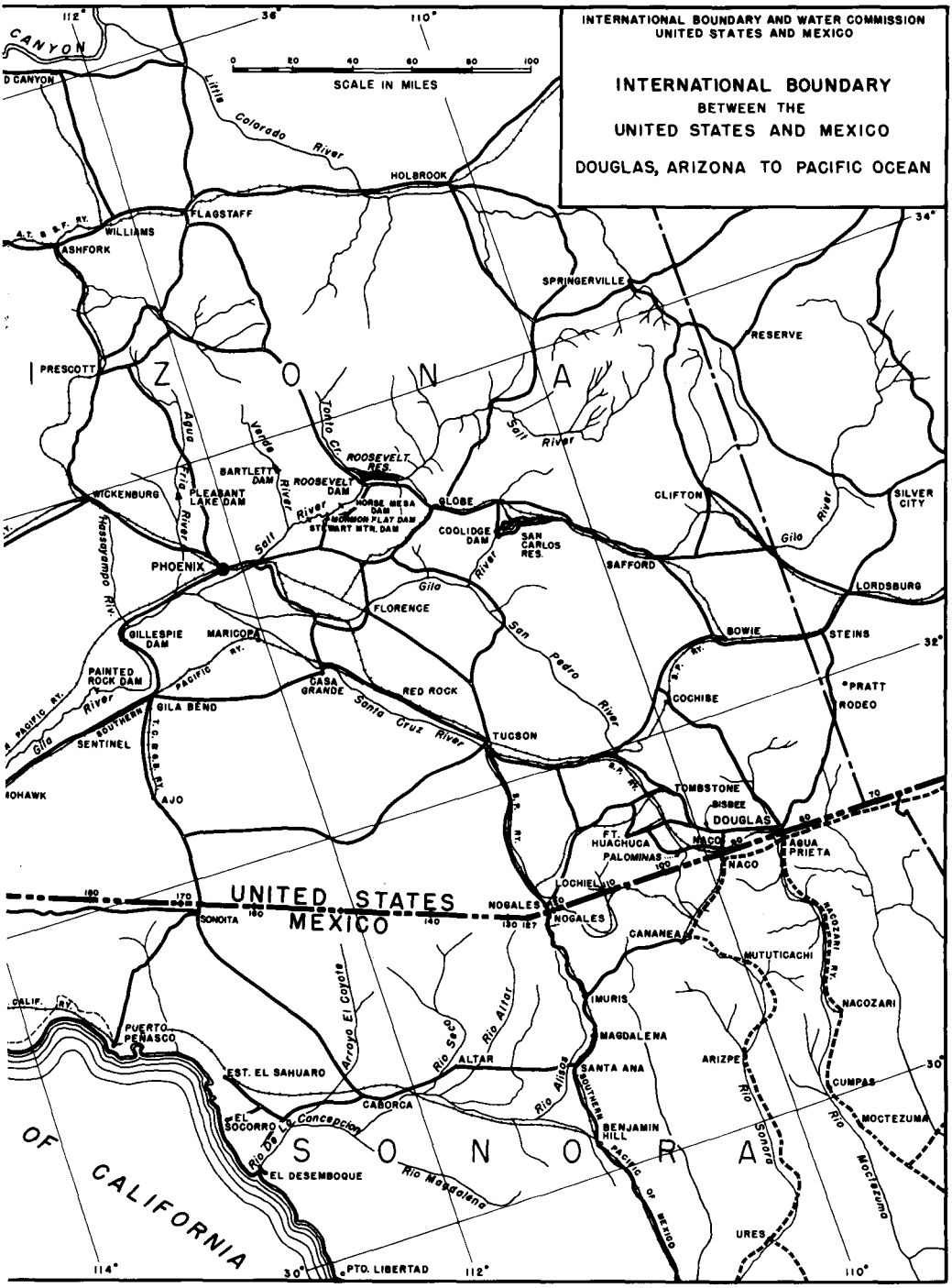
In Mexico

Month	Los Algodones, Baja California		Mexicali, Baja California		Bataques, Baja California		San Luis, R. C., Sonora		Delta, Baja California	
	1977	Average 1948-1977	1977	Average 1926-1977	1977	Average 1948-1977	1977	Average 1949-1977	1977	Average 1948-1977
Jan.	0.08	0.31	0.04	0.31	0	0.31	0.08	0.24	0.12	0.31
Feb.	0	.20	0	.31	0	.16	T	.24	.08	.16
Mar.	0	.12	.20	.20	0	.08	.08	.16	.04	.12
Apr.	0	.08	T	.12	0	.08	0	.08	0	.08
May	.04	T	T	T	0	T	.04	T	.47	T
June	0	T	0	T	0	.04	T	.04	.08	T
July	0	.08	.04	.12	0	.04	.04	.24	.04	.04
Aug.	6.14	.39	3.86	.35	1.26	.16	1.02	.43	*	.16
Sept.	.28	.20	T	.39	0	.12	.55	.28	0	.24
Oct.	.24	.31	.39	.28	.12	.28	.31	.39	0	.28
Nov.	0	.16	0	.16	0	.16	0	.51	0	.16
Dec.	.79	.31	1.57	.75	.94	.20	.71	.51	1.34	.31
Yearly	7.56	2.20	6.10	3.03	2.32	1.57	2.83	2.60		1.81

Month	Colonia Juarez, Baja California		Laguna Salada, Baja California		Riito, Sonora		San Felipe, Baja California		Santa Clara, Sonora	
	1977	Average 1952-1977	1977	Average 1974-1977	1977	Average 1959-1977	1977	Average 1948-1977	1977	Average 1971-1977
Jan.	0.08	0.47	0.91	0.31	0.24	0.20	0.24	0.28	0.28	0.12
Feb.	.08	.24	0	0	0	.16	0	.12	0	.16
Mar.	T	.24	0	T	T	.08	0	.16	0	.08
Apr.	0	.12	0	.20	0	.08	0	.08	0	.08
May	T	.04	0	T	T	T	.59	.04	0	0
June	0	T	0	0	0	.04	0	.08	0	T
July	0	.12	.12	.08	.04	.08	0	.12	0	0
Aug.	.87	.31	1.93	.67	.91	.20	*	.31	.16	.08
Sept.	.39	.31	0	1.85	.20	.63	*	.39	.79	.51
Oct.	.24	.51	0	.04	.31	.51	*	.24	.94	.59
Nov.	T	.28	0	.04	0	.28	*	.16	0	.08
Dec.	1.14	.35	1.54	.55	.91	.35	1.34	.39	.59	.28
Yearly	2.80	2.28	4.49	3.78	2.60	2.68		2.40	2.76	1.97

T Trace # Station discontinued July 7, 1977 * No record


NEVADA
CALIFORNIA
ARIZONA
BAJA CALIFORNIA
PACIFIC OCEAN
GULF
LAKE MEAD
BOULDER DAM
LAS VEGAS
DEATH VALLEY JUNCTION
OWENS LAKE
LAKE MOHAVE
COLORADO
DAVIS DAM
KINGMAN
NEEDLES
LAKE HAVASU
Bill Williams River
PARKER DAM
PARKER
RIVER
BLYTHE
LUDLOW
CADIZ
BARSTOW
KRAMER
MOJAVE
SAN BERNARDINO
COLTON
RIVERSIDE
BANNING
THERMAL
INDIO
COACHELLA
SALTON SEA
NILAND
IMPERIAL DAM
LAGUNA DAM
LOS ANGELES
LONG BEACH
SANTA ANA
LAKE MATHEWS
ELSMORE LAKE
OCEANSIDE
ESCONDIDO
EL CAPITAN RES.
LAKESIDE
SAN DIEGO
TIJUANA
RODRIGUEZ DAM
BRAWLEY
HOLTVILLE
EL CENTRO
CALEXICO
MEXICALI
YUMA
MORELOS DAM
GADSDEN
SAN LUIS
LA SALADA
LAGUNA SALADA BASIN
RIITO
EL DOCTOR
ENSENADA
SAN FELIPE
SAN ANTONIO DEL MAR
Rio Guadalupe
Rio San Carlos
Rio San Isidro
Rio San Antonio
Arroyo de Diablo
Rio Hardy
Virgin R.
Muddy R.
GRAND CANAL
SOUTHERN PAC. RY.
ALL-AMERICAN CANAL
Santa Clara R.
Santa S.F. Ry.
A.T. & S.F. Ry.
SOUTHERN PACIFIC
UNION PACIFIC R.R.
SONORA - BAJA
114°
116°
118°
36°
34°
32°


INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO
INTERNATIONAL BOUNDARY
BETWEEN THE
UNITED STATES AND MEXICO
DOUGLAS, ARIZONA TO PACIFIC OCEAN
SCALE IN MILES
0 20 40 60 80 100
CANYON
D CANYON
Little Colorado River
HOLBROOK
FLAGSTAFF
WILLIAMS
ASHFORK
A.T. & S.F. RY.
SPRINGERVILLE
RESERVE
PRESCOTT
Z O N A
Agua Fria River
Verde River
Tonto Cr.
Salt River
ROOSEVELT RES.
ROOSEVELT DAM
BARTLETT DAM
HORSE MESA DAM
MORMON FLAT DAM
STEWART MTN. DAM
PLEASANT LAKE DAM
WICKENBURG
Hassayampa River
PHOENIX
COOLIDGE DAM
SAN CARLOS RES.
GLOBE
CLIFTON
SILVER CITY
Gila River
SAFFORD
LORDSBURG
FLORENCE
GILLESPIE DAM
MARICOPA
PAINTED ROCK DAM
PACIFIC RY.
CASA GRANDE
RED ROCK
Santa Cruz River
San Pedro River
BOWIE
STEINS
COCHISE
PRATT
RODEO
GILA BEND
SOUTHERN PACIFIC RY.
SENTINEL
TUCSON
AJO
TOMBSTONE
BISBEE
DOUGLAS
FT. HUACHUCA
PALOMINAS
NACO
AGUA PRIETA
UNITED STATES
MEXICO
SONOITA
NOGALES
LOCHIEL
CANANEA
MUTUTICACHI
NACOZARI
IMURIS
MAGDALENA
ARIZPE
CUMPAS
MOCTEZUMA
Rio Sonora
Rio Moctezuma
Arroyo El Colorado
Rio Sasabe
Rio Altar
ALTAR
SANTA ANA
Rio Alisos
EST. EL SAHUARO
CABORCA
EL SOCORRO
Rio Concepcion
Rio De La
BENJAMIN HILL
PUERTO PENASCO
CALIF. RY.
EL DESEMBOQUE
Rio Magdalena
S O N O R A
OF CALIFORNIA
PTO. LIBERTAD
URES
Pacific Ocean of Mexico
114°
112°
110°
34°
32°
30°

RAINFALL ON THE COLORADO RIVER WATERSHED IN INCHES

In Mexico

Month	La Ventana, Baja California									
	1977	Average 1975-1977								
Jan.	0.28	0.16								
Feb.	0	.12								
Mar.	0	.43								
Apr.	0	.12								
May	0	0								
June	.20	.08								
July	0	0								
Aug.	2.76	1.38								
Sept.	0	.39								
Oct.	.31	.20								
Nov.	0	0								
Dec.	1.06	.63								
Yearly	4.61	3.50								

LOCATION OF RAINFALL STATIONS ON THE COLORADO RIVER WATERSHED

The precipitation records of the stations listed alphabetically below began on the date shown and extend through 1977.

In United States

	NAME OF STATION	LATITUDE	LONGITUDE	δ ELEV. (FT.)	RECORD BEGAN	OBSERVER
*	Blythe, California	33° 37'	114° 36'	268	1909	State Division of Forestry
	Brawley, California	32° 57'	115° 33'	100	1908	Agricultural Research Service
*	Davis Dam No. 2, Arizona	35° 12'	114° 34'	657	1954	U. S. Bureau of Reclamation (Discontinued July 7, 1977)
	El Centro, California	32° 46'	115° 34'	30	1930	El Centro Water Department
	Yuma Citrus Station, Arizona	32° 37'	114° 39'	191	1923	University of Arizona Experimental Farm

In Mexico

	NAME OF STATION	LATITUDE	LONGITUDE	δ ELEV. (FT.)	RECORD BEGAN	OBSERVER
	Bataques, Baja California	32° 33'	115° 04'	** 66	1948	# S. A. R. H.
	Delta, Baja California	32° 21'	115° 11'	** 39	1948	S. A. R. H.
	Colonia Juarez, Baja California	32° 15'	115° 03'	49	1952	S. A. R. H.
	Laguna Salada, Baja California	32° 12'	115° 44'	236	1974	S. A. R. H.
	La Ventana, Baja California	31° 42'	115° 04'	246	1975	S. A. R. H.
	Los Algodones, Baja California	32° 42'	114° 44'	115	1948	S. A. R. H.
	Mexicali, Baja California	32° 40'	115° 28'	13	1926	S. A. R. H.
	Riito, Sonora	32° 10'	114° 57'	** 39	1959	S. A. R. H.
*	San Felipe, Baja California	31° 02'	114° 53'	33	1948	S. A. R. H.
	San Luis, R. C., Sonora	32° 28'	114° 47'	131	1940	S. A. R. H.
	Santa Clara, Sonora	31° 42'	114° 29'	49	1971	S. A. R. H.

* Not shown on map δ Elevation above mean sea level except Brawley and El Centro, which are elevations below mean sea level

** Elevations obtained from International Boundary and Water Commission topographic maps

\# Ministry of Agriculture and Hydraulic Resources

EVAPORATION IN THE COLORADO RIVER BASIN
IN INCHES

Tabulated below are records of evaporation observed at two stations in Arizona and at ten stations in Baja California and Sonora, Mexico. The stations in the United States are operated by the U. S. Bureau of Reclamation and by the University of Arizona Experimental Farm. The stations in Mexico are operated by the Ministry of Agriculture and Hydraulic Resources. The type of pan used at all these stations was the National Weather Service standard pan of 4-foot diameter. For specific location of these stations, refer to data opposite the same station name shown in "Location of Rainfall Stations," page 51 in this bulletin.

In United States

Month	Davis Dam No. 2, Arizona		Yuma Citrus Station, Arizona	
	1977	Average 1955-1977	1977	Average 1931-1977
Jan.	6.53	7.43	3.03	3.92
Feb.	8.97	7.62	4.80	4.86
Mar.	10.27	10.18	7.09	7.57
Apr.	12.77	13.24	9.26	10.18
May	14.10	16.23	10.87	13.14
June	17.99	19.65	13.57	14.37
July	*		14.87	15.51
Aug.			12.09	13.73
Sept.			9.04	10.83
Oct.			6.59	7.66
Nov.			5.39	5.02
Dec.			3.16	3.68
Yearly			99.76	110.47

In Mexico

Month	Los Algodones, Baja California		Mexicali, Baja California		Bataques, Baja California		San Luis, R. C., Sonora		Delta. Baja California	
	1977	Avg. 1949-55 1961-1977	1977	Average 1926-1977	1977	Average 1963-1977	1977	Average 1953-1977	1977	Average 1959-1977
Jan.	4.13	4.41	2.60	2.64	3.82	3.86	2.83	3.39	3.70	3.27
Feb.	6.57	5.28	4.53	3.54	5.67	4.84	4.80	4.09	6.26	4.41
Mar.	8.66	7.52	7.09	5.94	7.76	7.17	6.97	6.38	6.54	6.38
Apr.	11.22	10.08	8.74	7.95	9.61	9.02	9.29	8.43	9.76	8.19
May	12.99	12.76	10.63	10.55	11.10	11.81	10.39	11.10	9.88	10.39
June	15.24	13.62	13.35	11.65	14.49	12.56	14.02	12.80	13.94	11.69
July	14.61	13.50	11.89	11.81	12.56	12.56	13.35	14.09	14.88	11.97
Aug.	12.64	12.32	8.39	10.16	11.50	10.83	11.69	12.60	**	10.71
Sept.	10.87	10.08	7.32	8.15	9.25	9.06	8.62	9.69	**	8.58
Oct.	7.76	7.95	5.71	5.79	6.77	6.30	6.10	6.54	**	6.22
Nov.	6.73	5.16	3.98	3.43	5.28	4.69	4.49	4.29	**	4.37
Dec.	4.37	4.17	2.13	2.48	3.07	3.43	2.68	3.23	#	3.31
Yearly	115.79	108.35	86.34	84.02	100.87	96.14	95.24	97.60		90.28

Month	Colonia Juarez, Baja California		Laguna Salada, Baja California		Riito, Sonora		San Felipe, Baja California		Santa Clara. Sonora	
	1977	Average 1970-1977	1977	Average 1974-1977	1977	Average 1963-1977	1977	Average 1952-1977	1977	Average 1971-1977
Jan.	3.19	3.50	4.06	4.17	2.52	3.19	3.86	5.08	4.61	5.39
Feb.	5.51	4.25	4.45	4.53	4.84	4.17	6.61	5.79	6.50	5.08
Mar.	7.01	6.42	7.13	7.28	6.22	6.02	6.97	7.05	7.40	6.34
Apr.	7.60	7.56	8.35	8.58	8.58	7.68	7.56	8.27	7.72	7.56
May	9.13	9.88	10.63	11.73	9.92	10.12	9.37	10.39	8.39	8.43
June	12.28	11.46	14.33	13.94	12.83	11.54	10.04	10.79	10.28	11.57
July	11.73	11.57	14.33	12.48	12.09	12.24	10.31	11.65	10.67	11.06
Aug.	9.88	10.55	11.69	12.83	10.47	10.28	**	10.98	9.84	11.22
Sept.	9.09	8.66	8.23	6.50	8.66	8.07	**	9.80	8.11	9.17
Oct.	6.81	6.30	5.71	7.05	6.34	5.51	**	8.30	7.68	7.64
Nov.	5.71	4.57	4.72	5.00	4.92	3.66	**	6.22	6.69	5.67
Dec.	2.68	3.35	3.43	3.70	2.76	2.87	3.66	4.80	5.28	5.63
Yearly	90.63	88.11	97.05	98.94	90.16	87.95		101.06	93.15	95.20

* Station discontinued July 7, 1977 ** No record # Record incomplete

TEMPERATURE IN THE COLORADO RIVER BASIN IN DEGREES FAHRENHEIT

The maximum, minimum, and monthly mean temperature observations for United States stations are from daily readings of thermometers generally exposed in a shelter located a few feet above sod-covered ground. The maximum and minimum temperatures shown for the stations in Mexico are from daily maximum and minimum thermometer observations, with maximum and minimum for their periods of record. For specific location, elevation, period of record, and the observer, refer to data opposite same station name as shown in "Location of Rainfall Stations," page 51 in this bulletin.

In United States

	Blythe, California				Davis Dam No. 2, Arizona				Yuma Citrus Station, Arizona			
	1977			Average	1977			Average	1977			Average
Month	Mean	Max.	Min.	1931-77	Mean	Max.	Min.	1955-77	Mean	Max.	Min.	1931-77
Jan.	52.7	75	28	52.5	51.3	70	30	52.3	53.0	76	30	53.0
Feb.	† 58.2	90	34	57.2	59.6	85	38	56.7	58.5	90	30	57.0
Mar.	58.7	86	35	62.9	58.1	84	39	61.9	58.0	87	32	62.0
Apr.	71.0	98	38	70.0	72.3	98	43	69.2	69.2	99	37	68.5
May	71.1	107	49	77.4	72.9	103	53	78.5	70.2	102	46	75.8
June	† 88.3	116	60	85.2	90.5	117	67	88.5	85.9	114	58	83.5
July	93.2	116	70	92.2	*				91.4	113	67	91.0
Aug.	91.1	114	65	91.0					89.8	112	69	90.4
Sept.	84.3	113	55	85.0					84.3	111	56	85.0
Oct.	75.2	100	46	73.1					76.1	99	47	73.5
Nov.	62.2	88	33	60.2					63.5	88	36	61.5
Dec.	56.2	80	33	53.2					57.8	80	35	54.5
Yearly	71.8	116	28	71.7					71.5	114	30	71.3

	Brawley, California				El Centro, California							
	1977			Average	1977			Average				
Month	Mean	Max.	Min.	1931-77	Mean	Max.	Min.	1931-77				
Jan.	53.9	79	28	53.6	54.1	79	27	53.6				
Feb.	60.2	90	32	58.0	60.3	89	35	57.9				
Mar.	58.4	85	34	63.1	58.0	86	33	62.9				
Apr.	69.0	97	38	69.9	68.2	98	40	69.5				
May	70.1	98	49	77.3	69.6	105	45	77.2				
June	85.9	116	60	85.0	86.6	116	60	84.9				
July	90.8	112	67	91.9	89.9	113	65	91.8				
Aug.	89.3	111	64	91.4	89.5	113	64	91.1				
Sept.	84.3	111	58	86.2	83.5	114	55	85.6				
Oct.	76.2	100	47	74.9	76.3	101	52	74.5				
Nov.	64.0	89	36	62.5	64.4	89	38	62.2				
Dec.	57.7	82	40	55.0	56.9	82	35	54.7				
Yearly	71.6	116	28	72.4	71.4	116	27	72.2				

In Mexico

	Laguna Salada, Baja California				Los Algodones, Baja California				Mexicali, Baja California			
	1977		1974-1977		1977		1948-1977		1977		1926-1977	
Month	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	77	37	84	18	73	32	88	23	81	30	93	19
Feb.	95	41	95	27	90	34	95	28	93	37	93	23
Mar.	88	50	95	32	86	34	100	32	86	37	100	30
Apr.	100	46	100	36	97	39	109	37	97	43	106	34
May	106	52	111	39	106	50	117	43	102	50	117	43
June	118	66	120	50	115	63	126	52	115	63	120	48
July	117	86	122	54	111	68	118	61	113	68	118	55
Aug.	118	72	118	52	113	68	120	61	115	63	118	54
Sept.	113	72	113	59	111	57	122	54	109	55	122	48
Oct.	108	68	108	36	100	48	111	32	102	54	109	32
Nov.	95	41	95	28	88	39	100	27	93	41	104	28
Dec.	86	37	86	19	81	41	90	28	86	43	90	23
Yearly	118	37	122	18	115	32	126	23	115	30	122	19

† One or more days missing * Station discontinued July 7, 1977 .

TEMPERATURE IN THE COLORADO RIVER BASIN
IN DEGREES FAHRENHEIT

In Mexico

	San Luis, R. C., Sonora				Delta, Baja California				Colonia Juarez, Baja California			
	1977		1949-1977		1977		1948-1977		1977		1964-1977	
Month	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	77	30	100	19	79	34	104	27	73	34	91	19
Feb.	93	34	109	27	93	36	104	28	90	36	97	21
Mar.	88	36	108	28	90	41	113	28	84	37	99	25
Apr.	100	41	115	37	100	41	118	32	97	41	115	30
May	108	48	115	41	108	48	129	32	106	48	117	36
June	118	64	126	45	120	52	133	36	115	57	122	39
July	115	72	126	59	115	70	135	45	113	70	122	45
Aug.	115	72	122	55			140	52	115	66	118	50
Sept.	111	57	118	50	115	54	135	39	113	57	122	39
Oct.	100	48	118	32	108	48	117	34	100	48	118	36
Nov.	97	39	113	28	99	39	120	32	90	39	104	25
Dec.	84	37	102	23	93	39	104	27	81	41	97	19
Yearly	118	30	126	19		34	140	27	115	34	122	19

	Riito, Sonora				San Felipe, Baja California				Santa Clara, Sonora			
	1977		1949-1977		1977		1948-1977		1977		1971-1977	
Month	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	75	28	91	19	75	36	99	30	75	39	90	18
Feb.	90	30	95	21	86	41	102	32	90	43	90	23
Mar.	90	34	100	25	81	36	104	32	86	46	90	37
Apr.	99	37	109	36	90	43	113	34	93	50	102	46
May	108	45	115	41	88	50	120	41	90	55	104	50
June	117	59	124	45	104	59	124	50	100	68	117	57
July	113	68	140	52	100	68	124	50	97	75	106	64
Aug.	117	64	122	46	*	*	135	41	104	75	106	68
Sept.	115	54	118	39	*	*	126	37	100	66	108	63
Oct.	100	46	115	30	*	*	117	41	97	59	100	41
Nov.	91	37	118	27	*	*	118	21	88	46	93	36
Dec.	82	36	86	21	79	43	97	28	82	43	82	25
Yearly	117	28	140	19			135	21	104	39	117	18

	La Ventana, Baja California				Bataques, Baja California							
	1977		1975-1977		1977		1948-1977					
Month	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.				
Jan.	75	39	82	32	81	32	113	16				
Feb.	90	43	90	43	91	36	99	21				
Mar.	86	41	88	41	86	34	113	25				
Apr.	97	43	97	43	97	36	118	16				
May	108	48	108	48	108	50	124	34				
June	111	66	111	59	118	57	135	43				
July	106	66	108	66	113	68	133	45				
Aug.	109	72	111	70	117	66	129	46				
Sept.	106	64	106	64	115	54	135	39				
Oct.	99	57	99	50	100	52	118	32				
Nov.	90	48	93	45	90	39	115	32				
Dec.	82	45	82	41	82	39	97	25				
Yearly	111	39	111	32	118	32	135	16				

* Missing record

IRRIGATED AREAS ALONG COLORADO RIVER BELOW IMPERIAL DAM

1977

The total drainage area within the Colorado River basin is about 246,000 square miles, of which 184,600 square miles lie above Imperial Dam and about 61,400 square miles are below the dam. Of the area below Imperial Dam, 59,400 square miles are in the United States and about 2,000 square miles are in Mexico. The area below Imperial Dam includes the Gila River watershed with a total area of about 58,200 square miles, of which about 1,100 square miles are in Mexico.

The irrigated areas tabulated below comprise the areas in the United States and Mexico which are served by diversions from the Colorado River at or below Imperial Dam. The diversions are supplemented by some pumping from wells in both countries. The areas in the United States include: 1) those within the U. S. Bureau of Reclamation Projects and in the North and South Gila Valleys located near Yuma, Arizona, the data for which are furnished by the U. S. Bureau of Reclamation; 2) those within the Coachella Valley, California, the data for which are furnished by the Coachella Valley County Water District and State of California Department of Water Resources; and 3) those within the Imperial Valley, California, the data for which are furnished by the Imperial Irrigation District. The areas in Mexico include those in the Mexicali Valley located in the states of Baja California and Sonora, the data for which are furnished by the Ministry of Agriculture and Hydraulic Resources of Mexico. The areas tabulated below refer to the total areas farmed, and insofar as possible, duplication of irrigated areas because of double cropping has been eliminated.

Point of Diversion from Colorado River and Designation of Areas	Total Irrigated Areas Acres
IN UNITED STATES:	
Imperial Dam	
Yuma Valley Division	45,681
Reservation Division	12,156
Yuma Mesa	17,797
Yuma Aux. Project Unit "B" (Yuma Mesa)	3,301
South Gila Valley	9,858
North Gila Valley	5,956
Wellton-Mohawk	60,622
Coachella Valley	55,611
Imperial Valley	459,929
Warren Act	80
Non-Project lands adjacent to Colorado River	12,564
Total in United States	683,555
IN MEXICO:	
Morelos Dam	
Mexicali Valley	* 501,218
Total in United States and Mexico	1,184,773

* An estimated 33% of total acreage is served by pumping from ground water in Mexicali Valley

ALAMO RIVER AT INTERNATIONAL BOUNDARY

DESCRIPTION: Staff gage located on the right bank of the river, about 7 miles (11.3 km) east of Calexico, California, immediately downstream from the international land boundary between the United States and Mexico and a few feet upstream from a 4-foot (1.22 m) Cipolletti weir in the throat of a twin-tube concrete culvert which carries the river flow under the All-American Canal.

RECORDS: Computed on the basis of head on the Cipolletti weir from daily staff gage readings, and weir ratings as determined by monthly current meter measurements. Records obtained and furnished by Imperial Irrigation District. Records available: June 1942 through 1977.

REMARKS: The flow at this station normally comprises seepage from the All-American Canal and drainage water from the Mexicali Valley which enters the United States.

EXTREMES: Maximum mean daily discharge, 258 second-feet (7.31 m^3/sec) (estimated), April 13, 1946; minimum discharge, no flow July 22-23, 29-30, 1949. Prior to the period of record, and since 1900, considerably higher flows occurred. During the years 1905 to 1907, when the Colorado River flowed into the Salton Sea, a part of its flow passed through the Alamo River channel.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.46	1.92	2.44	2.34	2.75	2.13	1.55	1.55	1.74	1.55	1.55	1.74
2	1.46	2.13	2.54	2.44	2.75	2.13	1.64	1.55	1.64	1.46	1.55	1.74
3	1.46	2.13	2.13	2.34	2.75	2.13	1.55	3.65	1.74	1.64	1.55	1.74
4	1.46	2.13	2.13	2.34	2.65	1.92	1.55	1.74	1.74	1.37	1.64	1.74
5	1.46	1.92	2.13	2.44	2.34	1.92	1.74	1.64	1.74	1.37	1.74	1.74
6	1.46	2.23	2.13	2.54	2.44	1.92	1.55	1.55	1.74	1.37	1.74	1.74
7	1.46	2.23	2.54	2.54	2.44	1.64	1.55	1.46	1.74	1.46	1.64	1.92
8	3.38	2.02	2.54	2.44	2.44	1.92	1.55	1.46	1.74	1.46	1.64	1.83
9	2.75	2.23	2.54	2.44	2.44	1.92	1.74	1.55	1.74	1.64	1.64	1.83
10	2.96	2.23	2.34	2.44	2.23	1.55	1.64	1.55	1.83	1.64	1.64	1.92
11	2.23	2.23	2.54	2.44	2.44	1.55	1.64	1.55	1.92	1.64	1.55	1.83
12	2.13	2.13	2.34	2.44	2.44	1.64	1.74	1.55	1.83	1.64	1.55	1.83
13	1.83	2.23	2.44	2.54	2.44	1.74	1.55	1.64	1.83	1.64	1.74	1.83
14	1.74	2.23	2.34	2.54	2.44	1.74	1.37	1.55	1.83	1.46	1.92	1.83
15	1.92	2.23	2.34	2.54	2.54	1.64	1.37	2.13	1.83	1.55	1.64	1.83
16	1.74	1.92	2.54	2.44	2.34	1.55	1.55	4.49	1.83	1.55	1.64	1.83
17	1.74	1.92	2.54	2.44	2.34	1.64	1.55	3.79	1.92	1.64	1.83	1.83
18	1.74	2.02	2.54	2.54	2.34	1.55	1.55	2.96	1.55	1.64	1.74	1.92
19	1.74	1.92	2.34	2.44	2.13	1.55	1.37	2.34	1.55	1.64	1.74	1.92
20	1.74	2.23	2.54	2.54	2.13	1.55	1.37	2.23	1.55	1.55	1.74	1.83
21	2.02	2.02	2.54	2.54	2.13	1.64	1.28	2.02	1.64	1.55	1.64	1.74
22	2.13	2.02	2.44	2.54	2.13	1.74	1.37	1.92	1.55	1.74	1.74	1.74
23	2.44	2.23	2.65	2.54	2.13	1.74	1.37	1.92	2.34	1.55	1.74	1.83
24	2.13	2.23	2.65	2.54	2.13	1.74	1.37	1.92	1.74	1.64	1.74	1.92
25	2.02	2.13	2.65	2.54	2.13	1.74	1.37	1.92	1.74	1.64	1.74	1.83
26	2.54	1.92	2.44	2.54	2.13	1.83	1.46	1.92	1.64	1.64	1.74	1.92
27	1.92	2.65	2.54	2.75	2.23	1.74	1.46	1.92	1.46	1.64	1.74	2.02
28	1.92	2.34	2.54	2.75	2.13	1.64	1.37	1.92	1.55	1.55	1.74	2.13
29	3.10		2.54	2.65	2.34	1.74	1.37	1.74	1.46	1.74	1.74	2.13
30	2.13		2.54	2.54	1.92	1.74	1.37	1.74	1.46	1.74	1.74	2.02
31	1.92		2.54		1.92		1.55	1.74		1.64		2.02
Sum	62.13	59.77	76.03	75.13	72.13	52.62	46.46	62.61	51.61	48.98	50.72	57.72

Month	Extreme Gage ∅ Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
	Current Year 1977								**Period 1943-1977**		
Jan.	0.43	0.25	8	3.38	† 1	1.46	2.00	123	343	2,790	99
Feb.	.37	.30	27	2.65	† 1	1.92	2.13	119	311	2,822	90.2
Mar.	.37	.32	†23	2.65	† 3	2.13	2.45	151	350	3,154	87.1
Apr.	.38	.34	†27	2.75	† 1	2.34	2.50	149	373	2,222	97
May	.38	.30	† 1	2.75	†30	1.92	2.33	143	290	1,799	73
June	.32	.26	† 1	2.13	†10	1.55	1.75	104	286	1,686	61
July	.28	.23	† 5	1.74	21	1.28	1.50	92.2	262	1,712	59
Aug.	.51	.25	16	4.49	† 7	1.46	2.02	124	312	1,672	65.7
Sept.	.34	.25	23	2.34	†27	1.46	1.72	102	296	1,406	83.5
Oct.	.28	.24	†22	1.74	† 4	1.37	1.58	97.2	319	1,845	63.3
Nov.	.30	.26	14	1.92	† 1	1.55	1.69	101	326	2,030	62.4
Dec.	.32	.28	†28	2.13	† 1	1.74	1.86	114	304	1,686	80
	0.51	0.23		4.49		1.28	1.96	1,419	3,772	22,146	1,071
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	0.16	0.07		0.13		0.04	0.06	1,750	4,653	27,317	1,321

∅ Mean daily † And other days

NEW RIVER AT INTERNATIONAL BOUNDARY

DESCRIPTION: Water-stage recorder located on the left (west) bank of the river in the limits of the city of Calexico, California, 1,400 feet (427 m) downstream (north) from the international land boundary between the United States and Mexico. Measurements are made from a foot bridge at the gage.

RECORDS: Based on a continuous record of gage heights and weekly current meter measurements, supplemented by additional measurements during periods of high flow, by the Imperial Irrigation District. Records computed and furnished by the District. Records available: June 1942 through 1977.

REMARKS: The New River flows northward from Mexico into the United States and thence into the Salton Sea. The flow at this station normally comprises 1) a portion of the waste and drainage water from the irrigation system in the Mexicali Valley, and 2) sewage and other wastes from Mexicali, Baja California. Flood waters enter the river from local drainage in Mexico, and such waters can reach damaging rates during violent desert storms. Waste flows from the Mexican system of canals are limited to an average annual quantity of 35,000 acre-feet (43,172,000 m^3) during any successive five-year period under the provisions of Minute No. 197 of the Commission.

EXTREMES: Maximum mean daily discharge, 691 second-feet (19.6 m^3/sec) on December 3, 1962; minimum mean daily discharge, 2 second-feet (0.06 m^3/sec) on May 14, 1945. Prior to the period of record, and since 1900, much higher flows occurred. During the years 1905 to 1907, when the Colorado River flowed into the Salton Sea, a considerable part of its flow passed through the New River channel.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	249	206	158	169	179	119	113	104	136	130	104	105
2	239	205	154	166	183	120	117	104	132	124	106	109
3	217	187	163	169	180	118	125	108	131	120	112	106
4	199	159	169	169	189	119	132	108	125	112	113	108
5	197	152	168	180	179	122	116	102	124	107	110	111
6	186	150	167	182	156	118	104	102	123	120	113	103
7	163	154	168	184	146	116	108	104	124	140	116	95
8	157	149	160	177	148	111	110	108	119	140	118	97
9	163	147	153	180	147	112	117	100	114	141	121	99
10	187	150	152	183	148	116	120	93	113	136	128	107
11	190	154	151	183	147	124	125	92	120	130	128	109
12	211	153	160	178	145	125	124	99	118	122	121	112
13	211	150	167	175	159	128	118	102	121	117	120	123
14	205	158	167	179	169	120	117	102	124	113	122	136
15	174	159	174	186	164	112	114	376	128	111	117	128
16	160	164	195	189	152	113	117	516	131	109	110	119
17	159	159	193	192	163	114	119	649	131	108	108	112
18	160	153	174	189	167	120	122	526	128	95	112	113
19	194	152	169	193	172	121	120	309	127	85	114	122
20	199	148	169	196	179	132	127	260	124	82	110	132
21	184	147	166	195	162	132	129	219	123	109	103	132
22	186	144	170	193	156	132	127	204	130	117	104	128
23	186	144	163	198	151	130	123	186	137	111	100	129
24	173	156	159	197	147	124	117	175	126	114	99	135
25	173	158	159	184	148	116	112	166	116	106	100	177
26	169	158	174	194	152	112	105	156	117	102	98	379
27	160	157	171	194	147	112	106	143	141	106	98	502
28	160	159	177	185	135	108	105	150	164	107	97	364
29	161		180	184	129	104	105	154	151	104	101	265
30	187		179	177	130	106	102	149	136	103	104	195
31	213		172		124		106	143		104		141
Sum	5,772	4,432	5,201	5,520	4,853	3,556	3,602	5,909	3,834	3,525	3,307	4,793

Month	∅ Extreme Gage ** Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Period 1943-1977 Acre-Feet		
				High		Low					
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	40.63	41.80	1	249	8	157	186	11,449	7,641	20,160	1,751
Feb.	41.05	41.87	1	206	†22	144	158	8,791	6,434	17,845	1,258
Mar.	41.48	41.83	16	195	11	151	168	10,316	7,144	12,960	1,008
Apr.	41.21	41.66	23	198	2	166	184	10,949	7,393	14,489	1,390
May	41.40	42.11	4	189	31	124	157	9,626	6,567	10,618	629
June	42.13	42.42	†20	132	29	104	119	7,053	5,534	9,689	1,087
July	42.13	42.40	4	132	30	102	116	7,144	5,490	9,390	817
Aug.	37.14	42.46	17	649	11	92	191	11,720	6,559	11,720	1,139
Sept.	41.66	42.33	28	164	10	113	128	7,605	6,675	12,688	1,795
Oct.	41.93	42.71	9	141	20	82	114	6,992	6,902	13,902	2,081
Nov.	42.21	42.44	†10	128	28	97	110	6,559	6,572	12,323	2,483
Dec.	38.49	42.41	27	502	7	95	155	9,507	7,302	21,205	1,763
	37.14	42.71		649		82	149	107,711	80,213	138,906	24,573
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	11.32	13.02		18.4		2.3	4.2	132,860	98,942	171,339	30,311

∅ Mean daily ** Feet below mean sea level † And other days

WASTES FROM MEXICALI POTABLE WATER PLANT TO NEW RIVER IN MEXICO

DESCRIPTION: Water-stage recorder and rectangular control weir installed by the State Commission of Public Services of Mexicali. Located 2,300 feet (700 m) upstream from the confluence of the canal with Rivera Drain (Drain 134), which is 1.2 miles (2.0 km) below the water plant and 1.2 miles (2.0 km) south of the international boundary.

RECORDS: The discharge over the weir is computed from discharge measurements and a continuous record of gage heights. The records are obtained and furnished by the Mexican Section of the Commission. Records available: January 1968 through 1977.

REMARKS: The plant began operation on September 28, 1963 by the State Commission of Public Services of Mexicali. Before 1968 the flow was small and infrequent. The weir was installed in December 1970, and operation began with the installation of the recorder in April 1971. The potable water plant obtains water from the West Main Canal, which is a part of Mexico's system of canals in the Colorado Irrigation System. Excess water discharges into a canal which is 2.5 miles (4.0 km) long that empties into Rivera Drain (Drain 134) which drains west; and then into New River, about 0.9 mile (1.4 km) above the international boundary. The station was removed September 27, 1977 because of work of enclosing Drain 134 in pipe.

EXTREMES: Maximum instantaneous discharge, 81.9 second-feet (2.32 m^3/sec) on March 26, 1969; minimum instantaneous discharge, zero during many days of 1977.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	1.4	4.6	6.0	4.9	1.8	6.4	8.8	1.4			
2	1.4	1.8	2.5	2.5	4.2	3.2	7.1	7.8	1.1			
3	3.2	2.5	4.6	5.7	3.5	4.2	8.8	7.8	1.4			
4	3.5	2.5	4.9	4.9	2.5	4.2	7.1	6.0	1.1			
5	2.5	2.5	4.6	4.2	4.6	5.7	6.0	8.1	1.4			
6	5.7	1.4	3.5	4.6	3.5	4.2	6.4	7.8	1.1			
7	3.2	3.2	3.2	4.9	3.2	2.1	9.9	6.4	.7			
8	2.5	2.1	3.2	6.4	4.9	4.9	8.1	8.1	1.1			
9	2.5	2.5	3.5	4.6	3.5	4.6	8.1	8.8	.4			
10	2.5	3.5	3.2	5.7	6.0	4.6	10.6	9.9	1.4			
11	3.2	3.2	2.1	4.2	2.8	5.7	7.1	6.4	1.4			
12	2.5	1.4	5.7	4.6	3.5	4.2	7.1	7.8	.4			
13	3.2	.4	7.1	4.2	4.6	2.5	7.8	8.1	.7			
14	3.2	1.4	2.5	3.5	2.8	2.1	6.4	8.8	2.1			
15	2.1	1.8	5.7	4.6	4.9	4.6	6.0	20.5	1.4			
16	2.8	4.2	2.5	3.2	3.2	4.2	7.1	23.3	2.5			
17	2.8	3.2	7.8	6.0	2.8	1.8	7.1	9.9	2.1			
18	1.8	.7	2.5	4.2	4.2	4.2	9.2	.7	3.5			
19	2.5	1.4	2.8	2.8	4.2	1.8	4.9	.4	2.1			
20	3.2	2.5	4.6	4.9	3.5	2.5	7.8	.4	2.1			
21	2.8	6.4	2.5	4.6	3.5	2.1	7.8	.4	3.2			
22	2.5	4.6	4.6	4.9	4.9	5.7	6.4	.4	1.8			
23	2.5	3.2	4.6	4.6	4.6	4.6	4.6	3.2	4.2			
24	1.8	4.6	5.7	4.2	4.6	4.2	6.0	3.2	3.2			
25	3.2	1.8	3.5	4.6	4.6	2.5	4.6	3.5	2.8			
26	2.5	1.4	4.9	6.4	4.9	3.2	5.7	3.5	2.1			
27	2.5	2.5	1.8	6.0	4.9	6.4	8.8	2.5	2.5			
28	1.8	2.1	3.2	4.9	3.2	2.1	5.7	2.1	* 2.8			
29	2.5		3.5	2.5	4.2	1.4	7.1	2.1	* 2.8			
30	2.8		4.9	3.2	5.7	3.2	6.0	1.8	* 2.8			
31	2.5		4.2		4.2		8.8	1.8				
Sum												

Month	Current Year 1977								Period 1968-1977		
	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	1.12	0	6	15.5	†11	0	2.8	173	268	520	154
Feb.	1.08	0	†21	14.8	13	0	2.5	139	225	311	139
Mar.	1.18	.03	8	17.0	† 1	0	3.9	246	316	871	132
Apr.	1.21	.03	11	17.7	† 2	0	4.6	273	289	431	135
May	1.44	.07	10	22.6	† 4	.4	4.2	252	323	435	226
June	1.08	.03	10	14.8	†25	0	3.5	215	282	409	116
July	1.25	.10	13	18.4	9	1.1	7.1	436	367	528	198
Aug.	3.58	0	15	37.1	†19	0	6.0	377	396	596	200
Sept.	.98	0	18	12.7	† 1	0	1.8	114	385	549	114
Oct.							* 5.7	* 345	345	507	139
Nov.							* 4.9	* 293	293	504	151
Dec.							* 4.6	* 292	292	597	115
							4.2	3,155	3,781	5,359	2,745
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
							0.12	3,892	4,664	6,610	3,386

† And other days * Estimated from period 1968-1976

WASTE WATERS FROM MEXICAN SYSTEM OF CANALS ENTERING THE UNITED STATES

DESCRIPTION: During 1977 the only flow to the New River in Mexico was from the Mexicali Potable Water Plant, which discharges into Rivera Drain (Drain 134), and thence to New River. There were no discharges during 1977 from Wisteria Wasteway, located 4.3 miles (7.0 km) upstream from the international boundary in Colonia Wisteria.

RECORDS: Records of the Potable Water Plant are based on a continuous record of gage heights and spillway discharges furnished by the Comision Estatal de Servicios Publicos de Mexicali and on weekly check measurements made in the discharge canal by the Mexican Section of the Commission, which obtained and provided the data. Records available: Wisteria Wasteway, January 1951 through 1975; Sifon Wasteway, January 1952 through April 1964; Pueblo Nuevo Wasteway, January 1956 through 1965; and the Potable Water Plant, January 1968 through September 27, 1977.

REMARKS: The station at the Potable Water Plant ceased operation on September 27, 1977. To obtain records of Sifon and Pueblo Nuevo Wasteways, see Bulletins 1960 through 1965. Flows from these two wasteways are used for irrigation and no longer reach New River. For records of Wisteria Wasteway, see Bulletins 1960 through 1975. Mean daily discharges for the Potable Water Plant are shown on page 58 of this bulletin.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1956-1977		
		Average	Maximum	Minimum
January	173	1,287	8,758	15.4
February	139	862	7,281	19.6
March	246	565	2,610	21.7
April	273	443	2,843	16.1
May	252	339	1,141	9.1
June	215	267	1,477	0
July	436	241	528	0
August	377	392	1,413	0
September	114	435	2,031	21.0
October	* 345	667	3,474	8.4
November	* 293	743	3,784	0
December	* 292	1,187	8,691	0
Yearly	3,155	7,427	27,430	399
	Thousands of Cubic Meters			
	3,892	9,161	33,835	492

* Estimated from period 1968-1976

SALTON SEA - ELEVATIONS OF WATER SURFACE

DESCRIPTION: Water-stage recorder and staff gage located on the western shore of the Salton Sea, 15.5 miles (24.9 km) northwest of Westmoreland, Imperial County, California. The Salton Sea is the sink of a closed basin which has a drainage area of 8,360 square miles (21,652 km^2). Zero of the gage is 250.00 feet (76.2 m) below mean sea level, U. S. C. & G. S. datum.

RECORDS: Records of water surface elevations available from November 1904 through 1977. From January 1925 to October 22, 1951, once monthly records of elevations were collected by Imperial Irrigation District from a bench mark at Figtree John's Spring about 22 miles (35.4 km) northwest along the western shore from the present gage. Since October 24, 1951, a continuous record of gage heights has been obtained by the U. S. Geological Survey at new gaging station published as "Salton Sea near Westmoreland, California." The elevation of the old station is at a datum of one foot (0.30 m) higher than that of the present station. All records reported below and the area and capacity table are adjusted to the datum of the present station.

REMARKS: Runoff from the basin, irrigation drainage and waste water from Imperial and Coachella Valleys in the United States, and drainage and waste water from part of the Mexicali Valley in Mexico discharge into the Salton Sea. Water from Mexico enters the United States in the Alamo and New River channels. The bottom of the sea is 277.7 feet (84.6 m) below mean sea level, U. S. C. & G. S. datum.

EXTREMES: Maximum elevation during year, 228.4 feet (69.6 m) below mean sea level. Minimum elevation during year, 229.4 feet (69.9 m) below mean sea level. Extremes for period of record, maximum elevation 195.9 feet (59.7 m) below mean sea level, February 10 to March 29, 1907; minimum elevation since 1906, 251.6 feet (76.7 m) below mean sea level in November 1924.

Mean Daily Water Surface Elevation in Feet below Mean Sea Level - 1977

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	229.4	229.1	229.0	229.0	228.7	228.8	* 228.9	* 229.0	* 228.6	* 229.2	* 229.2	* 229.2
2	229.4	229.1	229.0	228.9	228.7	228.8	228.9	229.0	228.6	229.2	229.2	229.2
3	229.3	229.1	229.0	228.9	228.7	228.8	228.9	229.0	228.6	229.2	229.2	229.2
4	229.3	229.1	229.0	228.9	228.7	228.8	228.9	229.0	228.6	229.2	229.2	229.2
5	229.3	229.1	229.0	228.9	228.6	228.7	228.9	229.0	228.6	229.2	229.2	229.2
6	229.3	229.1	229.0	228.9	228.8	228.7	228.9	229.0	228.6	229.2	229.2	229.2
7	229.3	229.1	229.0	228.9	228.8	228.7	228.9	229.0	228.6	229.2	229.2	229.1
8	229.3	229.1	229.0	228.9	228.7	228.7	228.9	229.0	228.7	229.2	229.2	229.1
9	229.3	229.1	229.0	228.9	228.8	228.7	228.9	229.0	228.7	229.2	229.2	229.1
10	229.3	229.0	228.9	228.9	228.8	228.7	228.9	229.0	228.7	229.2	229.2	229.1
11	229.3	229.0	228.9	228.9	228.8	228.8	228.9	229.0	228.7	229.2	229.2	229.1
12	229.3	229.0	229.0	228.8	228.8	228.8	228.9	229.0	228.7	229.2	229.2	229.1
13	229.3	229.0	229.0	228.8	228.8	228.8	228.9	229.0	228.7	229.2	229.2	229.1
14	229.3	229.0	229.0	228.8	228.8	228.8	228.9	229.0	228.7	229.2	229.2	229.1
15	229.3	229.0	229.0	228.8	228.8	228.8	228.9	229.0	228.8	229.2	229.2	229.1
16	229.3	229.0	229.0	228.8	228.9	228.8	228.9	229.0	228.8	229.2	229.2	229.1
17	229.3	229.0	229.0	228.7	228.8	* 228.8	228.9	228.8	228.8	229.2	229.2	229.1
18	229.3	229.0	229.0	228.7	228.8	228.8	228.9	228.7	228.9	229.2	229.2	229.1
19	229.3	229.0	229.0	228.7	228.8	228.8	228.9	228.6	228.9	229.2	229.2	229.1
20	229.2	229.0	229.0	228.7	228.8	228.8	228.9	228.5	228.9	229.2	229.2	229.1
21	229.2	229.0	228.9	228.7	228.8	228.8	228.9	228.4	228.9	229.2	229.2	229.1
22	229.2	229.0	228.9	228.7	228.8	228.8	228.9	228.4	229.0	229.2	229.2	229.1
23	229.2	229.0	229.0	228.7	228.8	228.8	228.9	228.4	229.0	229.2	229.2	229.1
24	229.2	229.0	229.0	228.7	228.9	228.8	228.9	228.5	229.0	229.2	229.2	229.1
25	229.2	229.0	229.0	228.7	228.8	228.8	228.9	228.5	229.0	229.2	229.2	229.1
26	229.2	229.0	228.9	228.7	228.8	228.9	229.0	228.5	229.1	229.2	229.2	229.1
27	229.2	229.0	228.9	228.7	228.8	228.9	229.0	228.5	229.1	229.2	229.2	229.0
28	229.2	229.0	228.9	228.7	228.8	228.9	229.0	228.5	229.1	229.2	229.2	229.0
29	229.2		228.9	228.7	228.8	228.9	229.0	228.5	229.1	229.2	229.2	229.0
30	229.1		228.9	228.7	228.7	228.9	229.0	228.5	229.1	229.2	229.2	229.0
31	229.1		228.9		228.8		229.0	228.5		229.2		229.0
Avg.	229.3	229.0	229.0	228.8	228.8	228.8	228.9	228.8	228.8	229.2	229.2	229.1

Current Year 1977			Period 1935-1977		
Month	∅ Extreme Elevation Feet		Elevation Feet		
	High	Low	# Average	Maximum	‡ Minimum
Jan.	229.1	229.4	237.60	229.1	249.3
Feb.	229.0	229.1	237.27	229.0	248.8
Mar.	228.9	229.0	237.02	228.9	248.6
Apr.	228.7	229.0	236.83	228.7	248.7
May	228.6	228.9	236.81	228.6	248.5
June	228.7	228.9	236.96	228.7	248.8
July	228.9	229.0	237.12	228.9	249.1
Aug.	228.4	229.0	237.32	228.4	249.4
Sept.	228.6	229.1	237.50	228.6	249.4
Oct.	229.2	229.2	237.55	229.2	249.8
Nov.	229.2	229.2	237.57	229.2	250.0
Dec.	229.0	229.2	237.43	229.0	249.6
Yearly	228.4	229.4	237.25	# 228.9	250.0

Area and Capacity Table		
Elevation Feet Below M.S.L.	Area Acres	Capacity Acre-Feet
277.7	0	0
274.0	20,600	25,700
270.0	62,900	188,700
266.0	94,600	510,600
260.0	122,600	1,170,000
256.0	134,700	1,684,000
252.0	148,800	2,250,000
244.0	179,700	3,562,000
240.0	196,900	4,315,000
235.0	221,800	5,360,000
230.0	235,800	6,504,000
220.0	262,000	8,993,000
210.0	288,500	11,740,000
200.0	315,500	14,760,000

∅ Mean daily # Mean monthly ‡ Reading near first day of month

* Estimated June 17 to December 31. Based upon U.S.G.S. records and records from near Figtree John's Spring

CHEMICAL ANALYSES OF WATER SAMPLES
1977

The tables below are based on quarterly samples from the Alamo River taken and analyzed by the State of California Department of Water Resources. Beginning December 1971, not all constituents analyzed. New River samples are collected monthly and analysed by the U. S. Geological Survey.

Samples from the Alamo River are taken north of the international boundary at upstream end of box culvert under the All-American Canal. Flow at this point includes drainage flows across international boundary and flows from drain intercepts along toe of south bank of All-American Canal. Samples from New River are taken from the right bank at road bridge 450 feet north of international boundary. Records of sampling extend from April 1951 through 1977.

To convert milligram equivalents to parts per million by weight, multiply each ion by its appropriate conversion factor. These factors are: Ca, 20.04; Mg, 12.16; Na, 22.99; (CO_3 plus HCO_3) expressed as CO_3, 30.00; SO_4, 48.03; Cl, 35.45; NO_3, 62.00. To convert tons per acre-foot to parts per million, multiply tons per acre-foot by 735.5. Electrical conductivity, reported in the tables as EC x 10^6 at 25°C, is a relative measure of the total salt concentration.

Month	No. of Samples	Dissolved Solids		ECx10^6 @25°C	Boron p.p.m.	pH	% Na **	% Cl ***	Mean Milligram Equivalents per Liter						
		Tons Per Acre-Foot	Total Tons						Ca	Mg	Na	CO_3 + HCO_3	SO_4	Cl	NO_3
Alamo River															
Jan. Feb.	1	8.96	1,102	9,990		8.1							26.25	73.26	
Mar. Apr. May	1	5.28	797	5,720		8.1							22.24	33.50	
June July Aug.	1	4.43	461	4,811		8.2							19.81	26.93	
Sept. Oct. Nov. Dec.	1	4.08	416	4,610		8.0							18.12	23.38	
Total	4														
New River															
Jan.	3	5.89	67,400	6,630		7.8	68	71	12.82	9.95	48.06	4.98	15.82	51.90	
Feb.	2	5.87	51,600	7,450		8.0	66	70	13.27	11.02	47.41	5.76	16.24	50.78	
Mar.	2	6.34	65,400	7,340		8.0	66	71	14.47	12.17	51.00	5.13	17.75	55.43	
Apr.	1	6.58	72,000	7,570		7.8	64	67	15.57	12.83	51.33	5.44	21.29	55.36	
May	1	6.65	64,000	3,050		7.5	67	71	14.47	12.17	53.50	5.08	18.53	58.67	
June	2	7.03	49,600	8,680		7.8	70	73	13.57	12.13	60.03	4.93	18.01	62.76	
July	1	6.62	47,300	7,930		7.7	69	72	13.17	11.27	55.24	4.56	18.01	58.67	
Aug.	1	7.02	82,300	8,370		7.7	69	73	13.47	12.34	58.72	4.69	18.22	63.47	
Sept.	1	7.38	56,100	8,360		8.4	70	74	13.97	12.42	62.64	5.51	18.53	67.00	
Oct.	1	5.32	37,200	6,380		7.5	68	69	10.88	9.95	43.50	4.59	15.82	45.13	
Nov.	2	5.64	37,000	6,730		7.6	66	70	12.13	11.10	45.24	5.13	16.19	48.66	
Dec.	2	6.10	58,000	7,260		7.4	67	70	12.82	11.47	49.59	4.93	17.70	52.80	
Total	19														

** Percent of total cations *** Percent of total anions

ELECTRICAL CONDUCTIVITY OF WATER SAMPLES
1977

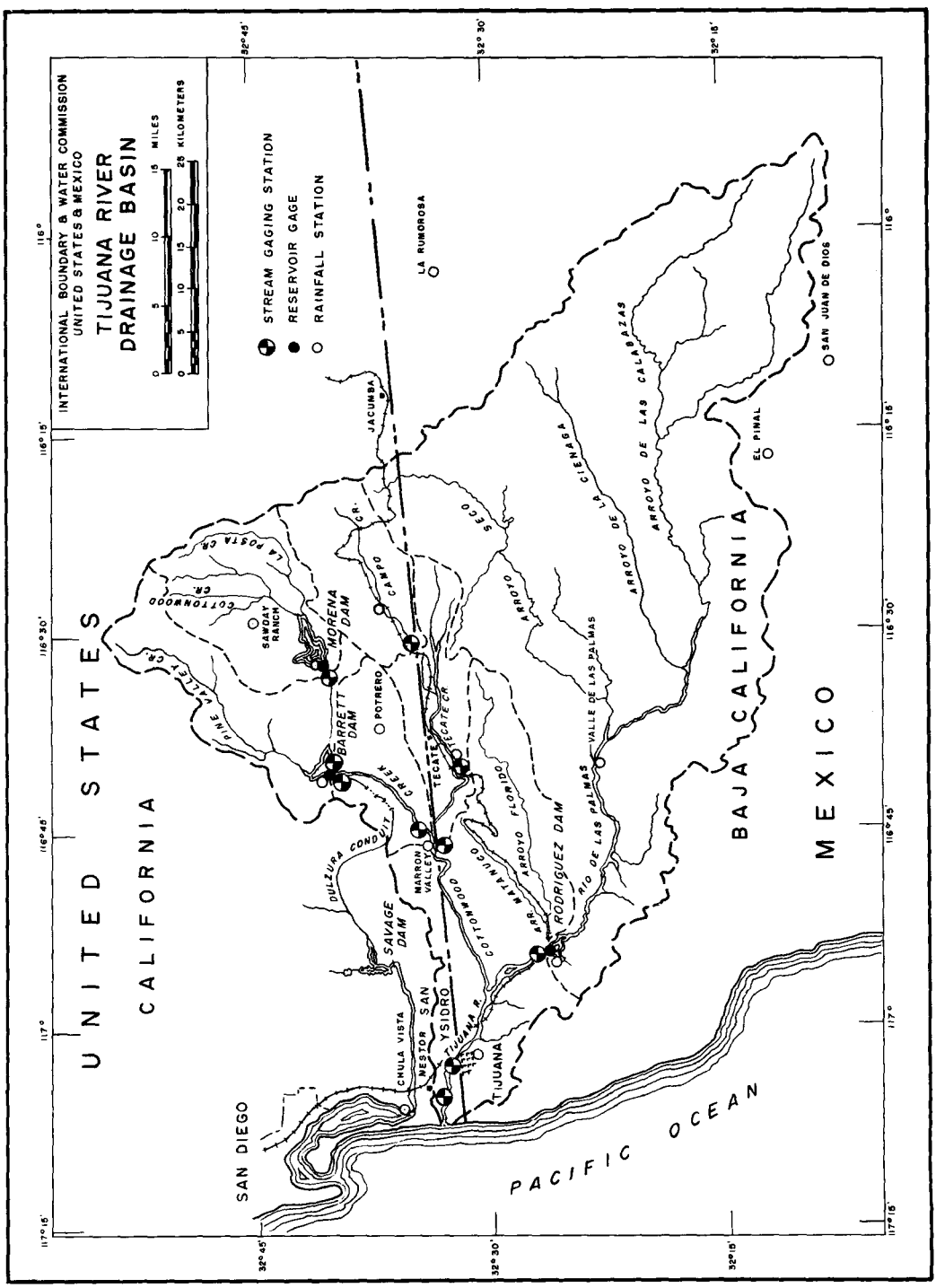
The following table shows electrical conductivity, expressed in mhos per centimeter x 10^6 at 25°C, of individual water samples from the New River in Mexico at the international boundary. Samples were taken by the Mexican Section of the Commission, who also made the determinations.

Electrical conductivity is a relative indication of the concentration of dissolved solids in the water samples.

Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C	Date	ECx10⁶ @25°C

New River at International Boundary

January		February		April		May		July		August		October		November	
4	6,900	22	6,950	5	6,830	23	7,200	4	7,100	23	5,300	3	6,900	15	6,990
11	6,810	28	6,850	12	7,200	31	6,900	11	6,900	29	6,020	11	6,640	22	6,910
18	7,000	March		25	7,400	June		18	7,200	September		18	6,550	29	7,020
25	7,200	1	7,030	May		6	7,190	25	7,000	5	6,800	25	7,110	December	
February		8	6,900	2	7,100	14	6,990	August		13	7,200	November		5	6,990
1	7,080	14	7,100	10	6,950	21	7,060	2	6,920	20	6,960	1	6,690	13	7,120
7	7,010	22	6,980	17	7,010	28	6,910	9	7,300	26	7,010	8	6,940	20	7,010
15	7,000	28	7,000											27	6,670


INTERNATIONAL BOUNDARY & WATER COMMISSION
UNITED STATES & MEXICO
TIJUANA RIVER
DRAINAGE BASIN
STREAM GAGING STATION
RESERVOIR GAGE
RAINFALL STATION
MILES
KILOMETERS
UNITED STATES
CALIFORNIA
BAJA CALIFORNIA
MEXICO
PACIFIC OCEAN
SAN DIEGO
CHULA VISTA
NESTOR
SAN YSIDRO
TIJUANA
TIJUANA R.
SAVAGE DAM
MARRON VALLEY
DULZURA CONDUIT
COTTONWOOD CREEK
BARRETT DAM
MORENA DAM
SAWDAY RANCH
COTTONWOOD CR.
LA POSTA CR.
PINE VALLEY CR.
POTRERO
CAMPO
JACUMBA
TECATE
TECATE CR.
LA RUMOROSA
SAN JUAN DE DIOS
EL PINAL
ARROYO SECO
ARROYO DE LA CIENEGA
ARROYO DE LAS CALABAZAS
ARROYO FLORIDO
ARROYO MATAHUAY
ARROYO COTTONWOOD
RODRIGUEZ DAM
RIO DE LAS PALMAS
VALLE DE LAS PALMAS
117°15'
117°
116°45'
116°30'
116°15'
116°
32°45'
32°30'
32°15'

COTTONWOOD CREEK ABOVE MORENA DAM, CALIFORNIA

DESCRIPTION: Staff gage located on east side of outlet tower immediately upstream from face of Morena Dam. The dam is located on Cottonwood Creek 1.8 miles (2.9 km) upstream from the mouth of Hauser Creek, 8.5 miles (13.7 km) upstream from Barrett Dam, and about 20 miles (32.2 km) upstream from the international boundary. The zero of the gage is 2,882.4 feet (878.56 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Reservoir inflows shown below were computed from monthly reservoir records of storage, releases, spills, leakage, evaporation, and rainfall, by the International Boundary and Water Commission, United States Section. They represent all water reaching Morena Reservoir, including rainfall on reservoir water surface. Basic data were furnished by the city of San Diego, California. Records available: April 1911 through 1977.

REMARKS: Storage began in Morena Reservoir March 1910. Reservoir capacity and area ratings date from 1910 when Morena Dam was completed. Records for 1977 computed on basis of area-capacity curves determined from 1948 resurvey. Various changes have been made to the spillway section since construction of the dam. Elevation of the present crest of ungated spillway is 157.00 feet (47.85 m), gage datum. Reservoir capacity at spillway crest, 1948 survey, is 50,210 acre-feet (61,934,000 m^3). The entire capacity of Morena Reservoir is used to furnish a part of the water supply of the city of San Diego, California. Water is released from Morena Reservoir down Cottonwood Creek to Barrett Reservoir as required.

EXTREMES: Prior to 1937, maximum monthly inflow, 37,200 acre-feet (45,886,000 m^3), January 1916; minimum, no flow during parts of many years.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1937-1977		
		Average	Maximum	Minimum
January	83.6	400	3,520	0
February	28.2	976	16,700	8.0
March	29.1	1,475	13,220	19.3
April	11.0	924	11,490	3.3
May	39.5	326	3,550	0
June	21.1	167	1,660	0
July	0	117	1,010	0
August	12.8	85.9	1,260	0
September	0	59.9	1,070	0
October	9.1	70.3	1,270	0
November	3.9	128	1,380	0
December	34.0	421	3,590	4.4
Yearly	272	5,150	39,439	121
	Thousands of Cubic Meters			
	336	6,352	48,648	149

COTTONWOOD CREEK BELOW MORENA DAM, CALIFORNIA

DESCRIPTION: Two water-stage recorders, one on the upstream side of the southeast abutment of Morena Dam for measuring head on the spillway crest and one immediately below the dam with a rectangular control weir for measuring ordinary reservoir releases, and cableway located about 0.8 mile (1.3 km) downstream from the dam. Discharge measurements made at the cableway include leakage, controlled releases, and spillway discharges.

RECORDS: Monthly records shown below represent the water available immediately below Morena Dam, consisting of spillway waste, draft, and leakage from the dam. They are computed by the International Boundary and Water Commission, United States Section, from basic data furnished by the city of San Diego, California. Records available: January 1911 through 1977.

REMARKS: Flows at this station are regulated by Morena Dam; storage began March 1910. Water is released from Morena Reservoir as required and flows down the natural channel of Cottonwood Creek to Barrett Reservoir. There are no major diversions above Morena Dam.

EXTREMES: Prior to 1937, *maximum* monthly discharge, 21,400 acre-feet (26,397,000 m^3), February 1916; minimum, no flow during several months of various years.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1937-1977		
		Average	Maximum	Minimum
January	1.7	107	1,700	0
February	2.9	297	4,260	0
March	3.2	241	1,731	0
April	3.1	737	12,950	0
May	3.1	201	3,040	0
June	3.1	276	7,360	0
July	3.1	158	2,340	0
August	3.1	131	1,550	0
September	3.1	258	5,880	0
October	0	76.6	529	0
November	0	103	1,260	0
December	0	285	5,350	0
Yearly	26.4	2,871	24,825	0
	Thousands of Cubic Meters			
	32.6	3,541	30,621	0

COTTONWOOD CREEK ABOVE BARRETT DAM, CALIFORNIA

DESCRIPTION: Staff gage located immediately upstream from face of dam on west side of outlet tower. Barrett Dam is located on Cottonwood Creek 8.5 miles (13.7 km) downstream from Morena Dam, 1 mile (1.6 km) downstream from the mouth of Pine Valley Creek and about 12 miles (19.3 km) upstream from the international boundary. Zero of gage is 1,446.12 feet (440.73 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Records reported below represent all water reaching Barrett Dam from the sub-basin below Morena Dam, including rainfall on the reservoir water surface. Leakage, releases, and spills from Morena Reservoir are not included. The inflows were computed from monthly reservoir records of storage, releases, spills, leakage, evaporation, and rainfall furnished by the city of San Diego, California. Records available: January 1921 through 1977. Records of stream flow for a station at the dam site are also available for the periods 1906-1915 and 1917-1920.

REMARKS: Storage began at Barrett Reservoir in January 1921. The area-capacity-elevation curves used in the inflow calculations are dated 1948, 1951, and 1955 and were furnished by the city of San Diego California. Capacity of reservoir at top of flash gates on spillway (gage height 168.88 feet (51.47 m)) is 44,755 acre-feet (55,205,000 m^3). Capacity at spillway crest (gage height 160.88 feet (49.04 m)) is 37,950 acre-feet (46,811,000 m^3). Dead storage, 719 acre-feet (887,000 m^3) below lowest outlet (gage height 58.88 feet) (17.95 m) is included in these capacities. The entire capacity of Barrett Reservoir is used to furnish a part of the water supply of the city of San Diego, California.

EXTREMES: Prior to 1937, maximum monthly discharge, 54,800 acre-feet (67,595,000 m^3) February 1927; minimum, no flow during several months of various years.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1937-1977		
		Average	Maximum	Minimum
January	77.8	525	3,430	5.2
February	21.3	1,434	26,790	7.6
March	65.9	2,416	18,860	14.1
April	16.7	1,577	21,630	10.2
May	29.6	485	5,130	0
June	.1	202	1,730	0
July	0	132	1,010	0
August	12.4	75.4	579	0
September	2.8	88.9	759	0
October	2.5	54.9	645	.1
November	2.5	117	1,200	0
December	24.1	429	3,380	1.7
Yearly	256	7,536	59,387	129
	Thousands of Cubic Meters			
	316	9,296	73,253	159

DULZURA CONDUIT BELOW BARRETT DAM, CALIFORNIA

DESCRIPTION: Water-stage recorder 0.5 mile (0.8 km) downstream from Barrett Dam on right bank of Dulzura Conduit 50 feet (15.2 m) upstream from road crossing to Barrett Dam. Elevation of gage has not been determined.

RECORDS: Computed on basis of head on control section of flume, as measured by water-stage recorder, and rating curve determined from current meter measurements. Records obtained and furnished by the city of San Diego, California. Records available: January 1909 through 1977.

REMARKS: Barrett Dam was completed in 1921. Prior to this date the intake of Dulzura Conduit was located 1.5 miles (2.4 km) upstream. The conduit carries diversions from Barrett Reservoir on Cottonwood Creek westerly across the divide into Otay Reservoir for municipal use by the city of San Diego. Prior to September 30, 1958, station was located 8 miles (12.9 km) along the conduit from Barrett Dam, being reported as "Dulzura Conduit near Dulzura" and the draft from Barrett Reservoir was computed from the discharges obtained at the conduit gaging station, multiplied by the factor 1.05 to allow for channel losses in the reach from the reservoir to the gaging station.

EXTREMES: Since 1937: Maximum mean daily discharge, 55 second-feet (1.56 m^3/sec) on March 15, 1954; minimum discharge, no flow for long periods on many occasions.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Sum	0	0	0	0	0	0	0	0	0	0	0	0

Month	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.				0		0	0	0	346	2,350	0
Feb.				0		0	0	0	354	2,130	0
Mar.				0		0	0	0	520	2,330	0
Apr.				0		0	0	0	814	2,860	0
May				0		0	0	0	900	3,040	0
June				0		0	0	0	912	2,980	0
July				0		0	0	0	746	2,920	0
Aug.				0		0	0	0	624	2,820	0
Sept.				0		0	0	0	404	2,320	0
Oct.				0		0	0	0	309	2,450	0
Nov.				0		0	0	0	426	2,760	0
Dec.				0		0	0	0	393	2,305	0
				0		0	0	0	6,748	27,170	0
Yearly	Meters		Cubic Meters per Second						Thousands of Cubic Meters		
				0		0	0	0	8,324	33,514	0

Current Year 1977 — Period 1937-1977

COTTONWOOD CREEK BELOW BARRETT DAM, CALIFORNIA

DESCRIPTION: Water-stage recorder and cableway located about 2.5 miles (4.0 km) downstream from Barrett Dam and 0.5 mile (0.8 km) upstream from Rattlesnake Canyon for measuring Barrett Dam spills; and staff gage and control weir located immediately below the dam for measuring leakage. The elevation of the gage is about 1,000 feet (305 m) (from topographic map).

RECORDS: Data furnished by the city of San Diego, California. Prior to January 1953, the records were furnished by the city of San Diego and reviewed and revised by the United States Section of the Commission. The recorder is to be operated only when Barrett Reservoir is near or above spillway level. There have been no spillway discharges since May 1943. Spillway discharges included in the period record below were computed by the city of San Diego from the head on the spillway crest, read on the reservoir gage, and applied to a broad-crested weir formula. Records available: January 1921 through 1977. Storage began in Barrett Reservoir in January 1921.

REMARKS: Records reported below represent the water available in the natural channel of Cottonwood Creek immediately below Barrett Dam. Records of draft from Barrett Reservoir are not included inasmuch as all releases are made to Dulzura Conduit which transports water outside the basin. Leakage is mainly through the spillway gates.

EXTREMES: Prior to 1937, maximum monthly discharge 38,400 acre-feet (47,366,000 m^3) February 1927; minimum, no flow during several months of various years.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1937-1977		
		Average	Maximum	Minimum
January	0	14.7	590	0
February	0	25.1	990	0
March	0	675	13,390	0
April	0	991	33,400	0
May	0	225	7,520	0
June	0	31.6	890	0
July	0	1.7	21	0
August	0	1.5	21	0
September	0	1.3	21	0
October	0	1.1	21	0
November	0	.8	15	0
December	0	1.3	21	0
Yearly	0	1,070	50,364	0
	Thousands of Cubic Meters			
	0	2.430	62,123	0

COTTONWOOD CREEK ABOVE TECATE CREEK NEAR DULZURA, CALIFORNIA

DESCRIPTION: Water-stage recorder and cableway located 1.6 miles (2.6 km) upstream from the international land boundary between the United States and Mexico, 0.8 mile (1.3 km) upstream from the confluence with Tecate Creek, and 5.1 miles (8.2 km) south of Dulzura, California. Low water discharge measurements are made by wading at the gage; high water measurements are made from the cableway which is located 700 feet (213 m) downstream from the gage. Zero of the gage is 569.40 feet (173.55 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based on a continuous record of gage heights and current meter measurements or observation of no flow generally made twice each month. Records obtained and furnished by the U. S. Geological Survey. Records available: October 1936 through 1977.

REMARKS: Flow is largely controlled by Barrett and Morena Reservoirs, 10 (16.1 km) and 18 miles (29.0 km), respectively, upstream from this station. During 1977 there were no releases or spills to the natural channel of Cottonwood Creek at Barrett Dam, the lowermost dam in Cottonwood Creek Basin.

EXTREMES: Maximum discharge 4,340 second-feet (123 m^3/sec) February 7, 1937 (gage height 9.65 feet) (2.94 m), from rating curve extended above 1,500 second-feet (42.5 m^3/sec) by logarithmic plotting. Minimum discharge, no flow during part of each year.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	.39	0	0	0	0	0	0	0	0	0	0	0
7	.94	0	0	0	0	0	0	0	0	0	0	0
8	.81	0	0	0	0	0	0	0	0	0	0	0
9	.49	0	0	0	0	0	0	0	0	0	0	0
10	.29	0	0	0	0	0	0	0	0	0	0	0
11	.19	0	0	0	0	0	0	0	0	0	0	0
12	.14	0	0	0	0	0	0	0	0	0	0	0
13	.09	0	0	0	0	0	0	0	0	0	0	0
14	.05	0	0	0	0	0	0	0	0	0	0	0
15	.02	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Sum	3.41	0	0	0	0	0	0	0	0	0	0	0

Month	Current Year 1977								Period 1937-1977		
	Extreme Gage Feet		∅ Extreme Second-Feet			Average Second-Feet	Total Acre-Feet	Acre-Feet			
	High	Low	High Day	High	Low Day	Low			Average	Maximum	Minimum
Jan.			7	0.94		0	0.11	6.8	172	1,190	0
Feb.				0		0	0	0	555	9,940	0
Mar.				0		0	0	0	1,484	20,880	0
Apr.				0		0	0	0	1,382	40,240	0
May				0		0	0	0	319	10,040	0
June				0		0	0	0	61.3	1,590	0
July				0		0	0	0	6.8	206	0
Aug.				0		0	0	0	.3	7.7	0
Sept.				0		0	0	0	1.8	72	0
Oct.				0		0	0	0	3.5	101	0
Nov.				0		0	0	0	19.4	440	0
Dec.				0		0	0	0	124	1,316	0
				0.94		0	0.01	6.8	4,129	66,700	0
Yearly	Meters			Cubic Meters per Second					Thousands of Cubic Meters		
				0.03		0	0	8.39	5,093	82,274	0

∅ Mean daily

CAMPO CREEK NEAR CAMPO, CALIFORNIA

DESCRIPTION: Water-stage recorder and broad-crested weir on left bank, 0.5 mile (0.8 km) upstream from the international land boundary between the United States and Mexico, just upstream from the bridge on California State Highway 94, 3.5 miles (5.6 km) southwest of Campo, California. Zero of gage is 2,178.92 feet (664.13 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based on current meter measurements and observation of no flow. Records obtained and furnished by the U. S. Geological Survey. Records available: October 1936 through 1977.

REMARKS: Campo Creek originates in the United States and flows southwestward into Mexico where it joins Tecate Creek. The flow at this station is partially regulated by a small conservation reservoir a quarter of a mile (0.4 km) upstream, completed in August 1956.

EXTREMES: Maximum discharge 880 second-feet (24.9 m^3/sec), February 6, 1937 (gage height 4.80 feet (1.46 m) present datum), from rating curve extended above 110 second-feet (3.12 m^3/sec) on basis of velocity-depth relation and cross-section area at the control. Minimum discharge, no flow during part of most years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0.01	0.01	0.01	0.01	0	0	0	0	0	0
2	0	0	.01	.02	.01	.01	0	0	0	0	0	0
3	.05	0	0	.01	.02	.01	0	0	0	0	0	0
4	.02	0	0	.01	.02	.01	0	0	0	0	0	0
5	.04	0	0	.01	.01	.05	0	0	0	0	0	0
6	.03	0	0	.01	.01	.05	0	0	0	0	0	0
7	.03	0	0	.01	.02	.04	0	0	0	0	0	0
8	.03	0	0	.01	.02	.04	0	0	0	0	0	0
9	.02	0	0	.01	.02	.04	0	0	0	0	0	0
10	.02	0	0	.01	.03	.03	0	0	0	0	0	0
11	.01	0	0	.01	.02	.03	0	0	0	0	0	0
12	.01	0	.01	.01	.03	.03	0	0	0	0	0	0
13	.01	0	.01	.01	.02	.03	0	0	0	0	0	0
14	.01	0	.01	.01	.02	.02	0	0	0	0	0	0
15	.01	0	.01	.01	.02	.01	0	0	0	0	0	0
16	.01	.01	.02	.01	.02	0	0	.06	0	0	0	0
17	0	.01	0	.01	.02	0	0	.07	0	0	0	0
18	0	.01	0	.01	.02	0	0	0	0	0	0	0
19	0	.01	0	.01	.02	0	0	0	0	0	0	0
20	0	.03	0	.01	.02	0	0	0	0	0	0	0
21	0	.01	0	.01	.02	0	0	0	0	0	0	0
22	0	.01	0	.01	.02	0	0	0	0	0	0	0
23	0	.01	0	.01	.02	0	0	0	0	0	0	.01
24	0	.03	0	.01	.03	0	0	0	0	0	0	0
25	0	.01	.02	.01	.03	0	0	0	0	0	0	0
26	0	.01	.01	.01	.02	0	0	0	0	0	0	.01
27	0	.01	.01	.01	.02	0	0	0	0	0	0	0
28	0	.01	.01	.01	.02	0	0	0	0	0	0	.02
29	0		.01	.01	.02	0	0	0	0	0	0	0
30	0		.01	.01	.02	0	0	0	0	0	0	0
31	0		.01		.01		0	0		0		0
Sum	0.30	0.17	0.16	0.31	0.61	0.41	0	0.13	0	0	0	0.04

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	∅ Extreme Second-Feet High Day	High	Low Day	Low	Average Second-Feet	Total Acre-Feet	Period 1937-1977 Acre-Feet Average	Maximum	Minimum
Jan.			3	0.05	† 1	0	0.01	0.6	115	906	0
Feb.			†20	.03	† 1	0	.01	.3	202	1,730	0
Mar.			†16	.02	† 3	0	.01	.3	290	2,360	0
Apr.			2	.02	† 1	.01	.01	.6	204	3,250	0
May			†10	.03	† 1	.01	.02	1.2	93.7	1,540	0
June			† 5	.05	†16	0	.01	.8	37.0	719	0
July				0		0	0	0	15.2	361	0
Aug.			17	.07	† 1	0	0	.3	11.0	321	0
Sept.				0		0	0	0	10.4	264	0
Oct.				0		0	0	0	18.0	543	0
Nov.				0		0	0	0	33.1	542	0
Dec.			28	.02	† 1	0	0	.1	91.5	808	0
				0.07		0	0.01	4.2	1,120.1	11,141	0
Yearly	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
				0		0	0	5.2	1,382	13,742	0

† And other days ∅ Mean daily

COTTONWOOD CREEK NEAR INTERNATIONAL BOUNDARY

DESCRIPTION: Water-stage recorder and cableway, 0.6 mile (1.0 km) upstream from the international land boundary between the United States and Mexico, 0.5 mile (0.8 km) downstream from the confluence of Cottonwood Creek and Tecate Creek, and 5.5 miles (8.9 km) south of Dulzura, California. Low water discharge measurements are made by wading at the gage. The zero of the gage is 542.42 feet (165.33 m) above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based on a continuous record of gage heights and current meter measurements or observation of no flow. Records obtained and furnished by the U. S. Geological Survey. Records available: October 1936 through 1977.

REMARKS: Flow is partially controlled by Barrett and Morena Reservoirs, 11 (17.7 km) and 19 miles (30.6 km) respectively, upstream from this station. The flow at this station represents the amount of water passing the Marron Dam site.

EXTREMES: Maximum discharge, 4,700 second-feet (133 m^3/sec), February 7, 1937 (gage height 8.50 feet) (2.59 m) from rating curve extended above 300 second-feet (8.50 m^3/sec) on basis of velocity, mean depth and area computations. Minimum discharge, no flow for part of most years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.69	0.10	0.23	0.50	0.16	0.21	0.07	0.07	0.10	0.12	0.11	0.17
2	0.80	.10	.21	.51	.17	.22	.08	.07	.08	.12	.12	.14
3	1.0	.10	.17	.52	.15	.23	.07	.06	.08	.12	.13	.11
4	1.2	.10	.18	.54	.17	.25	.06	.06	.09	.13	* .13	.10
5	1.5	.10	.17	.52	.18	.27	.07	.06	.11	.12	.13	.10
6	2.0	.10	.16	.48	.15	.28	.08	.05	.11	.22	.14	.11
7	2.5	.10	.16	.45	.15	.28	.07	.04	.11	.16	.14	.12
8	.80	.10	.15	.44	.15	.28	.07	.04	.10	.07	.11	.13
9	.25	.10	.15	.46	.22	.29	.08	.04	.10	.07	.12	.13
10	.20	.10	.15	.45	.13	.24	.07	.04	.09	.07	.13	.13
11	.18	.12	.15	.43	.11	.19	.07	.04	.09	.07	.12	.13
12	.16	.12	.15	.42	.12	.15	.07	.05	.09	.07	.12	.13
13	.15	.12	.15	.39	.13	.12	.07	.05	.09	.06	.13	.13
14	.15	.12	.15	.40	.11	.11	.08	.04	.09	.05	.13	.13
15	.15	.12	.15	.40	.11	.10	.10	.05	.09	.05	.12	.13
16	.15	.12	.15	.37	.11	.12	.09	.10	.09	.06	.12	.13
17	.15	.12	.40	.37	.11	.12	.07	.11	.08	.06	.13	.13
18	.15	.12	.35	.34	.11	.12	.07	.11	.08	.06	.14	.15
19	.15	.12	.28	.34	.09	.12	.07	.10	.09	.07	.15	.15
20	.15	.12	.25	.34	.09	.13	.06	.08	.10	.07	.14	.17
21	.13	.15	.25	.31	.09	.13	.06	.07	.10	.08	.13	.17
22	.13	.15	.25	.31	.09	.13	.05	.07	.10	.06	.12	.18
23	.13	.15	.25	.26	.09	.14	.05	.07	.12	.06	.12	.20
24	.13	.15	.25	.23	.11	.13	.07	.09	.12	.06	.16	.21
25	.13	.28	.60	.24	.11	.10	.08	.09	.13	.06	.17	.21
26	.13	.26	.55	.19	.10	.09	.06	.10	.15	.06	.14	.23
27	.13	.25	.50	.20	.11	.10	.03	.11	.13	.08	.13	.23
28	.13	.24	.50	.17	.11	.06	.03	.09	.11	.09	.16	* .22
29	.13		.46	.18	.13	.06	.04	.08	.11	.09	.18	.20
30	.13		.47	.17	.16	.06	.07	.09	.12	.10	.20	.18
31	.13		.48		.19		.07	.11		.12		.17
Sum	13.91	3.83	8.47	10.93	4.01	4.83	2.08	2.23	3.05	2.68	4.07	4.82

Current Year 1977 — **Period 1937-1977**

Month	Extreme Gage Feet		∅ Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.			7	2.5	†21	0.13	0.45	27.6	371	2,750	0
Feb.			25	.28	† 1	.10	.14	7.6	1,001	13,680	0
Mar.			25	.60	† 8	.15	.27	16.8	2,378	27,140	0
Apr.			4	.54	†28	.17	.36	21.7	1,894	51,060	0
May			9	.22	†19	.09	.13	8.0	479	14,110	0
June			9	.29	†28	.06	.16	9.6	100	2,630	0
July			15	.10	†27	.03	.07	4.1	17.1	312	0
Aug.			†17	.11	† 7	.04	.07	4.4	6.5	171	0
Sept.			26	.15	† 2	.08	.10	6.0	9.3	152	0
Oct.			6	.22	†14	.05	.09	5.3	21.3	705	0
Nov.			30	.20	† 1	.11	.14	8.1	52.5	839	0
Dec.			†26	.23	† 4	.10	.16	9.6	311	3,330	0
				2.5		0.03	0.18	129	6,641	97,900	0
Yearly	Meters		Cubic Meters per Second						Thousands of Cubic Meters		
				0.07		0	0.01	159	8,192	120,759	0

* Estimated ∅ Mean daily † And other days

INFLOWS TO RODRIGUEZ RESERVOIR, BAJA CALIFORNIA

DESCRIPTION: Rodriguez Dam is located in Mexico on Rio de las Palmas, the principal tributary to the Tijuana River, about 5.6 miles (9.0 km) upstream from its confluence with Cottonwood Creek, 10.6 miles (17.0 km) upstream from the point where the Tijuana River crosses the international boundary between the United States and Mexico, and 9.9 miles (16.0 km) southeast of Tijuana, Baja California.

RECORDS: Computed from monthly reservoir records of storage, releases, spills, leakage, evaporation, rainfall and including Emergency Deliveries of Colorado River Water to Tijuana beginning in August 1972. The Emergency Deliveries of Colorado River Water to Tijuana are made pursuant to Minute 240 of this Commission. Records obtained by the Ministry of Agriculture and Hydraulic Resources through May 1961; from June 1961 through March 1966 by the Junta de Agua Potable y Alcantarillado del Distrito Urbano of Tijuana, Baja California, and from April 1966 by the State of Baja California Commission of Public Services for Tijuana. Records furnished by the Mexican Section of the Commission. Records available: May 1937 through 1977. Storage began in Rodriguez Reservoir on September 22 1936.

REMARKS: Records of runoff represent all water reaching Rodriguez Reservoir including rainfall on the reservoir water surface. Area-capacity-elevation rating for reservoir used in the computations is dated 1927 when the reservoir area was initially surveyed. Elevation of crest of spillway 380.08 feet (115.85 m) above mean sea level; at top of spillway gates 410.10 feet (125.00 m) above mean sea level. Reservoir capacity at spillway crest 76,210 acre-feet (94,000,000 m^3); at top of spillway gates 111,070 acre-feet (137,000,000 m^3).

EXTREMES: Maximum monthly inflow, 77,790 acre-feet (95,953,000 m^3); April 1941; minimum, no flow during part of most years.

Monthly Discharge in Acre-Feet

Month	Current Year 1977			Period 1938-1977		
	Natural Inflow	* Otay Aqueduct	Total	Average	Maximum	Minimum
January	85.9	22.9	109	753	6,569	0
February	22.1	2.6	24.6	2,086	41,295	5.8
March	72.4	2.2	74.6	5,120	68,321	4.2
April	51.6	0	51.6	2,656	77,790	0
May	83.5	4.1	87.6	348	9,962	0
June	50.0	1.0	51.0	70.0	891	0
July	44.8	2.3	47.0	77.0	326	0
August	67.0	0	67.0	56.2	770	0
September	33.2	0	33.2	61.4	466	0
October	38.6	0	38.6	71.5	344	0
November	25.7	0	25.7	152	1,940	0
December	105	20.3	125	806	15,686	8.4
Yearly	679	55.3	735	12,256	177,668	254
	Thousands of Cubic Meters					
	838	68.2	906	15,118	219,151	313

* Inflow from the supply of water from Otay Aqueduct for the city of Tijuana

DIVERSIONS FROM RODRIGUEZ RESERVOIR, BAJA CALIFORNIA

DESCRIPTION: Sparling flow meter located immediately below the dam in the pipeline which carries water from Rodriguez Reservoir to Gate No. 1 (Poblado Presa) and to Gate No. 2 (City Aqueduct). Formerly, water for irrigation was also diverted to the North and South Canals.

RECORDS: Direct recording by Sparling flow meter. Records through May 1961 were obtained by the Ministry of Agriculture and Hydraulic Resources; from June 1961 to March 1966 by the Junta de Agua Potable y Alcantarillado del Distrito Urbano de Tijuana; and from April 1966 through 1977 by the State of Baja California Commission of Public Services for Tijuana. Records furnished by the Mexican Section of the Commission. Records available: May 1937 through 1977.

REMARKS: Beginning in January 1937, diversions for irrigation began from both sides for the Tijuana Valley and for domestic use at the village by Rodriguez Dam and the city of Tijuana. Since February 1960, no water has been released for irrigation of farmlands.

EXTREMES: Maximum monthly diversion, 1,963 acre-feet (2,421,000 m^3), July 1944; minimum, no flow March and April 1941, August 1960, and December 1962.

Monthly Discharge in Acre-Feet

Month	Current Year 1977	Period 1938-1977		
		Average	Maximum	Minimum
January	83.5	212	782	1.5
February	221	239	1,132	.8
March	199	287	1,223	0
April	186	400	1,602	0
May	126	544	1,676	1.8
June	139	632	1,857	1.9
July	112	670	1,963	1.9
August	173	583	1,859	0
September	183	473	1,420	1.9
October	172	407	1,187	1.9
November	138	312	1,037	1.9
December	101	273	981	0
Yearly	1,835	5,034	15,317	29.3
	Thousands of Cubic Meters			
	2,263	6,209	18,893	36.2

TIJUANA RIVER AT INTERNATIONAL BOUNDARY

DESCRIPTION: Water-stage recorder on right bank about 550 feet (168 m) downstream from the international boundary and about 0.8 mile (1.3 km) west of the international gate at San Ysidro, California. The zero of the gage is at mean sea level, U. S. C. & G. S. datum.
RECORDS: Based on current meter measurements and observations of no flow and a continuous record of gage heights. Records obtained and furnished by the United States Section of the Commission. Records available: May 1947 through 1977.
EXTREMES: Since May 1947: Maximum instantaneous discharge, 2,570 second-feet (72.8 m^3/sec), March 15, 1952; minimum discharge, no flow during part or all of each year since 1951.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	0.2	0.3	0	0	0	0	0	0	0	0	0
2	.3	.2	.1	.7	0	0	0	0	0	0	0	0
3	53.1	.2	.1	.1	0	0	0	0	0	0	0	0
4	3.9	.1	.1	0	0	0	0	0	0	0	0	0
5	41.6	.1	0	0	0	0	0	0	0	0	0	0
6	96.4	0	0	0	0	0	0	0	0	18.3	0	0
7	70.9	0	0	0	0	0	0	0	0	.6	0	0
8	20.5	0	0	0	65.8	0	0	0	0	0	0	0
9	2.6	0	0	0	70.4	0	0	0	0	0	0	0
10	.8	0	0	0	3.5	0	0	0	0	0	0	0
11	.5	0	0	0	.8	0	0	0	0	0	0	0
12	.4	0	0	0	.6	0	0	0	.2	0	0	0
13	.2	0	0	0	.4	0	0	0	1.3	0	0	0
14	.3	0	0	0	.3	0	0	0	.7	0	0	0
15	.3	0	0	0	.2	0	0	0	.1	0	0	0
16	.3	0	8.3	0	.2	0	0	41.9	0	0	0	0
17	.3	0	4.7	0	.1	0	0	88.5	0	0	0	0
18	.3	0	.1	0	.1	0	0	4.2	0	0	0	2.0
19	.2	0	0	0	0	0	0	.7	0	0	0	.2
20	.2	0	0	0	0	0	0	.5	0	0	0	.1
21	.2	0	0	0	0	0	0	.5	0	0	0	.5
22	.2	0	0	0	0	0	0	.4	0	0	0	.9
23	.3	0	0	0	0	0	0	.2	0	0	0	.5
24	.3	.5	0	0	0	0	0	0	0	0	0	0
25	.2	.3	47.4	0	0	0	0	0	0	0	0	8.3
26	.5	.1	.3	0	0	0	0	0	0	0	0	10.1
27	.4	0	.1	0	0	0	0	0	0	0	0	1.6
28	.8	0	0	0	0	0	0	0	0	0	0	26.9
29	3.1		0	0	0	0	0	0	0	0	0	30.5
30	.2		0	0	0	0	0	0	0	0	0	2.5
31	.2		0		0		0	0		0		.6
Sum	302.0	1.7	61.5	0.8	142.4	0	0	136.9	2.3	18.9	0	84.7

Month	Current Year 1977								Period 1947-1977		
	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
				High		Low					
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.	49.24	46.13	3	190	13	0.1	9.7	599	367	4,603	0
Feb.	46.58	46.04	24	1.9	23	0	.1	3.4	277	1,496	0
Mar.	49.19	46.04	25	181	† 6	0	2.0	122	756	13,309	0
Apr.	46.61	46.04	2	2.2	† 1	0	0	1.6	218	2,926	0
May	49.97	46.04	8	331	† 1	0	4.6	282	44.9	312	0
June	46.04	46.04		0		0	0	0	22.3	309	0
July	46.04	46.04		0		0	0	0	17.0	239	0
Aug.	49.27	46.04	16	420	† 1	0	4.4	272	23.8	272	0
Sept.	46.98	46.50	13	2.5	† 1	0	.1	4.6	24.9	216	0
Oct.	48.21	46.50	6	80.6	† 1	0	.6	37.5	36.6	305	0
Nov.	46.50	46.50		0		0	0	0	96.4	1,084	0
Dec.	48.71	46.50	28	188	† 1	0	2.7	168	258	2,725	0
	49.97	46.04		420		0	2.0	1,490	2,142	19,882	0
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	15.23	14.03		11.9		0	0.1	1,838	2,642	24,524	0

† And other days

TIJUANA RIVER NEAR NESTOR, CALIFORNIA

DESCRIPTION: Water-stage recorder on county road bridge 4.1 miles (6.6 km) downstream from the international land boundary between the United States and Mexico, 2.9 miles (4.7 km) upstream from mouth of the river, and 1.7 miles (2.7 km) south of Nestor, California. The zero of the gage is 15.14 feet (4.61 m) above mean sea level, U. S. C. & G. S. datum. From April 10, 1953 to August 5, 1958, station was located 2 miles (3.2 km) upstream at different datum.

RECORDS: Based on current meter measurements or observation of no flow. Records obtained and furnished by the U. S. Geological Survey. Records available: October 1914 through September 1915, and October 1922 through 1977 (October 1922 through May 1936 are from city of San Diego, California).

REMARKS: The flow at this station is partially controlled by Morena and Barrett Reservoirs on Cottonwood Creek in the United States and by Rodriguez Reservoir on Rio de las Palmas in Mexico. Some diversions for irrigation are normally made in Mexico whenever surface runoff occurs in the river or in its two principal tributaries.

EXTREMES: Since October 1, 1936: Maximum discharge, 17,700 second-feet (501 m^3/sec), February 7, 1937 (gage height 8.20 feet (2.50 m)), obtained from rating curve extended above 2,000 second-feet (56.6 m^3/sec) on basis of velocity-depth relationship, and cross section after peak of the flood. Minimum discharge, no flow during parts of most years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.74	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	3.6	0	0	0	0	0	0	0	0	0	0	0
4	.27	0	0	0	0	0	0	0	0	0	0	0
5	.53	0	0	0	0	0	0	0	0	0	0	0
6	1.1	0	0	0	0	0	0	0	0	0	0	0
7	19	0	0	0	0	0	0	0	0	0	0	0
8	17	0	0	0	0	0	0	0	0	0	0	0
9	1.9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0		0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
Sum	44.14	0	0	0	0	0	0	0	0	0	0	0

Month	Current Year 1977								Period 1937-1977		
	Extreme Gage Feet		ø Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum
Jan.			7	19	†10	0	1.42	87.6	632	4,070	0
Feb.				0		0	0	0	3,477	66,920	0
Mar.				0		0	0	0	6,050	107,000	0
Apr.				0		0	0	0	5,173	181,900	0
May				0		0	0	0	577	18,340	0
June				0		0	0	0	97.4	3,060	0
July				0		0	0	0	19.3	523	0
Aug.				0		0	0	0	13.7	242	0
Sept.				0		0	0	0	20.2	234	0
Oct.				0		0	0	0	69.1	1,340	0
Nov.				0		0	0	0	118	1,490	0
Dec.				0		0	0	0	634	7,930	0
Yearly				19		0	0.12	87.6	16,881	332,749	0
	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
				0.54		0	0	108	20,823	410,443	0

† And other days ø Mean daily

STORED WATER IN RESERVOIRS, TIJUANA RIVER BASIN

Data are presented below for all storage reservoirs in the Tijuana River Basin. The data represent contents on the last day of the month in acre-feet. The reservoir capacities indicated are total capacities at the top of the spillway gates in closed position on the controlled spillways of Barrett and Rodriguez Dam, and at spillway level for Morena Dam, which has had an uncontrolled spillway since the spillway gates were removed in 1942. The records of storage reported below for Morena, Barrett, and Rodriguez Reservoirs are based on the capacities as determined by the following surveys: Morena 1948; Barrett 1948, 1951, and 1955; and Rodriguez 1927, when the reservoir area was initially surveyed.

Records for Morena and Barrett Reservoirs are obtained and furnished by the city of San Diego, the U. S. Geological Survey, and the National Weather Service. Records for Rodriguez Reservoir obtained and furnished by the State of Baja California Commission of Public Services for Tijuana.

In Acre-Feet

Month	MORENA RESERVOIR, CALIFORNIA (Capacity 50,210)		BARRETT RESERVOIR, CALIFORNIA (Capacity 44,760)		RODRIGUEZ RESERVOIR, BAJA CALIFORNIA (Capacity 111,880)		TOTAL IN TIJUANA RIVER BASIN RESERVOIRS (Capacity 206,850)	
	1977	Average 1937-1977	1977	Average 1937-1977	1977	Average 1937-1977	1977	Average 1937-1977
Jan.	2,283	14,231	913	9,943	2,676	27,683	5,872	51,857
Feb.	2,283	14,825	926	11,216	2,404	28,361	5,613	54,402
Mar.	2,278	15,927	977	12,597	2,196	30,993	5,451	59,517
Apr.	2,240	15,928	973	13,016	1,972	30,973	5,185	59,917
May	2,237	15,784	982	12,367	1,847	31,962	5,066	60,113
June	2,145	15,347	947	11,656	1,667	30,177	4,759	57,180
July	2,048	14,930	903	10,928	1,505	29,169	4,456	55.027
Aug.	1,981	14,547	882	10,266	1,321	28,252	4,184	53,065
Sept.	1,898	14,081	852	10,022	1,099	27,480	3,849	51,583
Oct.	1,848	13,873	835	9,718	910	26,831	3,593	50,422
Nov.	1,810	13,774	825	9,414	743	26,390	3,378	49,578
Dec.	1,834	13,825	839	9,675	724	26,672	3,397	50,172
Average	2,074	14,756	904	10,902	1,589	28,678	4,567	54,336
Maximum	2,283	# 61,670	982	Q 45,920	2,676	109,608	5,872	213,600
Minimum	1,810	10	825	106	724	0	3,378	1,264

March 31, 1941 - Prior to removal of spillway gates
Q April 30, 1937 - Sandbags were placed on crest of spillway

RAINFALL ON THE TIJUANA RIVER WATERSHED
IN INCHES

Tabulated below are monthly records of rainfall with averages for their periods of record at stations located in California and Baja California. Daily records, where available, are on file in the offices of the United States and Mexican Sections of the Commission. For location, elevation, period of record, and the observer, see alphabetical listing of these stations on page 78.

In United States

	Morena Dam, California		Barrett Dam, California		Marron Valley, California		Potrero, California		Sawday Ranch, California	
Month	1977	Average 1906-1977	1977	Average 1907-1977	1977	Average 1951-1977	1977	Average 1914-1977	1977	Average 1950-1977
Jan.	3.47	3.63	3.42	3.22	3.10	2.40	3.34	3.25	2.40	2.78
Feb.	.60	3.66	.54	3.29	.30	1.91	.46	3.55	.57	2.28
Mar.	2.10	3.30	2.12	2.89	1.50	2.27	1.84	2.93	2.15	2.70
Apr.	.28	1.73	.30	1.57	.20	1.38	.20	1.79	.45	1.67
May	1.76	.62	1.91	.57	1.90	.42	1.60	.64	2.02	.45
June	.01	.14	.01	.07	0	.07	.09	.10	0	.06
July	0	.36	0	.11	0	.03	0	.19	.15	.42
Aug.	1.22	.52	2.28	.21	1.50	.15	2.03	.21	1.02	.71
Sept.	0	.39	0	.26	0	.25	0	.29	0	.44
Oct.	.90	.89	.48	.71	.30	.43	1.01	.74	.66	.53
Nov.	.39	1.55	.23	1.36	.30	1.46	.43	1.48	.16	1.68
Dec.	4.31	3.19	3.46	2.84	3.40	2.23	3.38	3.09	3.84	2.35
Yearly	15.04	19.98	14.75	17.10	12.50	13.00	14.38	18.26	13.42	16.07

	Campo, California		Chula Vista, California		Lower Otay Dam, California		Brown Field, California			
Month	1977	Average 1900-1977	1977	Average 1930-1977	1977	Average 1906-1977	1977	Average 1964-1977		
Jan.	3.10	2.89	2.48	1.70	3.25	1.91	2.50	1.29		
Feb.	.35	3.20	.08	1.67	.10	1.39	.12	1.21		
Mar.	.85	2.68	.84	1.46	1.15	1.78	.90	1.50		
Apr.	.19	1.44	.03	.83	.07	1.08	.08	1.04		
May	1.15	.52	1.42	.26	1.99	.33	1.18	.26		
June	0	.07	.03	.05	.01	.08	T	.08		
July	T	.52	T	.02	0	.04	0	.06		
Aug.	1.18	.50	2.00	.10	1.71	.12	2.33	.18		
Sept.	T	.35	0	.18	0	.23	0	.16		
Oct.	.88	.64	.74	.42	.55	.34	.72	.33		
Nov.	.25	1.35	.12	1.02	.08	1.29	.13	1.53		
Dec.	3.09	2.51	2.11	1.66	2.68	1.48	2.57	1.83		
Yearly	11.04	16.67	9.85	9.37	11.59	10.07	10.53	9.47		

In Mexico

	La Rumorosa, Baja California		Tecate, Baja California		Tijuana, Baja California		Rodriguez Dam, Baja California		Valle de Las Palmas, Baja California	
Month	1977	Average 1945-1977	1977	Average 1946-1959 1961-1977	1977	Average 1948-1959 1961-1977	1977	Average 1938-1977	1977	Average 1948-1977
Jan.	0.98	0.67	2.01	2.24	2.01	1.61	2.76	1.42	1.60	1.38
Feb.	.39	.43	.32	1.38	.08	1.38	.08	1.30	.32	1.06
Mar.	.20	.51	1.26	1.93	1.02	1.26	.70	1.38	.63	1.10
Apr.	0	.32	.16	1.06	*	.67	.08	.75	.04	.59
May	.32	.08	1.61	.35	*	.20	1.93	.16	.70	.12
June	.08	.04	0	.12	*	.04	T	.04	T	.04
July	0	.32	0	.12	*	.04	0	T	0	.04
Aug.	4.33	.67	2.05	.20	*	.04	1.97	.12	1.54	.12
Sept.	.12	.32	0	.12	*	.16	0	.24	0	.24
Oct.	.51	.43	.98	.35	*	.32	.35	.35	.98	.24
Nov.	.08	.47	.63	1.22	*	1.02	.39	.87	.20	.75
Dec.	2.32	.71	3.86	2.13	*	1.34	2.60	1.57	2.60	1.02
Yearly	9.33	4.96	13.78	11.89		8.46	10.94	8.15	8.78	6.81

T Trace * Missing record

RAINFALL ON THE TIJUANA RIVER WATERSHED IN INCHES

In Mexico

Month	El Pinal, Baja California		San Juan de Dios, Baja California							
	1977	Average 1964-1977	1977	Average 1956-1977						
Jan.	3.15	1.77	2.24	1.85						
Feb.	1.02	2.40	.71	1.97						
Mar.	2.13	2.48	1.19	1.73						
Apr.	.55	1.77	.24	1.14						
May	2.20	.51	.94	.28						
June	0	.04	0	.12						
July	.16	.71	.43	1.10						
Aug.	3.23	.75	5.04	.91						
Sept.	.43	.87	.39	.55						
Oct.	.91	.35	1.10	.63						
Nov.	.47	1.73	.59	1.26						
Dec.	5.59	3.19	5.12	2.01						
Yearly	19.84	16.38	17.99	14.61						

LOCATION OF RAINFALL STATIONS ON THE TIJUANA RIVER WATERSHED

In United States

NAME OF STATION	LATITUDE	LONGITUDE	δ ELEV. (FT.)	RECORD BEGAN	OBSERVER
Barrett Dam, California	32° 41'	116° 40'	1,750	1907	City of San Diego
Brown Field, California	32° 34'	116° 59'	515	1964	City of San Diego
Campo, California	32° 37'	116° 28'	2,630	1877	Archie C. Leach
Chula Vista, California	32° 36'	117° 06'	9	1930	Western Salt Company
Lower Otay Dam, California	32° 37'	116° 56'	540	1906	City of San Diego
Marron Valley, California	32° 34'	116° 46'	550	1951	County of San Diego
Morena Dam, California	32° 41'	116° 32'	3,010	1906	City of San Diego
Potrero, California	32° 37'	116° 36'	2,400	1914	County of San Diego
Sawday Ranch, California	32° 45'	116° 29'	3,200	1950	William Tulloch

In Mexico

NAME OF STATION	LATITUDE	LONGITUDE	ELEV. (FT.)	RECORD BEGAN	OBSERVER
El Pinal, Baja California	‡ 32° 11'	‡ 116° 17'	‡ 4,429	1964	* S. A. R. H.
La Rumorosa, Baja California	32° 31'	116° 04'	3,937	1945	S. A. R. H.
Rodriguez Dam, Baja California	32° 26'	116° 55'	459	1938	S. A. R. H.
San Juan de Dios, Baja California	31° 59'	116° 00'	‡ 3,280	1956	S. A. R. H.
Tecate, Baja California	32° 33'	116° 39'	1,690	1946	S. A. R. H.
Tijuana, Baja California	32° 31'	117° 02'	180	1948	S. A. R. H.
Valle de Las Palmas, Baja California	32° 23'	116° 40'	148	1948	S. A. R. H.

δ Elevation above mean sea level ‡ Estimated from topographic maps
* Ministry of Agriculture and Hydraulic Resources

EVAPORATION IN THE TIJUANA RIVER BASIN IN INCHES

Tabulated below are records of evaporation observed at four stations in California and at five stations in Baja California, with averages for their periods of record. The stations in California are observed by Western Salt Company, city of San Diego, California, and the United States Section of the Commission; those in Baja California are observed by the Ministry of Agriculture and Hydraulic Resources of Mexico. For specific location of these stations, refer to data opposite same station name shown in "Location of Rainfall Stations," page 78 in this bulletin.

Types of pans used:

1. Barrett Reservoir: January 1921 through September 1926, square 3-foot by 3-foot by 18-inch deep floating pan. October 1926 through 1977, square 3-foot by 3-foot by 18-inch deep land pan set 15 inches in ground.

2. Chula Vista: September 1918 through 1977, National Weather Service 4-foot diameter pan, 10 inches deep, set on 2 by 4-inch-timber grill.

3. Morena Reservoir: October 1915 through December 1921, square 3-foot by 3-foot by 18-inch deep floating pan. January 1922 through August 1926 records are the average of evaporation in a square 3-foot by 3-foot by 18-inch deep floating pan and a land pan of the same dimensions. September 1926 through 1977, square 3-foot by 3-foot by 18-inch deep land pan set 15 inches in ground.

4. Lower Otay Dam: January 1950 through 1977, square 3-foot by 3-foot by 18-inch deep land pan set 15 inches in ground.

In United States

Month	Morena Dam, California		Barrett Dam, California		Chula Vista, California		Lower Otay Dam, California	
	1977	Average 1916-1977	1977	Average 1921-1977	1977	Average 1919-1977	1977	Average 1950-1977
Jan.	1.03	2.21	1.49	1.86	2.80	2.85	2.44	1.99
Feb.	2.02	2.25	2.51	2.22	4.01	3.36	2.55	2.38
Mar.	2.46	3.40	3.25	3.51	5.81	5.01	3.73	3.48
Apr.	3.70	4.77	4.54	4.78	6.08	5.96	5.02	4.69
May	3.18	6.69	4.48	6.80	6.82	6.83	4.96	6.27
June	9.12	8.64	7.19	8.33	6.34	6.93	6.59	6.91
July	7.48	9.98	9.08	9.94	7.72	7.58	8.17	8.44
Aug.	6.02	9.26	3.79	9.32	6.57	7.33	6.44	8.03
Sept.	4.36	7.43	7.73	7.61	6.83	6.08	5.85	6.50
Oct.	2.54	5.23	4.18	5.36	4.59	4.91	3.52	4.75
Nov.	1.99	3.44	3.00	3.38	3.84	3.64	3.18	2.87
Dec.	.89	2.42	2.41	2.07	2.96	2.77	1.73	2.15
Yearly	44.79	65.81	53.65	65.18	64.37	63.25	54.18	58.46

In Mexico

Month	Tecate, Baja California		Tijuana, Baja California		Rodriguez Dam, Baja California		Valle de Las Palmas, Baja California		San Juan de Dios, Baja California	
	1977	Average 1961-1973	1977	Avg. 1952-50 1961-1976	1977	Avg. 1939-42 1946-1977	1977	Average 1952-1977	1977	Average 1956-1977
Jan.	*	3.27	3.35	3.07	3.22	4.72	3.35	3.66	ø	2.72
Feb.	*	3.31	#	3.50	4.09	3.78	4.57	3.58	3.74	2.76
Mar.	*	4.29	*	3.94	4.84	4.84	5.47	5.08	ø	4.13
Apr.	*	5.20	*	4.84	5.98	5.71	7.32	6.46	5.94	4.92
May	*	6.14	*	5.75	5.94	7.09	6.80	7.60	5.32	6.73
June	*	6.38	*	5.83	7.13	7.80	8.43e	9.25	9.72	7.83
July	*	8.62	*	6.69	8.15	8.78	11.57e	10.79	7.48	8.86
Aug.	*	8.27	*	6.97	6.60	8.11	8.27	10.04	7.76	8.07
Sept.	*	6.81	*	5.83	6.14	6.81	7.60	8.54	7.56	7.76
Oct.	*	6.38	*	4.76	4.33	5.75	5.08	6.26	5.32	5.28
Nov.	*	3.86	*	3.50	4.84	4.80	5.28	4.40	*	3.66
Dec.	*	3.54	*	3.03	2.48	3.70	3.43	3.86	3.98	3.10
Yearly		67.87		57.13	63.86	71.30	77.24	79.49		60.71

* Missing record # Incomplete record ø Frozen tank e Partly estimated

TEMPERATURE IN THE TIJUANA RIVER BASIN IN DEGREES FAHRENHEIT

The maximum, minimum, and monthly average temperature observations for United States stations are from daily readings of thermometers generally exposed in a shelter located a few feet above sod-covered ground. The maximum and minimum temperatures shown for the stations in Mexico are from daily maximum and minimum thermometer observations, with maximum and minimum for their periods of record. For specific location, elevation, period of record, and the observer, refer to data opposite same station name as shown in "Location of Rainfall Stations," page 78 in this bulletin.

In United States

Month	Barrett Dam, California				Campo, California				Chula Vista, California			
	1977			Average 1931-1977	1977			Average 1951-1977	1977			Average 1931-1977
	Mean	Max.	Min.		Mean	Max.	Min.		Mean	Max.	Min.	
Jan.	49.0	75	27	48.6	48.2	72	25	46.9	56.0	82	39	52.6
Feb.	52.7	87	28	50.4	50.1	85	21	48.0	57.4	81	40	53.9
Mar.	48.5	77	25	53.1	45.3	79	15	49.2	54.2	73	39	55.2
Apr.	58.5	88	35	57.5	54.9	87	27		58.4	71	45	57.8
May	57.5	85	39	62.6	54.4	95	28	58.2	59.4	68	49	60.5
June	70.1	96	46	68.2	65.8	98	29	64.8	63.6	70	55	63.0
July	77.1	105	48	76.0	72.7	102	35	73.2	67.0	82	56	
Aug.	76.8	101	54	76.1	74.2	100	42	73.2	69.5	81	63	
Sept.	70.8	102	44	72.1	67.2	102	35	68.7	67.7	81	55	
Oct.	65.9	95	40	63.9	62.9	94	32	60.6	65.0	79	52	62.9
Nov.	57.9	91	30	55.8	55.8	90	23	52.7	60.2	80	42	
Dec.	54.9	83	31	50.4	51.9				59.5	76	45	54.3
Yearly	61.6	105	25	61.2	58.6	102			61.5	82	39	

Month	Potrero, California			
	1977			Average 1975-1977
	Mean	Max.	Min.	
Jan.	50.1	77	28	52.9
Feb.	54.6	87	27	51.5
Mar.	48.2	78	24	49.4
Apr.	58.6	87	31	53.4
May	57.2	95	36	59.8
June	70.4	99	43	69.3
July	77.2	102	50	75.7
Aug.	75.8	99	50	74.4
Sept.	69.8	100	40	71.2
Oct.	66.7	98	39	64.4
Nov.	59.8	88	33	58.8
Dec.	54.8	80	40	53.0
Yearly	61.9	102	24	61.1

In Mexico

Month	La Rumorosa, Baja California				Tecate, Baja California				Tijuana, Baja California			
	1977		1946-1977		1977		1946-1977		1977		1948-1977	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	64	28	81	5	75	30	100	16	79	37	93	27
Feb.	75	32	82	10	90	28	100	18	86	43	102	32
Mar.	79	28	88	16	77	23	97	23	77	41	93	34
Apr.	79	30	91	23	88	32	100	28	*	*	97	34
May	90	34	97	28	90	39	100	36	*	*	97	43
June	95	52	113	34	91	43	104	32	*	*	100	41
July	97	57	104	39	108	50	115	36	*	*	120	46
Aug.	97	59	102	46	99	55	113	34	*	*	106	52
Sept.	86	48	104	34	104	45	115	36	*	*	120	46
Oct.	82	39	93	25	95	39	106	27	*	*	117	41
Nov.	84	37	88	14	95	32	97	27	*	*	108	34
Dec.	77	30	81	10	86	36	97	23	*	*	99	25
Yearly	97	28	113	5	108	23	115	16			120	25

* Missing record

TEMPERATURE IN THE TIJUANA RIVER BASIN
IN DEGREES FAHRENHEIT

In Mexico

	Rodríguez Dam, Baja California				Valle de las Palmas, Baja California				El Pinal, Baja California			
	1977		1938-1977		1977		1948-1977		1977		1964-1977	
Month	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	79	36	90	27	75	30	91	12	59	21	73	12
Feb.	93	37	93	32	91	34	99	23	81	23	81	21
Mar.	81	37	88	32	81	30	100	28	66	21	82	19
Apr.	88	41	93	36	97	37	104	32	73	28	82	18
May	82	46	99	37	93	41	108	36	68	28	90	27
June	86	52	108	46	99	48	118	39	86	41	99	28
July	99	54	104	48	108	50	120	45	91	36	102	32
Aug.	97	61	106	52	104	54	111	48	90	32	104	32
Sept.	97	52	109	48	104	46	117	43	84	30	102	25
Oct.	90	48	108	34	97	43	108	32	84	32	95	23
Nov.	93	41	99	30	93	34	100	19	81	23	84	23
Dec.	82	41	93	27	95	34	95	21	72	21	79	18
Yearly	99	36	109	27	108	30	120	12	91	21	104	12

	San Juan de Dios, Baja California											
	1977		1956-1977									
Month	Max.	Min.	Max.	Min.								
Jan.	68	21	88	7								
Feb.	77	23	84	16								
Mar.	70	16	84	14								
Apr.	77	25	102	19								
May	88	27	91	19								
June	93	30	106	28								
July	95	39	120	36								
Aug.	93	46	106	32								
Sept.	91	34	100	25								
Oct.	86	32	100	18								
Nov.	81	21	99	12								
Dec.	77	21	88	12								
Yearly	95	16	120	7								

DRAINAGE AREAS ABOVE GAGING STATIONS AND IRRIGATED AREAS ALONG TIJUANA RIVER AND TRIBUTARIES

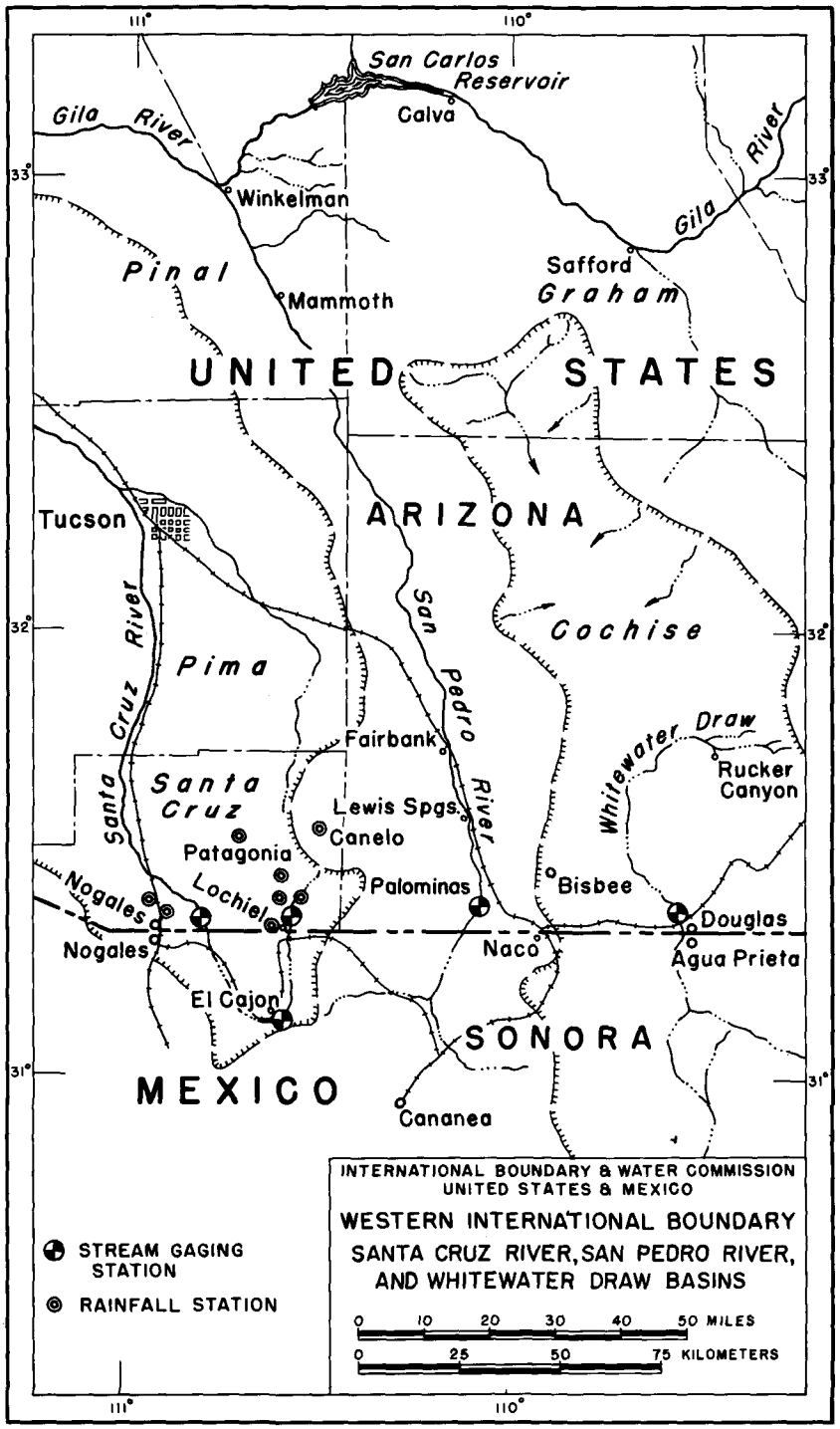
1977

The total area within Tijuana River basin is 1,731 square miles, as determined from the best available maps from both the United States and Mexico. The drainage areas shown below are tabulated according to their downstream sequence.

The irrigated areas, tabulated in downstream sequence, are from the most reliable sources available. Those in the United States were furnished by the United States Department of Agriculture and the State Engineer, State of California, or estimated from aerial photographs. Those in Mexico were furnished by the Ministry of Agriculture and Hydraulic Resources of Mexico through the Mexican Section of the Commission. All irrigation in the Tijuana basin 1977 was by pumping from ground water.

Designation of Areas	Drainage Basin-Square Miles			Irrigated Areas-Acres		
	United States	Mexico	Total	United States	Mexico	Total
Cottonwood Creek above Morena Dam	114	0	114	(a) 75	0	(a) 75
Morena Dam to Barrett Dam	133	0	133	0	0	0
above Barrett Dam	247	0	247	(a) 75	0	(a) 75
below Barrett Dam and above Tecate Creek	65	0	65	(a) 145	0	(a) 145
above Tecate Creek	312	0	312	(a) 220	0	(a) 220
Campo Creek above International Boundary	82	4	86	(a) 320	0	(a) 320
Tecate Creek above International Boundary (not including Campo Creek)	19	64	83	0	0	0
Cottonwood Creek above International Boundary Station	413	68	481	(a) 540	0	(a) 540
Rio de las Palmas above Rodriguez Dam	7	981	988	0	(b) 0	0
Tijuana River above Nestor Gaging Station	458	1,266	1,724			
above the Mouth	462	1,269	1,731	3,000	(c) 0	3,000

(a) Estimated. During extremely dry years these areas may be materially reduced.
(b) Areas in upper valleys may be irrigated by pumping from ground water.
(c) There was no irrigation in 1977 in the Tijuana Irrigation District, Tijuana Valley, Baja California, Mexico, from the Rodriguez Reservoir.


111°
110°
San Carlos Reservoir
Gila River
Calva
Winkelman
Gila River
33°
Pinal
Mammoth
Safford
Graham
UNITED STATES
Tucson
ARIZONA
Santa Cruz River
32°
Pima
San Pedro River
Cochise
Fairbank
Whitewater Draw
Rucker Canyon
Santa Cruz
Lewis Spgs.
Canelo
Patagonia
Nogales
Lochiel
Palominas
Bisbee
Douglas
Nogales
Naco
Agua Prieta
El Cajon
SONORA
31°
MEXICO
Cananea
INTERNATIONAL BOUNDARY & WATER COMMISSION
UNITED STATES & MEXICO
WESTERN INTERNATIONAL BOUNDARY
SANTA CRUZ RIVER, SAN PEDRO RIVER,
AND WHITEWATER DRAW BASINS
STREAM GAGING STATION
RAINFALL STATION
0 10 20 30 40 50 MILES
0 25 50 75 KILOMETERS

WHITEWATER DRAW NEAR DOUGLAS, ARIZONA

DESCRIPTION: Water-stage recorder located on U. S. Highway 80 bridge between Douglas and Bisbee, Arizona, about 450 feet (137 m) upstream from the Southern Pacific Railroad bridge, 1.5 miles (2.4 km) upstream from the international boundary, and 2 miles (3.2 km) west of Douglas, Arizona. Zero of gage is 3,909.14 feet (1,191.51 m) above mean sea level, U. S. C. & G. S. datum of 1929. Location April 26, 1972 to April 10, 1974 was 200 feet (61.0 m) upstream from bridge. Datum 4.40 feet (1.34 m) higher.

RECORDS: Based on current meter measurements or observations of no flow during the year. Computations by shifting control methods. Records obtained and furnished by the U. S. Geological Survey. Records poor. Records available: August to October 1911 (gage heights and discharge measurements only), July to October 1912, January to June 1913, October 1913, December 1913 to June 1914, February to June 1915, October 1915 to September 1919, October 1919 to April 1922 (gage heights and discharge measurements only), June 1930 to December 1933, May 1935 to July 1947, October 1947 through 1977 (July 1954 to March 1955 monthly discharge only).

REMARKS: Diversions above this station are mainly by pumping from ground water for irrigation. Records show flow at the international boundary into Mexico except for some smelter waste water entering the stream a short distance below this station.

EXTREMES: Prior to 1936: Maximum recorded discharge, 3,450 second-feet (97.7 m^3/s) August 10, 1931 (gage height 12.15 feet (3.70 m); maximum estimated discharge, 4,050 second-feet (115 m^3/s) July 27, 1919; minimum discharge, no flow for several days of many years. Since 1936: Maximum discharge, 5,060 second-feet (143 m^3/s) August 7, 1955; maximum gage height 16.55 feet (5.04 m) July 29, 1966; minimum daily discharge, no flow at times during most years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	0	0	0	0	0.03	3.0	0	0.21	0.12
2	0	0	0	0	0	0	0	.03	5.6	0	.20	.14
3	0	0	0	0	0	0	0	.02	3.7	0	.20	.15
4	0	0	0	0	0	0	140	.02	.20	0	.18	.15
5	0	0	0	0	0	0	46	.02	1.7	0	.18	.15
6	0	0	0	0	0	0	4.4	.01	275	17	.28	.14
7	0	0	0	0	0	0	0	4.4	13	40	.53	.17
8	0	0	0	0	0	0	0	52	6.8	448	.42	.15
9	0	0	0	0	0	0	0	30	6.6	1,160	.18	.16
10	0	0	0	0	0	0	55	2.7	6.4	868	.17	.14
11	0	0	0	0	0	0	169	29	5.8	150	.16	.19
12	0	0	0	0	0	0	13	145	19	89	.17	.20
13	0	0	0	0	0	0	3.1	11	9.5	64	.17	.14
14	0	0	0	0	0	0	6.0	2.0	5.2	54	.18	.12
15	0	0	0	0	0	0	13	9.9	2.4	46	.17	.14
16	0	0	0	0	0	0	3.5	375	.46	40	.18	.14
17	0	0	0	0	0	0	.19	89	.32	35	.19	.11
18	0	0	0	0	0	0	.22	6.5	.28	31	.18	.11
19	0	0	0	0	0	0	1.7	251	.26	23	.17	.10
20	0	0	0	0	0	0	1.2	31	.22	8.8	.17	.08
21	0	0	0	0	0	0	0	62	.09	.43	.13	.07
22	0	0	0	0	0	0	30	26	0	.29	.13	.08
23	0	0	0	0	0	0	135	17	0	.26	.14	.09
24	0	0	0	0	0	0	36	11	0	.24	.14	.14
25	0	0	0	0	0	0	16	9.3	0	.22	.13	.18
26	0	0	0	0	0	0	4.8	8.4	9.9	.22	.13	.17
27	0	0	0	0	0	0	2.4	7.8	23	.24	.13	.23
28	0	0	0	0	0	0	1.2	7.2	8.4	.22	.12	.44
29	0		0	0	0	0	.15	7.3	1.4	.27	.10	.54
30	0		0	0	0	0	.05	5.8	0	.30	.11	.26
31	0		0		0		.04	4.9		.20		.13
Sum	0		0		0		1,205.33		3,076.69			5.13
	0.		0		0		681.95		408.23		5.55	

Month	Extreme Gage Feet		Extreme Second-Feet				Average Second-Feet	Total Acre-Feet	Acre-Feet		
			High		Low						
	High	Low	Day		Day				Average	Maximum	Minimum
Jan.				0		0	0	0	38.4	451	0
Feb.				0		0	0	0	20.4	132	0
Mar.				0		0	0	0	29.7	295	0
Apr.				0		0	0	0	20.4	173	0
May				0		0	0	0	14.8	138	0
June				0		0	0	0	129	1,590	0
July	7.91		10	605	† 1	0	22.0	1,353	# 2,133	8,110	39
Aug.	7.95		19	625	6	0	38.9	2,391	# 3,212	14,480	0
Sept.	7.59		6	514	22	0	13.6	810	# 758	3,170	0
Oct.	12.28		9	3,020		0	99.2	6,103	313	6,103	0
Nov.	2.75	2.49	7	.58	29	.10	.18	11.0	38.3	352	0
Dec.	2.84	2.47	29	.60	21	.07	.17	10.2	123	2,363	0
	12.28			3,020		0	14.5	10,678	6,830	22,321	900
Yearly	Meters		Cubic Meters per Second					Thousands of Cubic Meters			
	3.74			85.5		0	0.41	13,171	8,425	27,533	1,110

† And other days

1947 records not available

SEWAGE INFLUENT, DOUGLAS, ARIZONA
INTERNATIONAL TREATMENT PLANT

DESCRIPTION: Parshall flume in influent line to the international treatment plant, equipped with Simplex digital meter for measuring combined sewage flows from Douglas, Arizona and Agua Prieta, Sonora; and Parshall flume with recorder for measuring the sewage from Douglas. Flows from Agua Prieta are deduced from total flows and the city of Douglas flows; however, since April 8, 1968, all sewage flows from Agua Prieta have been diverted to new oxidation ponds located in Mexico, 1.6 miles (2.6 km) south of the international boundary.

RECORDS: Continuous monthly records since March 1948; daily records from March 18, 1948 through 1950 and from January 1952 through 1977.

REMARKS: The Douglas-Agua Prieta International Treatment Plant was constructed by the governments of the United States and Mexico in 1947 to correct a serious international sanitation problem. The plant is located in the United States adjacent to the international boundary about one mile (1.6 km) west of the Douglas-Agua Prieta Port of Entry. Prior to December 1970, the treatment of sewage was complemented by the use of old oxidation ponds in Mexico adjacent to the international boundary. Since December 1970, sewage effluent from the plant flows into Mexico and then across to the right bank of the Agua Prieta Arroyo, by means of a canal bridge, to be used for irrigation.

Month	Total Monthly Flows Millions of Gallons			Mean Daily Flows-Millions of Gallons Per Day					
				Current Year 1977			Period 1952-1977		
	U.S.	Mexico	Total	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Jan.	31.419	0	31.419	1.550	0.798	1.014	1.618	0.619	1.059
Feb.	31.965	0	31.965	1.355	.950	1.142	1.784	.584	1.060
Mar.	32.015	0	32.015	1.150	.810	1.033	1.598	.590	1.067
Apr.	31.250	0	31.250	1.300	.935	1.042	1.536	.619	1.065
May	34.570	0	34.570	1.200	1.000	1.115	1.595	.619	1.072
June	32.920	0	32.920	1.190	1.020	1.097	1.784	.626	1.123
July	33.950	0	33.950	1.140	1.000	1.095	3.209	.619	1.175
Aug.	34.115	0	34.115	1.230	1.005	1.100	1.985	.619	1.104
Sept.	34.125	0	34.125	1.330	1.020	1.138	1.884	.626	1.165
Oct.	32.960	0	32.960	1.230	.940	1.063	1.667	.626	1.109
Nov.	29.080	0	29.080	1.130	.830	.969	1.536	.619	1.079
Dec.	31.460	0	31.460	1.160	.960	1.015	1.760	.619	1.073
Yearly	390.729	0	390.729	1.550	0.798	1.071	3.209	0.534	1.105

SEWAGE INFLUENT, AGUA PRIETA, SONORA
INTERNATIONAL OXIDATION PONDS

DESCRIPTION: Parshall flume equipped with staff gage in influent line to oxidation ponds. Since April 8, 1968, all sewage from Agua Prieta, Sonora has been diverted to oxidation ponds, which are located in Mexico; if necessary, sewage from Douglas, Arizona may be included, but this has never been done.

RECORDS: Discharges are computed from daily 11:00 a.m. readings of the staff gage by applying an index for that hour, determined from 7 days of hourly measurements from which the relationship between mean daily readings and 11:00 a.m. readings was developed. Records available: Mean daily flows from April 8, 1968 through 1977.

REMARKS: The construction of the international oxidation ponds in Agua Prieta, Sonora was completed in April 1968 by the government of Mexico, fulfilling an international agreement to solve the problem of insufficient capacity at the international treatment plant in Douglas, where the combined flows from Douglas and Agua Prieta were treated. If necessary, sewage from Agua Prieta may be treated in this plant, but since the completion of the oxidation ponds, this has never been done. The ponds are located 1.6 miles (2.6 km) south of international monument 85a.

Month	Total Monthly Flows Millions of Gallons			Mean Daily Flows-Millions of Gallons Per Day					
				Current Year 1977			Period 1968-1977		
	U.S.	Mexico	Total	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Jan.	0	15.232	15.232	0.507	0.436	0.471	0.640	0.394	0.487
Feb.	0	14.530	14.530	.507	.436	.471	.726	.394	.503
Mar.	0	16.491	16.491	.507	.394	.450	.666	.394	.479
Apr.	0	16.292	16.292	.568	.394	.481	.666	.394	.484
May	0	16.516	16.516	.630	.436	.533	.666	.394	.510
June	0	17.135	17.135	.630	.436	.533	.630	.394	.502
July	0	17.266	17.266	.568	.436	.502	.691	.259	.500
Aug.	0	17.212	17.212	.568	.436	.502	.967	0	.445
Sept.	0	16.583	16.583	.568	.436	.502	.630	0	.463
Oct.	0	17.705	17.705	.568	.507	.538	.630	0	.472
Nov.	0	16.523	16.523	.630	.507	.568	.717	.394	.509
Dec.	0	17.215	17.215	.563	.507	.538	.709	.394	.483
Yearly	0	198.700	198.700	0.630	0.394	0.507	0.967	0	0.487

SAN PEDRO RIVER AT PALOMINAS, ARIZONA

DESCRIPTION: Water-stage recorder located near left bank on the downstream side of bridge pier on Highway 92, 0.7 mile (1.1 km) east of Palominas, 2.5 miles (4.0 km) upstream from Green Brush Draw, 4.5 miles (7.2 km) downstream from international boundary, and 12 miles (19 km) southwest of Bisbee, Arizona. Zero of gage is 4,187.62 feet (1,276.39 m) above mean sea level (State Highway bench mark).

RECORDS: Based on current meter measurements or observations of no flow during the year. Records available: May 1930 to October 1933, May 1935 to July 1941, and July 1950 through 1977. Records obtained and furnished by U. S. Geological Survey.

REMARKS: There are some small diversions for irrigation of a few hundred acres above this station, mostly in Mexico. Record shows approximate flow of river at international boundary.

EXTREMES: Maximum daily discharge, 22,000 second-feet (623 m^3/sec) on August 14, 1940 (gage height 16.16 feet (4.93 m) present datum), from rating curve extended above 5,600 second-feet (159 m^3/sec) on basis of slope-area measurement of peak flow; no flow at times in most summers. Greatest flood known occurred on September 28, 1926 (gage height, about 23.9 feet (7.28 m) present datum, from flood marks; discharge not determined).

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	4.8	1.4	0.24	0	2.8	1.7	600	16	20	22	11
2	4.0	4.5	.75	.28	0	3.1	1.8	50	26	15	21	12
3	3.9	4.5	.50	.54	0	3.1	7.5	27	69	10	13	11
4	3.7	4.5	.45	.53	0	3.2	44	17	65	5.0	17	10
5	3.7	4.4	.46	.49	0	3.0	2.7	8.5	134	2.0	15	11
6	3.8	4.4	.46	.48	.50	3.2	4.3	8.6	80	12	14	10
7	4.0	4.3	.48	.54	.50	30	4.2	7.8	25	8.4	16	9.5
8	4.3	4.2	.46	.64	.50	26	3.9	7.8	10	9,190	16	9.5
9	4.4	3.9	.41	.39	1.0	2.7	3.3	118	10	10,300	14	9.5
10	4.1	3.5	.33	.30	1.0	1.5	3.1	596	5.0	2,050	11	9.5
11	4.0	3.3	.28	.35	1.0	1.3	1.8	57	5.0	634	11	9.5
12	3.9	3.2	.29	.25	1.0	1.3	5.1	125	188	401	11	9.5
13	3.8	3.3	.47	.22	2.0	1.3	64	25	59	288	11	9.5
14	4.0	3.4	.51	.23	2.0	1.5	169	10	30	140	12	9.5
15	3.9	3.0	.29	.23	2.0	1.7	75	8.0	20	75	16	9.6
16	3.7	3.1	.19	.25	2.5	1.8	20	777	15	60	16	9.6
17	3.6	2.8	.21	.24	2.8	1.6	15	109	10	190	15	9.7
18	3.5	2.2	.25	.21	3.1	1.0	20	96	9.0	65	14	9.7
19	3.5	2.3	.29	.19	3.5	1.6	20	66	8.0	45	14	9.5
20	3.5	2.1	.23	.10	3.5	1.1	10	35	7.0	40	14	9.5
21	4.5	2.6	.22	.09	3.1	.82	5.0	466	7.0	35	14	9.5
22	5.0	.99	.29	0	2.3	.69	13	35	6.0	32	14	10
23	5.0	.74	.33	0	3.4	1.1	84	15	6.0	30	14	11
24	4.2	1.1	.27	0	2.4	1.1	59	25	6.0	28	14	11
25	4.0	1.4	.20	0	2.2	1.2	155	34	5.0	27	14	11
26	4.1	1.1	.27	0	2.0	.80	93	17	5.0	26	13	12
27	4.2	1.8	.36	0	2.4	.59	20	11	228	25	14	13
28	4.3	2.0	.42	0	2.7	1.1	10	10	96	25	14	14
29	4.4		.41	0	2.8	1.2	5.0	9.7	40	25	12	17
30	5.1		.24	0	2.9	.77	59	13	25	25	14	18
31	4.8		.29		2.9		987	18		30		16
Sum	127.0	83.43	12.01	6.79	56.00	102.17	1,966.4	3,402.4	1,265.0	23,858.4	435	341.1

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1951-1977 Acre-Feet Average	Maximum	Minimum
Jan.	3.94	3.85	22	5.8	4	3.1	4.10	252	574	7,313	2.6
Feb.	3.91	3.64	1	5.2	24	.55	2.98	165	415	2,767	3.0
Mar.	3.87	3.62	1	2.0	16	.12	.39	23.8	336	2,512	13.3
Apr.	3.86		7	.85	†19	0	.23	13.5	88.0	373	0
May	3.90		19	5.0	† 1	0	1.81	111	32.3	183	0
June	5.27	3.43	7	278	27	.42	3.41	203	173	1,391	0
July	9.04	3.54	31	3,310	5	.90	63.4	3,900	6,465	17,238	184
Aug.	8.94	3.40	21	3,190	8	7.5	110	6,749	9,510	36,369	165
Sept.	7.37	3.76	5	1,530	25	5.0	42.2	2,509	1,841	16,344	11.3
Oct.	16.04		9	14,500	5	2.0	770	47,322	1,993	47,322	0
Nov.	3.64	3.48	1	24	10	11	14.5	863	170	863	0
Dec.	3.58	3.37	29	20	16	9.4	11.0	677	745	10,959	6.2
Yearly	16.04			14,500		0	85.3	62,788	22,342	62,788	4,400
	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
	4.89			411		0	2.42	77,448	27,559	77,448	5,427

† And other days

SANTA CRUZ RIVER NEAR LOCHIEL, ARIZONA

DESCRIPTION: Water-stage recorder located in the United States near left bank on the downstream side of concrete bridge pier of county highway bridge, 2.5 miles (4.0 km) northeast of Lochiel, Arizona, and 1.7 miles (2.7 km) upstream from the international land boundary. The elevation of the zero of the gage has not been determined but topographic maps indicate the elevation of the stream bed at the gage is about 4,620 feet (1,408 m).

RECORDS: Based on current meter measurements or observations of no flow during the year. Records obtained and furnished by the U. S. Geological Survey. Records available: January 1949 through 1977.

REMARKS: There are small diversions by ground water pumping for irrigating about 200 acres (80.9 ha) above this station.

EXTREMES: Maximum discharge, 12,300 second-feet (348 m^3/sec) on October 9, 1977 (gage height 10.21 feet) (3.11 m); minimum discharge, no flow for several days of each year.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.66	0.52	0.45	0.26	0.21	0.06	0.05	0.67	0.33	0.10	7.1	2.5
2	.60	.54	.43	.26	.25	.06	.05	.21	.18	.14	7.0	2.5
3	.60	.53	.43	.29	.28	.05	.11	.18	.15	.17	6.5	2.5
4	.60	.55	.43	.28	.30	.05	.09	.15	.14	.20	6.0	2.5
5	.60	.56	.40	.28	.28	.06	.08	.14	107	.22	5.5	2.5
6	.60	.56	.40	.28	.27	.06	.06	.14	5.0	.25	5.6	2.5
7	.60	.56	.40	.28	.23	.05	.04	.12	.46	1.1	6.5	2.5
8	.62	.56	.38	.28	.22	.05	.04	.52	.33	349	5.5	2.5
9	.59	.56	.40	.28	.25	.04	.05	31	.33	1,710	5.1	2.5
10	.58	.55	.40	.29	.25	.04	.07	2.8	.34	78	5.0	2.5
11	.60	.48	.36	.29	.23	.05	5.9	1.4	8.5	33	5.0	2.5
12	.58	.48	.36	.27	.20	.06	.32	.20	3.1	19	5.0	2.9
13	.52	.49	36	.27	.18	.06	.17	.31	.35	14	4.8	2.8
14	.51	.50	.33	.27	.18	.05	.76	49	.31	12	4.8	2.8
15	.48	.48	.33	.26	.16	.06	1.6	71	.29	11	4.5	2.6
16	.48	.45	.33	.26	.16	.06	1.2	35	.24	11	3.9	2.6
17	.51	.44	.30	.28	.14	.06	1.1	3.1	.22	21	3.8	2.6
18	.51	.45	.30	.30	.14	.06	.88	2.9	.23	17	3.8	2.5
19	.49	.46	.30	.30	.12	.06	.66	2.0	.23	11	3.9	2.4
20	.50	.48	.23	.27	.12	.06	.70	1.5	.23	9.2	4.1	2.2
21	.57	.47	.23	.26	.10	.05	.55	3.3	.22	9.1	3.9	1.8
22	.54	.45	.19	.25	.10	.06	.94	2.2	.22	8.7	3.9	2.0
23	.55	.43	.18	.27	.03	.08	3.6	8.1	.21	8.5	3.8	2.0
24	.52	.44	.20	.29	.03	.07	.76	1.1	.22	8.2	3.8	2.2
25	.52	.45	.22	.31	.09	.06	.44	.80	.21	8.2	3.6	2.1
26	.50	.45	.23	.31	.08	.05	1.1	.58	.22	8.2	3.6	2.4
27	.48	.43	.23	.27	.03	.06	.41	.46	.22	7.7	3.6	2.6
28	.48	.43	.23	.24	.08	.06	.30	.45	.20	7.4	2.9	3.0
29	.53		.23	.20	.07	.07	.27	.38	.14	8.1	2.6	2.2
30	.59		.23	.19	.08	.06	.21	.34	.09	7.4	2.3	1.9
31	.52		.26		.07		.19	.30		6.8		2.0
Sum	17.03	13.75	9.75	8.14	5.08	1.73	22.70	220.35	129.91	2,385.68	137.4	75.1

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1949-1977 Acre-Feet Average	Maximum	Minimum
Jan.	1.61	1.57	1	0.66	14	0.48	0.55	33.8	43.8	226	1.3
Feb.	1.56	1.53	1	.57	16	.43	.49	27.3	37.3	261	1.8
Mar.	1.55	1.49	1	.46	23	.16	.31	19.3	33.2	250	.7
Apr.	1.55	1.48	26	.33	29	.19	.27	16.1	19.5	148	0
May	1.54	1.45	3	.30	31	.06	.16	10.1	8.9	49.5	0
June	1.48	1.43	22	.09	3	.04	.06	3.4	8.7	169	0
July	3.14	1.42	11	105	7	.03	.73	45.0	577	4,270	1.6
Aug.	5.42	1.71	14	868	11	.10	7.11	437	954	10,120	.08
Sept.	5.96	2.04	5	1,130	30	.09	4.33	258	300	2,634	0
Oct.	10.21	2.04	9	12,300	1	.09	77.0	4,732	241	4,732	0
Nov.	2.09	1.80	7	7.9	29	1.0	4.58	273	48.8	273	0
Dec.	1.90	1.85	28	3.0	20	1.7	2.42	149	67.7	693	0
Yearly	10.21	1.42		12,300		0.03	8.17	6,004	2,340	12,633	126
	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
	3.11	0.43		348		0	0.23	7,406	2,886	15,583	155

SANTA CRUZ RIVER NEAR NOGALES, ARIZONA

DESCRIPTION: Water-stage recorder, cable with sit-down cable car located 5.5 miles (8.9 km) east of Nogales, Arizona, 0.8 mile (1.3 km) downstream from the international boundary and 6 miles (9.7 km) upstream from the Santa Cruz bridge on State Highway No. 82. Zero of gage is 3,702.54 feet (1,128.53 m) above sea level, U. S. C. & G. S. datum (levels by International Boundary and Water Commission).

RECORDS: Based on current meter measurements or observation of no flow during the year. Records obtained and furnished by the U. S. Geological Survey. 1977 records fair. Records available: March to November 1907 and April 1909 to December 1912 (discharge measurements and fragmentary gage height record); January 1913 to June 1922 (October 1915 to September 1916, monthly discharges only); May 1930 to December 1933; and July 1935 through 1977.

REMARKS: Diversions in both countries affect the flow at this station. The major diversions occur in Mexico for domestic and irrigation uses. There are no storage dams above the station as of December 1977.

EXTREMES: Maximum discharge, 33,500 second-feet (949 m^3/sec) on October 9, 1977 (gage height 15.5 feet) (4.72 m); minimum discharge, no flow for several days of many years.

Mean Daily Discharge in Second-Feet 1977 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	2.2	1.1	0.60	0	0	0	0	0	0	44	25
2	1.7	2.2	.80	.60	0	0	0	0	0	.10	40	24
3	1.7	2.0	.70	.60	0	0	0	0	0	.10	39	24
4	1.7	1.7	.60	.60	0	0	0	0	455	.10	38	24
5	2.0	1.6	.50	.60	0	0	0	0	85	.10	37	23
6	2.0	1.6	.40	.60	0	0	0	0	100	8.1	37	22
7	2.1	1.6	.40	.60	0	0	0	0	10	214	39	22
8	2.3	1.6	.50	.50	0	0	0	0	1.0	10,900	39	20
9	2.5	1.6	.50	.50	0	0	0	.30	0	14,200	38	20
10	2.5	1.7	.50	.50	0	0	0	9.0	0	1,930	37	20
11	2.6	1.4	.40	.50	0	0	0	0	275	504	36	19
12	2.6	1.4	.40	.40	0	0	0	0	245	298	36	19
13	2.6	1.4	.50	.40	0	0	0	2.4	10	200	36	18
14	2.6	1.6	.50	.40	0	0	0	143	1.0	165	36	18
15	2.8	1.3	.60	.40	0	0	0	1.0	0	141	33	18
16	2.8	1.3	.60	.40	0	0	0	135	0	124	30	17
17	2.6	1.3	.60	.40	0	0	0	.20	0	127	30	17
18	2.5	1.3	.70	.40	0	0	58	255	0	121	29	16
19	2.5	1.3	.70	.40	0	0	0	8.0	0	101	28	16
20	2.5	1.3	.70	.40	0	0	0	0	0	88	28	16
21	2.6	1.2	.50	.40	0	0	0	0	0	79	28	14
22	2.5	1.1	.50	.40	0	0	0	0	0	76	28	15
23	5.9	1.1	.40	.20	0	0	0	0	0	68	27	15
24	3.3	1.1	.50	0	0	0	0	0	0	64	26	15
25	2.8	1.1	.50	0	0	0	3.2	0	0	55	27	16
26	2.6	.90	.70	0	0	0	0	0	0	52	25	17
27	2.5	.90	.90	0	0	0	0	0	0	52	26	18
28	2.3	1.0	.70	0	0	0	0	0	0	49	27	21
29	2.3		.60	0	0	0	0	0	0	49	27	17
30	3.3		.60	0	0	0	7.1	0	0	49	25	17
31	3.0		.60		0		23	0		44		18
Sum	79.1	39.8	18.2	10.8	0	0	91.3	553.9	1,182.0	29,758.5	976	581

Month	Current Year 1977 Extreme Gage Feet High	Extreme Gage Feet Low	Extreme Second-Feet High Day	Extreme Second-Feet High	Extreme Second-Feet Low Day	Extreme Second-Feet Low	Average Second-Feet	Total Acre-Feet	Period 1936-1977 Acre-Feet Average	Maximum	Minimum
Jan.	4.28	3.87	23	17	1	1.0	2.55	157	1,071	16,710	0
Feb.	3.97	3.83	1	2.5	26	.70	1.42	78.9	898	11,129	0
Mar.	3.87	3.80	1	1.1	23	.40	.59	36.1	853	12,454	0
Apr.	3.83		1	.60	23	0	.36	21.4	225	1,308	0
May				0		0	0	0	64.1	338	0
June				0		0	0	0	60.2	1,020	0
July	6.00		18	2,010	† 1	0	2.95	181	2,891	15,610	45
Aug.	8.70		18	6,700	† 1	0	17.9	1,099	5,900	45,790	91
Sept.	7.00		4	3,520	† 1	0	39.4	2,344	1,392	7,507	0
Oct.	15.5		9	33,500	1	0	960	59,025	1,755	59,025	0
Nov.	3.74	3.58	1	44	26	25	32.5	1,936	311	1,936	0
Dec.	3.60	3.47	1	26	22	12	18.7	1,152	1,666	28,559	0
	15.5			33,500		0	89.7	66,030	17,086	66,030	3,499
Yearly	Meters			Cubic Meters per Second				Thousands of Cubic Meters			
	4.72			949		0	2.54	81,447	21,075	81,447	4,316

† And other days

SEWAGE INFLUENT, NOGALES INTERNATIONAL TREATMENT PLANT

DESCRIPTION: Three 24-inch (61.0 cm) Parshall flumes, each with a recording flow meter and continuous totalizer, one located at the international boundary for measuring effluent from Nogales, Sonora, one located in the influent line to the treatment plant and one on the plant effluent line. Nogales International Treatment Plant is located approximately 6 miles (9.7 km) north of the international boundary.

RECORDS: Flows from the United States are deduced from total plant influent less the flows measured crossing the international boundary from Mexico. Records available: Continuous monthly record for plant influent since August 1951, daily records for plant influent, January 1952 through 1977.

REMARKS: Prior to December 18, 1971 the plant was located along the right bank of Nogales Wash, approximately two miles (3.2 km) north of the international boundary. Nogales International Treatment Plant treats combined sewage from Nogales, Arizona and Nogales, Sonora by means of aerated stabilization lagoons. Chlorination of plant effluent, which may be used for irrigation of lands lying north of the plant, is carried out by the United States at its expense.

Month	Total Monthly Flows Millions of Gallons			Mean Daily Flows-Millions of Gallons Per Day					
				Current Year 1977			Period 1952-1977		
	U.S.	Mexico	Total	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Jan.	69.495	69.398	138.893	4.915	4.027	4.480	4.915	0.650	2.591
Feb.	61.936	59.978	121.914	4.673	3.899	4.354	* 6.130	.650	2.635
Mar.	67.439	68.133	135.572	4.836	4.041	4.373	5.342	.750	2.572
Apr.	63.080	62.033	125.113	4.369	3.784	4.170	4.775	.700	2.532
May	60.567	67.432	127.999	4.675	3.437	4.129	4.697	.550	2.450
June	53.906	67.738	121.644	4.431	3.668	4.055	4.431	.700	2.312
July	59.051	68.456	127.507	4.887	3.373	4.113	4.887	.700	2.388
Aug.	62.720	70.622	133.342	5.071	3.983	4.301	5.071	.750	2.670
Sept.	62.351	63.809	126.160	4.967	3.916	4.205	5.434	.800	2.944
Oct.	# 62.409	# 52.792	# 115.201	# 9.807	# 4.005	# 5.486	9.807	.700	2.845
Nov.	† 96.738	† 65.084	† 161.822	† 6.315	† 5.035	† 5.779	6.315	.800	2.700
Dec.	60.689	92.223	152.912	5.407	4.667	4.933	5.407	.350	2.675
Yearly	780.381	807.698	1,588.079	9.807	3.373	4.532	9.807	0.350	2.610

* Partly estimated # Based on 21 days record † Based on 28 days record

RAINFALL ON THE SANTA CRUZ RIVER WATERSHED IN INCHES

Tabulated below are the monthly records of rainfall with averages for their periods of record at stations located in Arizona and one in Sonora, Mexico. Three stations are operated and maintained by the United States Section of the Commission, three by the National Weather Service and one by the Mexican Section of the Commission. For location, elevation, period of record, type of gage in use, and the observer, see alphabetical listing of stations on page 92.

In United States

Month	San Rafael #1, Arizona		San Rafael #2, Arizona		Canelo, Arizona		Patagonia, Arizona		Nogales, Arizona	
	1977	Average 1952-1977	1977	Average 1973-1977	1977	Average 1930-1977	1977	Average 1930-1977	1977	Average 1914-1977
Jan.	1.81	0.83	1.91	1.24	1.69	1.08	2.11	1.16	1.76	1.01
Feb.	0	.53	0	.93	0	1.03	.03	1.00	0	.83
Mar.	.65	.81	.27	.71	.29	.77	.55	.85	.60	.75
Apr.	.11	.23	.04	.47	.24	.36	.09	.34	.32	.30
May	0	.08	.07	.04	0	.13	0	.16	.03	.14
June	.32	.58	.28	.46	.18	.80	.23	.51	.38	.45
July	3.61	4.83	4.07	6.14	2.58	4.32	3.48	4.54	4.82	4.30
Aug.	*		4.80	2.70	4.57	4.32	3.04	4.06	5.02	3.89
Sept.	*		*		2.75	1.76	1.93	1.86	1.55	1.65
Oct.	*		*		5.13	.98	7.89	1.04	8.30	.89
Nov.	*		*		.20	.73	.41	.77	.38	.69
Dec.	*		*		1.02	1.31	1.09	1.33	1.05	1.25
Yearly					18.65	17.50	20.85	17.62	24.21	16.15

Month	Nogales Sanitation Plant 6N, Arizona									
	1977	Average 1953-1977								
Jan.	3.66	0.95								
Feb.	0	.63								
Mar.	.56	.74								
Apr.	.10	.18								
May	0	.11								
June	0	.38								
July	4.20	4.92								
Aug.	3.56	3.70								
Sept.	1.94	1.62								
Oct.	8.26	1.25								
Nov.	.37	.58								
Dec.	1.15	1.20								
Yearly	23.80	16.35								

In Mexico

Month	San Lazaro, Sonora									
	1977	Average 1961-1977								
Jan.	2.24	0.75								
Feb.	0	.63								
Mar.	.12	.63								
Apr.	0	.30								
May	0	.12								
June	.32	.47								
July	3.82	4.53								
Aug.	2.60	3.11								
Sept.	2.60	1.69								
Oct.	5.91	1.14								
Nov.	.32	.59								
Dec.	.79	1.18								
Yearly	18.70	14.00								

* Missing record

LOCATION OF RAINFALL STATIONS ON THE SANTA CRUZ WATERSHED

The precipitation records of the stations listed alphabetically below begin on the date shown and extend through 1977.

In United States

NAME OF STATION	TYPE GAGE	LATITUDE	LONGITUDE	ELEV. (FT.)	RECORD BEGAN	OBSERVER
Canelo, Arizona	S	31° 33'	110° 32'	4,985	1930	R. E. Ewing
Nogales, Arizona	R	31° 21'	110° 55'	3,803	1914	Milford L. Noon
Nogales Sanitation Plant 6N, Arizona	S	31° 25'	110° 57'	3,560	June 1952	I. B. & W. C.
Patagonia, Arizona	S	31° 33'	110° 45'	4,044	1930	O. J. Rothrock
San Rafael #1, Arizona	S	31° 26'	110° 36'	4,836	Mar. 1952	I. B. & W. C.
San Rafael #2, Arizona	S	31° 22'	110° 38'	4,860	Jan. 1975	I. B. & W. C.

In Mexico

NAME OF STATION	TYPE GAGE	LATITUDE	LONGITUDE	ELEV. (FT.)	RECORD BEGAN	OBSERVER
San Lazaro, Sonora	S	*	*	4,100	Mar. 1954	I. B. & W. C. Mexican Section

S Standard 8" rain gage R Recording rain gage * Unavailable

TEMPERATURE, HUMIDITY, EVAPORATION AND WIND IN THE SANTA CRUZ RIVER BASIN

Tabulated below are monthly records of temperature, humidity, evaporation and wind at the station located at the Nogales Sanitation Plant in Arizona 6 miles (9.7 km) north of the international boundary. December 18, 1971 the station was moved to correspond with a new Nogales Sanitation Plant. Prior to this date, the station was located 2 miles (3.2 km) north of the international boundary, at the old Nogales Sanitation Plant. This station is operated and maintained by the United States Section of the Commission. Also tabulated below are the monthly records of temperature and evaporation for a station at San Lazaro, Sonora, located approximately 6.5 miles (10.5 km) southwest of Santa Cruz, Sonora, and approximately 22 miles (35 km) southeast of Nogales, Sonora. This station is operated and maintained by the Mexican Section of the Commission. The equipment at the Nogales Sanitation Plant - 6N consists of: Standard 8-inch (203 mm) rain gage, 48-inch (1,219 mm) evaporation pan with stillwell and hook gage, maximum and minimum thermometer, anemometer (registers miles), hygrothermograph, and psychrometer, hand turbine type. The equipment at the station at San Lazaro, Sonora, consists of: Maximum and minimum thermometer, standard 8-inch (203 mm) rain gage and a 48-inch (1,219 mm) diameter evaporation pan.

For specific location of these two stations, refer to data opposite same station name shown in "Location of Rainfall Stations," page 92 of this bulletin.

In United States

Temperature - Degrees Fahrenheit

Month	Nogales Sanitation Plant - 6N 1977 Mean	Max. #	Min. #
Jan.	43.8	73	15
Feb.	47.4	83	14
Mar.	46.0	82	16
Apr.	58.1	90	23
May	61.5	97	31
June	76.1	103	44
July	* 80.7	103	62
Aug.	79.2	101	56
Sept.	75.1	97	50
Oct.	65.3	93	36
Nov.	54.3	83	27
Dec.	50.1	79	21
Yearly	61.5	103	14

Mean Relative Humidity-Percent

Month	Nogales Sanitation Plant - 6N 1977 Max.	Min.
Jan.	94	41
Feb.	95	17
Mar.	100	17
Apr.	100	27
May	96	17
June	84	16
July	100	29
Aug.	96	48
Sept.	95	53
Oct.	100	23
Nov.	88	0
Dec.	100	9
Yearly	100	0

Evaporation - Inches

Month	Nogales Sanitation Plant - 6N 1977	Average 1953-1977
Jan.	** 3.60	3.54
Feb.	† 5.52	4.64
Mar.	† 7.17	7.35
Apr.	† 9.69	9.66
May	11.00	12.41
June	13.13	13.86
July	† 9.73	10.30
Aug.	8.88	8.28
Sept.	† 8.09	8.03
Oct.	† 5.80	6.94
Nov.	† 4.38	4.54
Dec.	† 4.72	3.37
Yearly	91.71	92.92

Mean Wind Speed - Miles per Hour

Month	Nogales Sanitation Plant - 6N 1977	Average 1953-1977
Jan.	1.7	2.0
Feb.	2.5	2.3
Mar.	2.9	2.6
Apr.	2.9	2.6
May	2.7	2.5
June	1.9	2.4
July	1.4	1.6
Aug.	1.2	1.1
Sept.	1.3	1.2
Oct.	1.2	1.6
Nov.	1.5	1.6
Dec.	1.2	1.8
Yearly	1.9	1.9

In Mexico

Temperature - Degrees Fahrenheit

Month	San Lazaro, Sonora 1977 Max.	1977 Min.	1961-1977 Max.	1961-1977 Min.
Jan.	73	25	93	10
Feb.	81	23	88	16
Mar.	75	23	99	19
Apr.	86	30	106	18
May	99	39	117	28
June	102	50	124	39
July	100	61	126	50
Aug.	97	57	117	52
Sept.	93	54	115	39
Oct.	95	41	111	32
Nov.	81	36	102	21
Dec.	73	28	95	10
Yearly	102	23	126	10

Evaporation - Inches

Month	San Lazaro, Sonora 1977	Average 1961-1977
Jan.	2.40	3.66
Feb.	5.67	4.80
Mar.	7.80	7.13
Apr.	9.41	9.69
May	11.81	11.03
June	12.24	12.76
July	6.42	8.27
Aug.	7.76	7.40
Sept.	7.60	7.36
Oct.	4.76	6.85
Nov.	4.53	4.65
Dec.	3.90	3.58
Yearly	84.20	88.43

* One or more days missing ** Ten-year average † Adjusted to full month

\# See "Corrections to Previous Water Bulletins." page 95 Bulletin for 1976, for corrected maximums and minimums for 1972, 1973, and 1974

DRAINAGE AREAS ABOVE GAGING STATIONS AND IRRIGATED AREAS ALONG SANTA CRUZ RIVER, SAN PEDRO RIVER, AND WHITEWATER DRAW

1977

The drainage basin areas tabulated below are derived from the best available maps from both the United States and Mexico.

Data on irrigated areas in the Whitewater Draw Basin were furnished by the Soil Conservation Service at Douglas, Arizona.

Designation of Areas	Drainage Basin - Square Miles			Irrigated Areas - Acres		
	United States	Mexico	Total	United States	Mexico	Total
Santa Cruz River:						
Above Lochiel, Arizona Gaging Station	82	0	82	200	0	200
Above El Cajon, Mexico Gaging Station	179	125	304	200	2,352	2,552
Above Nogales, Arizona Gaging Station	185	348	533	200	2,696	2,896
San Pedro River:						
Above Palominas, Arizona Gaging Station	92	649 *	741	700	3,459	4,159
Whitewater Draw:						
Above Douglas, Arizona Gaging Station	1,023	0	1,023	33.000	0	33,000

* An additional 47 square miles in Mexico is tributary to the San Pedro River downstream from this station