

Prepared in cooperation with MoWR and MoAWR under the auspices of the U.S. Department of Defense, Task Force for Business and Stability Operations

# Stream Gage Descriptions and Streamflow Statistics for Sites in the Tigris River and Euphrates River Basins, Iraq

Data Series 540

U.S. Department of the Interior  
U.S. Geological Survey

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By Dina K. Saleh

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**U.S. Department of the Interior**  
**U.S. Geological Survey**

**U.S. Department of the Interior**  
KEN SALAZAR, Secretary

**U.S. Geological Survey**  
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U.S. Geological Survey, Reston, Virginia: 2010

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Conversion Factors and Datum

Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
inch (in.)	2.54	centimeter (cm)

SI to Inch/Pound

Multiply	By	To obtain
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
square kilometer (km²)	0.3861	square mile (mi²)
cubic meter per second (m³/s)	35.31	cubic foot per second (ft³/s)

Water year is the 12-month period from October 1 through September 30. The water years is designated by the calendar year in which the water year ends.

Datum

Vertical coordinate information is referenced either to an arbitrary datum or to the Great Trigonometrical Survey (GTS) datum.



# Stream Gage Descriptions and Streamflow Statistics for Sites in the Tigris River and Euphrates River Basins, Iraq

By Dina K. Saleh

## Abstract

Statistical summaries of streamflow data for all long-term streamflow-gaging stations in the Tigris River and Euphrates River Basins in Iraq are presented in this report. The summaries for each streamflow-gaging station include (1) a station description, (2) a graph showing annual mean discharge for the period of record, (3) a table of extremes and statistics for monthly and annual mean discharge, (4) a graph showing monthly maximum, minimum, and mean discharge, (5) a table of monthly and annual mean discharges for the period of record, (6) a graph showing annual flow duration, (7) a table of monthly and annual flow duration, (8) a table of high-flow frequency data (maximum mean discharge for 3-, 7-, 15-, and 30-day periods for selected exceedance probabilities), and (9) a table of low-flow frequency data (minimum mean discharge for 3-, 7-, 15-, 30-, 60-, 90-, and 183-day periods for selected non-exceedance probabilities).

## Introduction

Unlike other Middle East countries, Iraq has generous water resources originating in the upper drainage basins of the Tigris and Euphrates Rivers in Iraq and its neighboring countries of Turkey, Iran, and Syria. These water resources coupled with good riparian soils have resulted in an agriculturally centered population in Iraq. According to the U.S. Department of Agriculture (USDA), agriculture is the second largest component of Iraq's gross domestic product (GDP) and an important part of the social structure of rural communities (U.S. Department of Agriculture, 2009). About 60 percent of arable land in Iraq is under cultivation and one-fourth of the entire Iraqi workforce is employed in the agricultural sector (U.S. Department of Agriculture, 2009). Although the natural water resources generally are sufficient, Iraq still imports the vast majority of its foodstuffs because of inefficient and, in some cases, environmentally harmful farming practices (Food and Agriculture Organization of the United Nations, 2010). Thus, support and development of the agricultural sector in Iraq is critical for improving economic stability. The strong connection between water resources and agricultural production and improved decision support systems for managing water resources could enable the agricultural

sector to develop beyond its current status. This development in turn could lead to increased job opportunities and a reduction in Iraq's current need for importing foodstuffs.

Water supplies from the Tigris and Euphrates Rivers have decreased significantly over the past several decades (Ministry of Irrigation, 1958, 1959, and 1976). This decreasing trend is expected to continue as a result of upstream development in Turkey, Syria, and Iran, as well as the possible effects of climate change and increased drought periods on regional hydrology. As these traditional sources of water in Iraq decrease, use of the remaining resource will need to be optimized and new sources of water will need to be developed. Methods for optimizing existing water resources include the development of decision support systems that take advantage of accurate and real-time hydrologic data. Because some water supplies in Iraq originate in high elevation mountainous areas in Turkey, Iran, and Iraq, developing methods to estimate the snowpack in a given year and to forecast runoff would allow better management of dams and reservoirs in Iraq as facility operators balance demands for irrigation water with hydroelectric generation and flood control concerns. A system that predicts runoff and provides real-time information on inflows, outflows, and water quality from Iraq's complex system of dams, barrages, and irrigation canals would optimize the utilization of surface waters for agricultural needs, hydroelectric generation, and public water supplies.

Knowledge of the magnitude and time distribution of streamflow is essential for all aspects of water management and environmental planning. Agencies responsible for the development and management of Iraq's surface-water resources can use this knowledge for making safe, economical, and environmentally sound water-resource planning decisions. To provide the Iraqi managers with necessary streamflow information, the U.S. Geological Survey, in cooperation with the Ministry of Water Resources (MoWR) and Ministry of Agriculture Water Resources (MoAWR) under the auspices of the U.S. Department of Defense, Task Force for Business and Stability Operations, computed streamflow statistics for data collected at long-term streamflow-gaging stations in the Tigris River and Euphrates River Basins.

The purpose of this report is to provide summaries of streamflow characteristics for all long-term streamflow-gaging stations in the Tigris River and Euphrates River Basins. The long-term streamflow-gaging stations used in this report are listed in table 1 and the locations are shown in figure 1.

**Table 1.** Streamflow-gaging stations for which streamflow statistics are published in this report, Tigris River and Euphrates River Basins, Iraq.[ID, identification; km<sup>2</sup>, square kilometer; WY, water year; —, no data available]

Site name	Site ID name	USGS station ID	Site location lat/long	Area (km <sup>2</sup> )	Period of record	Missing data
<b>Tigris River Basin</b>						
Tigris River at Paish Khabur-Tusan	IRQ_T1	37040004223000	37°04'00"N/42°23'00"E	46,700	Jan 1958–Sept 1975	Mar–Apr 1974, Sept 1977
Khabur River at Zakho	IRQ_T2	37080004241000	37°08'00"N/42°41'00"E	3,500	Nov 1958–Sept 1989	Jan–91
Tigris River at Mosul	IRQ_T3	36375704249030	36°37'57"N/42°49'03"E	54,900	Oct 1931–Aug 1997	Apr–Sept 1963, Oct–Aug 1964, Mar–Sept 1965, WY 1966, WY 1967, WY 1968, Oct–Nov 1969, Apr–May 1973, Mar–Sept 1974, Oct–May 1975
Rawanduz River at Jmdian	IRQ_T4	36380004434000	36°38'00"N/44°34'00"E	1,160	Feb 1957–Sept 1975	
Balikian River at Balikian	IRQ_T5	36390004430000	36°39'00"N/44°30'00"E	1,060	Apr 1958–Mar 1974	
Khazir River at Bakrman Dam-IMRP	IRQ_T6	—	—	—	Nov 1931–Sept 2004	
Greater Zab River at Bekhme Dam-IMRP	IRQ_T7	36382904429420	36°38'29"N/44°29'42"E	—	Nov 1931–Sept 2004	
Khazir River at Manquba	IRQ_T8	36180004333000	36°18'00"N/43°33'00"E	2,900	Feb 1943–July 1994	Sept 1976, Mar–Apr 1991
Greater Zab River at Eski Kelek	IRQ_T9	36160004339000	36°16'00"N/43°39'00"E	20,500	Jan 1932–Sept 1990	WY 1935–1937
Lesser Zab River at Dokan	IRQ_T10	35571404457100	35°57'14"N/44°57'10"E	—	Nov 1931–Sept 2004	
Lesser Zab River at Dokan Village	IRQ_T11	35530004458000	35°53'00"N/44°58'00"E	11,700	Apr 1952–Sept 1975	Mar–May 1974
Lesser Zab River at Altun Kupri-Goma Zerdela	IRQ_T12	35454104408520	35°45'41"N/44°08'52"E	—	Oct 1932–May 1987	Apr 1978, Sept 1983
Tigris River at Fatha	IRQ_T13	35030004333000	35°03'00"N/43°33'00"E	107,600	Mar 1930–Sept 1999	Apr–June 1983
Tigris River at Beiji	IRQ_T14	34554504329350	34°55'45"N/43°29'35"E	—	Apr 1930–Mar 2005	
Adhaim River Injana	IRQ_T15	34300004431000	34°30'00"N/44°31'00"E	9,840	Oct 1945–Sept 1997	June–Sept 1984, Aug–Sept 1987, Oct 1988, Oct 1995
Diyala River at Derbendi-Khan	IRQ_T16	35080004545000	35°08'00"N/45°45'00"E	17,800	Nov 1931–Sept 2004	July–85
Diyala River at discharge site	IRQ_T17	35060104542020	35°06'01"N/45°42'02"E	29,700	Jan 1930–Sept 1991	WY 1995, WY 1996, WY 1997, WY 1998, WY 1999, WY 2000, Dec 2001, Feb 2001, Sept 2001, Mar 2003, May–July 2003, Nov–Feb 2004
Tigris River at Baghdad	IRQ_T18	33243404420320	33°24'34"N/44°20'32"E	134,000	Mar 1930–May 2004	July–Aug 1983, Nov 1998, WY 1999, WY 2000, Mar 2003, Nov 2004, Apr 2004, July–Sept 2004, Dec–Feb 2005
Gharraf Canal	IRQ_T19	32315504547250	32°31'55"N/45°47'25"E	—	Dec 1940–Mar 2005	WY 1983, WY 1984, WY 1985, WY 1986, WY 1987, July 1997, June 1999, Dec 2000, Feb 2000, Apr 2003, Feb 2004, Apr 2004, July–Aug 2004
Tigris River downstream of Kut Barrage	IRQ_T20	32290004550000	32°29'00"N/45°50'00"E	166,200	Oct 1931–Nov 2005	
<b>Euphrates River Basin</b>						
Euphrates River at Husaybah	IRQ_E1	34252004100380	34°25'20"N/41°00'38"E	—	Nov 1981–Sept 1997	WY 1995
Euphrates River at Hit	IRQ_E2	33362304250140	33°36'23"N/42°50'14"E	264,100	Oct 1932–May 1997	WY 1988, May–June 1991, Oct–Jan 1992, Mar–May 1992, Aug–Sept 1992, Nov 1995
Euphrates River downstream of Hindiya Barrage	IRQ_E3	32430104416010	32°43'01"N/44°16'01"E	274,100	Feb 1930–Sept 1999	WY 1987, WY 1990





**Figure 1.** Locations of streamflow-gaging stations for which streamflow statistics are published in this report, Tigris River and Euphrates River Basins, Iraq. Site location information is unavailable for site T6.

## History of Streamflow-Gaging Station Program

Daily streamflow data were provided by the Ministry of Irrigation (1958, 1959, and 1976) of the Government of Iraq. Most of the data available from 1959 to 2005 were based on recorded gage heights at or near river staff gages on the riverbank, mounted either on a post or on bridge piers or on masonry steps constructed specifically for this purpose. Periodic measurements of stream discharge were used to develop rating curves or tables that were used to convert recorded gage heights to discharge. Prior to 1959, measuring facilities varied from station to station and included cableways, boats, and bridges. Discharge measurements generally were made at 10-m intervals across the stream, at 0.5-m water depth, taking about 3 minutes to measure at each 10-m interval. At the smaller rivers, the interval was reduced to less than 10 m. The spacing of vertical sections generally resulted in about 20 sections at medium and high stages; however, at low stages, the number of sections was reduced, sometimes as low as 10 sections. A coefficient of 0.98 was applied to the observed velocity to obtain the mean in the vertical (Ministry of Irrigation, 1958, 1959, and 1976). The frequency of discharge measurements made varied at each station and depended on factors such as the stability of the channel and the accessibility of the station.

## Streamflow-Gaging Station Summaries

Streamflow-gaging station summaries are presented so that each station description and tables of streamflow statistics and probabilities of occurrence are presented in the same order and format for each streamflow-gaging station. The order of presentation is as follows:

1. Station description (information provided by the Ministry of Irrigation of the Government of Iraq),
2. Graph showing the annual mean discharge for the period of record,
3. Table of extremes and statistics of monthly and annual mean discharges,
4. Graph showing monthly discharge (maximum, minimum, and mean discharge),
5. Table of monthly and annual mean discharges for the period of record,
6. Graph showing the annual flow duration,
7. Table of monthly and annual flow duration,
8. Table of exceedance probability of maximum mean discharge for selected numbers of consecutive days,
9. Table of non-exceedance probability of minimum mean discharge for selected numbers of consecutive days.

## Station Descriptions

The station description for each streamflow-gaging station provide descriptive information, such as station location, gage information, general description of records, period of record, and drainage area when available. This information is compiled from records maintained by Ministry of Irrigation of the Government of Iraq. The following comments clarify information presented under the various headings of the station manuscript.

**LOCATION:** Information about the location of the streamflow-gaging station primarily is limited to latitude and longitude.

**DRAINAGE AREA:** Drainage area was obtained from data reports provided by the Iraqi government.

**PERIOD OF RECORD:** The period of record is the period for which published records for the streamflow-gaging station are available.

**GAGE:** The type of gage in use during this reporting period, the datum of the gage refers to a standard datum, and general description of the method used to measure discharge.

**RECORD:** The quality of the discharge measurement is explained.

## Methods

### Statistics of Monthly and Annual Mean Data

Statistics of monthly and annual mean discharges presented for each gaging station include (1) the maximum, minimum, and mean monthly discharges and (2) the maximum, minimum, and mean annual discharges. The water years in which the maximum (October 1 through September 30) and minimum discharges (April 1 through March 31) occurred are listed with the respective values, and the standard deviation and coefficient of variation of the monthly and annual mean discharges are listed with the respective values. The percentage of the annual discharge that occurs each month is listed in the table for each station.

The method for computing the monthly and annual mean discharges can be illustrated by using the data for one of the gaging stations, Tigris River at Baghdad (IRQ\_T18), as an example. Each monthly mean is the mean of the daily values for that month. Months or years for which all daily values are not available are not included in the compilation of statistics. The maximum monthly mean discharge is the maximum value of all monthly mean values for a given month for the period of record. For example, the maximum mean value

during October for the Tigris River at Baghdad (IRQ\_T18) is 1,685.0 m<sup>3</sup>/s (water year 1989). Similarly, the minimum monthly mean discharge is the minimum value of all monthly mean values. The minimum mean value during October for the Tigris River at Baghdad (IRQ\_T18) is 180.50 m<sup>3</sup>/s (water year 1956). The maximum and minimum monthly mean values can be found in the statistics of the monthly and annual mean discharges table or by searching the monthly and annual mean discharges tables for each station. The mean monthly discharge is the mean of all the monthly mean discharges for a given month for the period of record, and the standard deviation is a measure of the variability of the values. The mean monthly discharge for the Tigris River at Baghdad (IRQ\_T18) is 411.35 m<sup>3</sup>/s for October, and the standard deviation is 234.52 m<sup>3</sup>/s. The mean monthly discharge for October is the same as the mean of all October daily values for the period of record used. The coefficient of variation is the ratio of the standard deviation to the mean. The coefficient of variation is a dimensionless measure of the spread of the values. Because monthly mean discharges are much greater in spring than in winter, the standard deviations also are much greater in spring than in winter. Using the coefficient of variation tends to equalize the measure of spread of values for all months so a more meaningful comparison among months can be made.

The percentage of the annual discharge is the percent of the annual discharge that occurred during each month. It is calculated by dividing the mean discharge for the month by the total of the 12 monthly mean discharges and multiplying by 100. Because of rounding of the monthly percentage, the sum of the 12 percentages may not equal 100 percent.

The maximum, minimum, and mean annual discharges are computed from the annual mean discharges for the period of record, using mathematical computations. The water years of occurrence of the maximum and minimum values are listed with the respective values, and the standard deviation of the mean of the annual mean values is listed with the mean value. The maximum annual mean discharge for the Tigris River at Baghdad (IRQ\_T18) was 1,815.49 m<sup>3</sup>/s in 1954, and the minimum annual mean discharge was 393.14 m<sup>3</sup>/s in 2001. The mean annual discharge for the period of record is 1,019.73 m<sup>3</sup>/s.

## Monthly and Annual Flow Duration

The monthly and annual flow duration table represents how frequently particular values of daily mean discharge were exceeded over the period of data collection. Flow duration data are computed by tabulating the number of daily mean discharge values that fall within pre-selected class limits, computing the percentage of values in each class, and interpolating discharge values for the percentages shown in the table. Monthly flow duration values are calculated from daily values in all complete months in the record, and annual figures

are calculated for all complete water years. For example, if the 90-percent flow duration value for October is 221.50 m<sup>3</sup>/s, then 90 percent of all October daily discharge values for the period of record are greater than 221.50 m<sup>3</sup>/s.

## Probability of Occurrence of High or Low Discharges

High- and low-flow frequency data show the exceedance probability of maximum mean discharge and non-exceedance probability of minimum mean discharge computed over selected numbers of consecutive days. For example, an annual 3-day high flow is the largest value of mean discharge over any consecutive 3-day period during the water year. For high-flow frequency computations, the water year is selected to help ensure that the largest 3-day mean flow will not span two water years. Because high flows are uncommon in the September–October period, the water year used for high-flow frequency computations is October 1 through September 30. Likewise, an annual 15-day low flow is the smallest mean discharge for any consecutive 15-day period during a water year. Because low flows are uncommon during the spring, the water year for low-flow frequency computations is April 1 through March 31.

The exceedance probabilities of annual high flows and the non-exceedance probabilities of annual low flows are determined by fitting a log Pearson Type 3 probability distribution to the annual high- or low-flow series. The high-flow series used for this study were the annual 3-, 7-, 15-, and 30-day maximum discharges, and the low-flow series were the annual 3-, 7-, 15-, 30-, 60-, 90-, and 183-day minimum discharges. Exceedance probabilities were used to characterize the high-flow data, and non-exceedance probabilities (1 minus exceedance probability) were used to characterize the low-flow data. On this basis, small exceedance probabilities are associated with large (rare) maximum discharges, and small non-exceedance probabilities are associated with small (rare) minimum discharges. Recurrence interval, which is the average length of time between exceedance of a high flow and non-exceedance of a low flow, is another way of expressing annual exceedance or non-exceedance probability. Recurrence interval is the reciprocal of exceedance or non-exceedance probability. Thus, for example, a 3-day high flow with an annual exceedance probability of 0.10 has a 10-percent chance of being exceeded in a given year and has a recurrence interval of 10 years.

Although high- and low-flow frequency are both affected by the watershed changes and processes, low-flow frequency particularly is sensitive to natural-channel processes, such as evapotranspiration, and human-induced hydrologic modifications, such as the operation of many small water-storage reservoirs; the effects of surface-water withdrawal for agricultural, municipal, and industrial use; and the effects of return flow to the river.

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## Stream-Gage Descriptions and Streamflow Statistics

### Tigris River Basin

#### TIGRIS RIVER AT PAISH KHABUR-TUSAN (IRQ\_T1)

(U.S. Geological Survey identification number: 37040004223000)

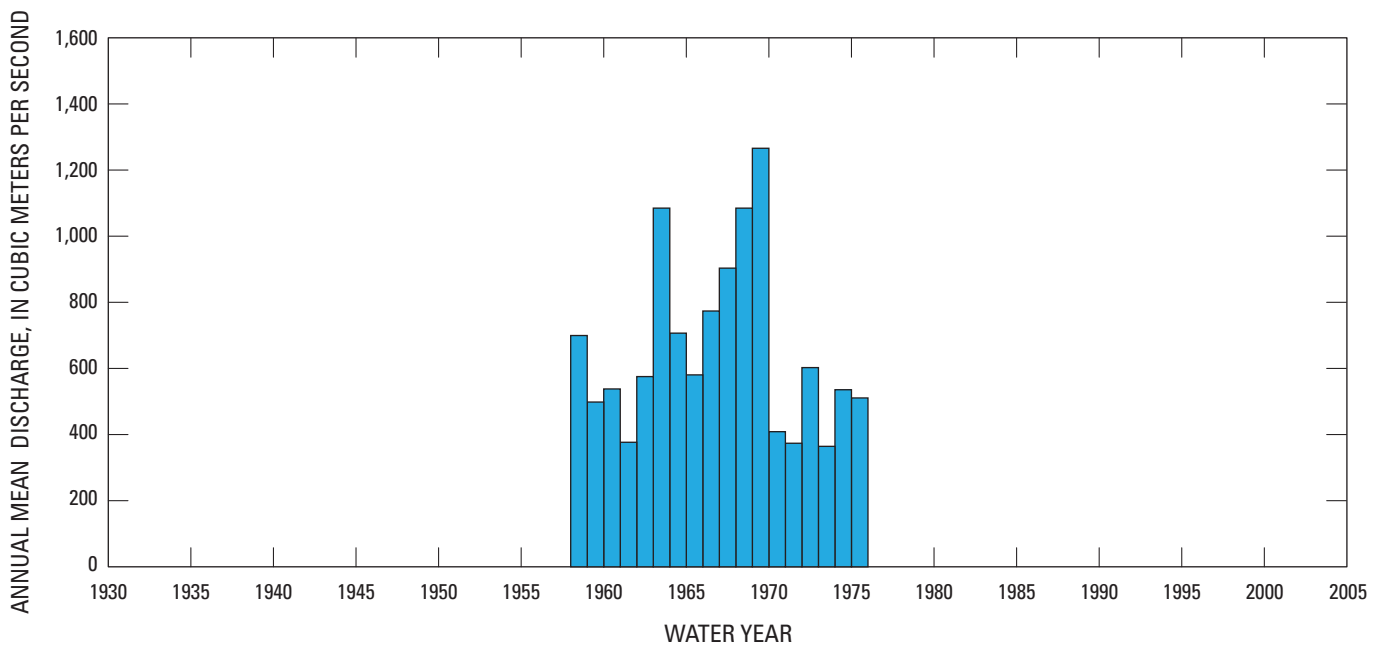
LOCATION: Latitude 37° 04' 00" N, Longitude 42° 23' 00" E.

DRAINAGE AREA: 46,700 square kilometers.

PERIOD OF RECORD: January 1958 to September 1975.

GAGE: Gage is located on the left bank immediately downstream of Paish Khabur village. The automatic water stage recorder and the staff gage are on the right bank at the Tusan station. A correction of 324.76 meters must be added to the gage reading to convert to GTS datum. The streamflow-gaging station was moved in 1957 to Tusan, 8 km downstream of the Paish Khabur Station. Tusan is located at Latitude 37° 04' 00" N, Longitude 42° 28' 00" E.

RECORDS: Discharge measurements were made at Tusan from a cableway.



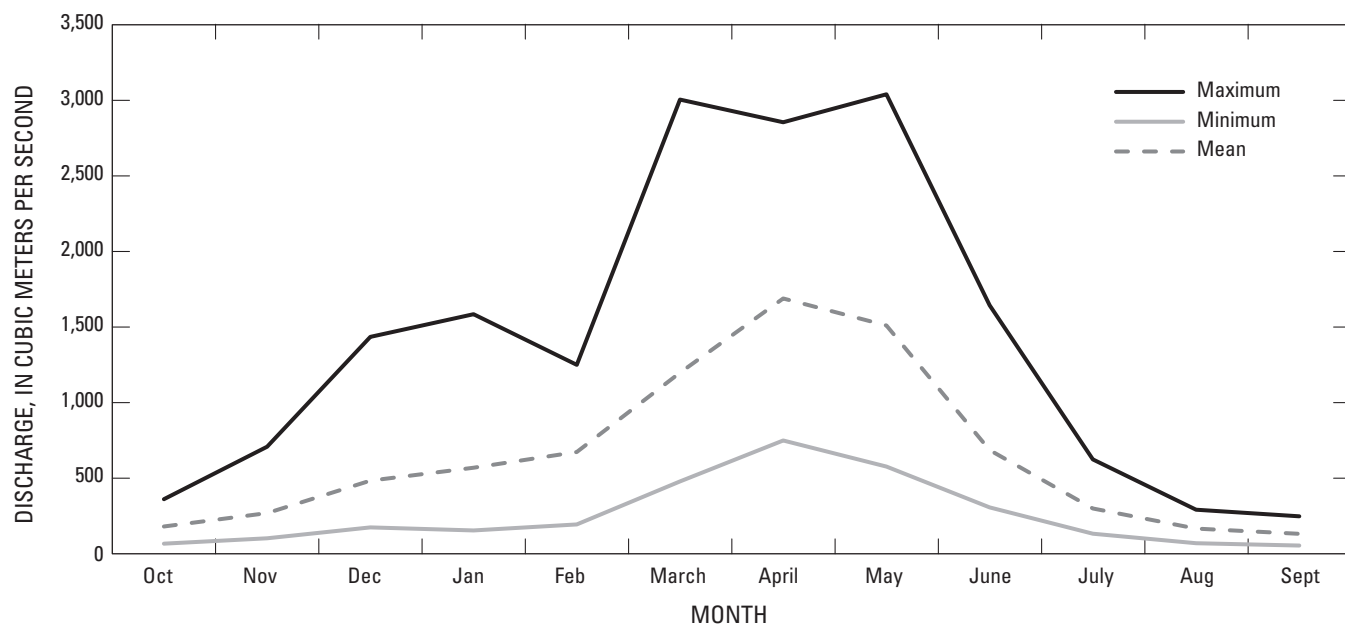
**Figure 2.** Annual mean discharge at streamflow-gaging station IRQ-T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

## 8 Stream Gage Descriptions and Streamflow Statistics for Sites in the Tigris River and Euphrates River Basins, Iraq

**Table 2.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

[m<sup>3</sup>/s, cubic meter per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	361.00	1966	66.80	1975	180.46	87.04	0.48	2.30
November	708.30	1968	102.40	1975	269.11	146.70	0.55	3.42
December	1,435.00	1969	174.50	1961	483.78	367.80	0.76	6.16
January	1,585.00	1969	154.30	1971	569.27	418.88	0.74	7.24
February	1,250.00	1963	194.10	1971	673.27	327.20	0.49	8.57
March	3,005.00	1969	478.60	1961	1,197.97	657.85	0.55	15.25
April	2,855.00	1963	749.50	1973	1,689.08	604.81	0.36	21.50
May	3,040.00	1963	576.90	1970	1,510.39	728.09	0.48	19.22
June	1,644.00	1963	306.80	1970	685.95	320.53	0.47	8.73
July	624.30	1963	132.70	1974	299.63	150.27	0.50	3.81
August	291.50	1969	69.80	1974	166.62	76.27	0.46	2.12
September	247.80	1969	54.40	1971	131.93	56.05	0.42	1.68
Annual	1,265.89	1969	364.33	1961	666.42	264.35	0.40	100



**Figure 3.** Monthly discharge at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.



**Table 3.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1958	—	—	—	680.5	626.9	1,218	1,578	1,053	588.9	258	159.3	133.3	699.54
1959	140.8	156.7	323.4	457.5	309.6	803.7	1,472	1,204	572.2	247.2	155.7	137.3	610.70
1960	171	198.4	193	533.7	517.1	928.1	1,714	1,300	447.7	204.7	131.7	115.9	537.94
1961	129.3	191.5	174.5	320.8	374.3	478.6	1,036	1,022	416.1	166.4	112.1	98.5	376.68
1962	112.1	280.3	705.4	476.7	840.1	1,216	1,254	1,051	507.5	225.3	126.5	109.3	575.35
1963	118	144.9	701.8	1,026	1,250	1,136	2,855	3,040	1,644	624.3	290.1	188.5	1,084.88
1964	334.9	428.6	414.5	306.7	719	2,061	1,584	1,364	709.4	278.6	153.5	126.5	706.73
1965	131.3	283.3	251.6	283.7	698.5	1,061	1,718	1,285	689.9	275.6	158.1	130	580.50
1966	361	358.3	583.9	1,269	1,250	1,022	1,646	1,303	737.6	368.9	211.2	173.1	773.67
1967	226.3	239.9	487.1	668.3	701.9	1,502	2,218	2,805	1,050	512.2	250.8	178.9	903.37
1968	242.3	708.3	1,272	1,159	1,004	2,196	2,536	1,937	1,014	484.5	271.6	193.4	1,084.84
1969	232.9	388.3	1,435	1,585	1,107	3,005	2,838	2,616	928.1	516.1	291.5	247.8	1,265.89
1970	282.5	299.6	366.4	365	800.7	753.3	835	576.9	306.8	162.2	90	66	408.70
1971	86.6	167	253.9	154.3	194.1	604.9	1,466	846.8	414.7	162.5	79.5	54.4	373.73
1972	122.5	146.8	341.9	222.5	346.4	642.6	1,347	2,371	816.4	413.4	254.8	204.9	602.52
1973	199.5	302.7	241.8	240.4	455.6	521.5	749.5	783.3	443.3	217.2	121.7	95.5	364.33
1974	110	177.8	208.4	230.5	251.8	1,474	1,948	1,210	554.3	132.7	69.8	59.2	535.54
1975	66.8	102.4	269.6	267.2	671.9	939.8	1,609	1,419	506.2	143.5	71.2	62.3	510.74

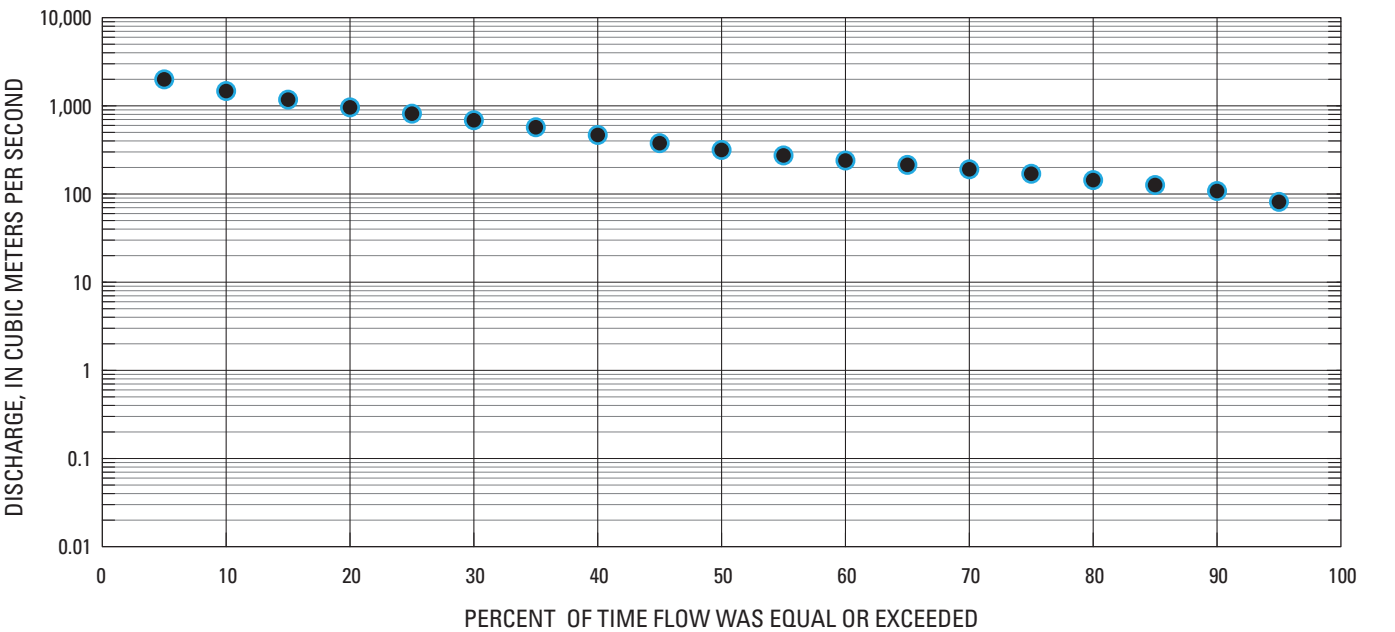


Figure 4. Annual flow duration at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

Table 4. Monthly and annual flow duration at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	66.10	88.80	153.50	170.40	176.70	392.30	751.90	632.40	278.80	114.30	66.30	58.10	87.30
90	84.30	103.90	171.40	190.20	223.60	456.50	837.20	731.30	319.60	133.40	77.10	60.00	116.10
85	102.00	133.30	184.50	208.30	269.80	505.30	926.60	812.90	357.10	146.60	81.00	64.10	136.00
80	108.00	139.10	198.50	223.20	293.20	560.00	1,018.70	908.50	388.60	165.70	94.90	66.50	154.80
75	114.50	144.90	211.30	239.70	322.90	624.20	1,095.20	981.80	421.30	179.20	105.70	93.40	182.90
70	122.20	153.20	221.40	257.60	357.20	689.30	1,228.00	1,021.00	454.40	194.90	116.10	101.10	205.70
65	126.30	164.30	231.40	278.70	396.40	762.00	1,308.20	1,062.70	494.30	204.80	124.10	108.20	231.10
60	130.00	181.30	247.40	297.00	448.60	841.80	1,381.80	1,111.20	533.70	215.00	131.50	113.50	259.20
55	133.80	197.90	266.60	314.50	508.30	904.70	1,481.00	1,169.80	576.80	230.40	138.70	122.20	296.30
50	139.90	215.50	290.20	346.20	566.80	956.40	1,575.60	1,236.10	611.20	243.50	145.80	127.20	342.20
45	147.40	232.50	308.90	394.90	625.60	1,029.80	1,651.60	1,320.60	654.50	270.10	154.50	129.90	409.20
40	173.10	244.20	356.50	446.60	684.60	1,111.30	1,717.80	1,388.00	698.30	299.30	169.80	132.60	507.60
35	183.20	255.90	388.40	502.10	757.70	1,208.70	1,798.10	1,468.50	741.00	321.70	183.40	139.00	621.90
30	191.00	273.40	435.90	544.60	833.80	1,338.00	1,895.00	1,617.60	789.40	352.30	206.50	165.40	748.10
25	209.50	294.10	547.90	618.10	907.70	1,475.50	2,030.00	1,791.40	839.30	378.80	231.50	177.70	889.50
20	237.70	322.40	612.50	793.60	977.80	1,635.60	2,178.20	2,046.90	901.00	416.00	247.70	182.70	1,049.50
15	255.00	359.30	739.00	913.80	1,073.90	1,852.00	2,480.00	2,473.10	979.00	482.60	260.80	195.00	1,286.30
10	294.30	439.20	950.90	1,084.00	1,222.90	2,153.00	2,736.70	2,747.10	1,106.80	556.00	293.20	216.40	1,613.00
5	374.50	682.30	1,497.60	1,534.10	1,556.20	3,075.20	3,344.00	3,304.30	1,380.00	631.00	314.50	238.50	2,193.50

**Table 5.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,926.80	1,687.10	1,463.40	1,310.50
0.50	2	3,068.00	2,571.10	2,175.30	1,905.70
0.20	5	4,561.40	3,702.80	3,086.60	2,670.80
0.10	10	5,469.10	4,385.60	3,640.90	3,141.20
0.05	20	6,273.00	4,990.20	4,136.20	3,566.10
0.02	50	7,223.70	5,707.10	4,730.40	4,082.40
0.01	100	7,877.00	6,202.00	5,145.80	4,448.20

**Table 6.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T1, Tigris River at Paish Khabur-Tusan, Iraq, water years 1958–75.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second]						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	123.940	124.420	125.000	126.970	133.800	145.520	206.870
0.2	5	85.333	85.645	85.710	86.501	91.817	100.080	152.020
0.1	10	68.495	68.726	68.729	69.091	74.001	81.422	131.170
0.05	20	56.375	56.547	56.556	56.652	61.307	68.283	116.910
0.02	50	44.622	44.737	44.786	44.668	49.059	55.671	103.460
0.01	100	37.848	37.932	38.017	37.799	42.007	48.409	95.750

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## Tigris River Basin

### KHABUR RIVER AT ZAKHO (IRQ-T2)

(U.S. Geological Survey identification number: 37080004241000)

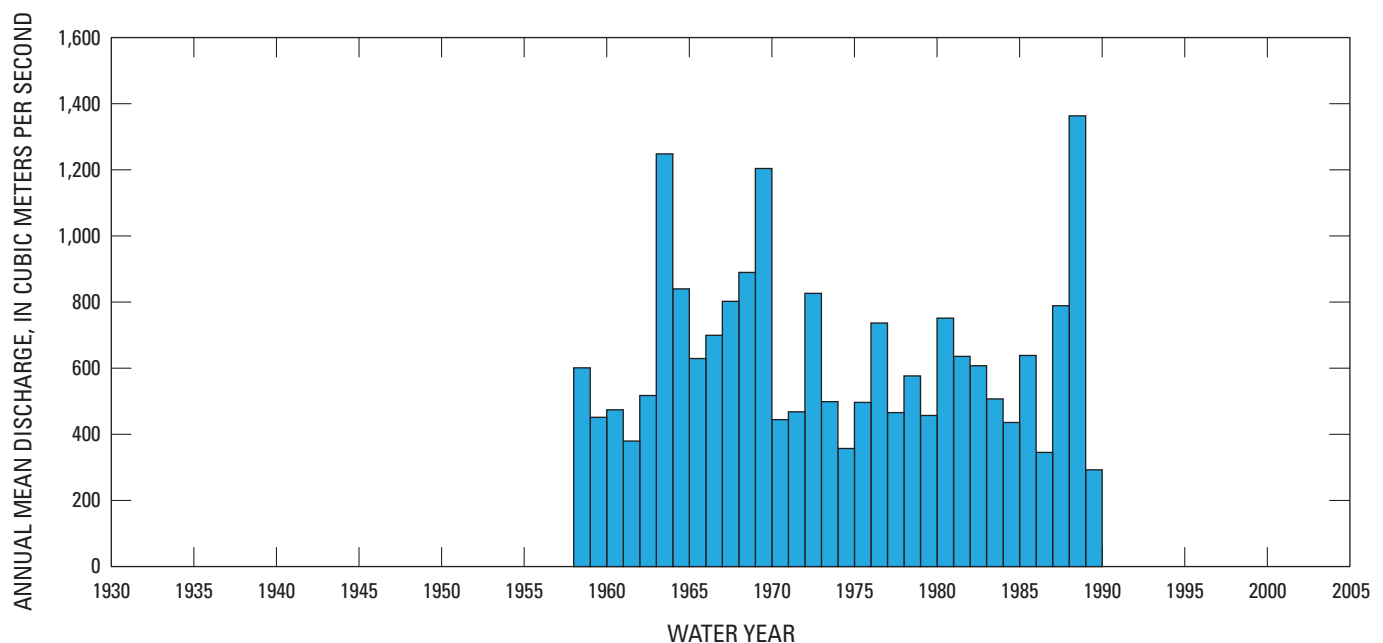
LOCATION: Latitude 37° 08' 00" N, Longitude 42° 41' 00" E.

DRAINAGE AREA: 3,500 square kilometers.

PERIOD OF RECORD: November 1958 to September 1989.

GAGE: The staff gage is located on the left bank about 500 meters upstream of the Abbasid Bridge. The automatic water stage recorder installed near the staff was damaged in 1962. The auxiliary staff gage is downstream at the Power House Bridge, which is at the head of the left of the two channels round the town of Zakho. Each gage is set to an arbitrary datum.

RECORDS: Daily discharge records are excellent until 1962 and good for the rest of the period. Discharge measurements had been made regularly until March 1962 at the recorder site from a cableway or by wading; very few observations were made after March 1962.



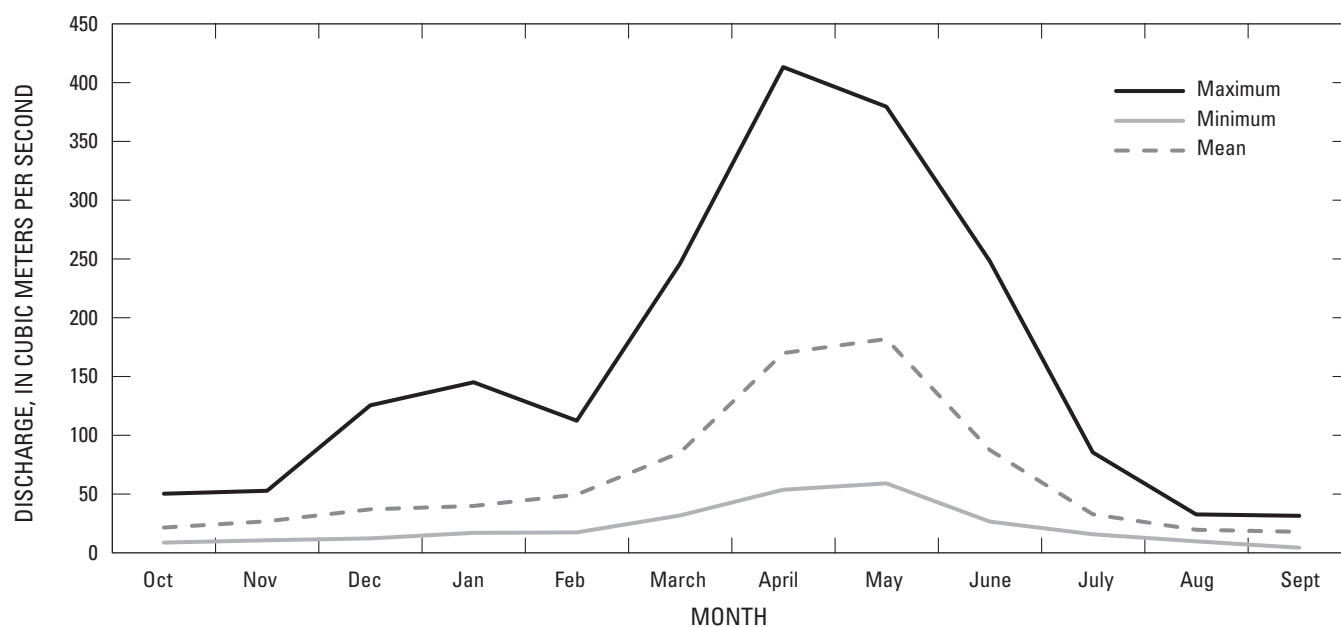
**Figure 5.** Annual mean discharge at streamflow-gaging station IRQ\_T2, Tigris River, Khabur River at Zakho, Iraq, water years 1958–89.

## 14 Stream Gage Descriptions and Streamflow Statistics for Sites in the Tigris River and Euphrates River Basins, Iraq

**Table 7.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.

[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean Discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	50.30	1966	8.740	1976	21.52	11.04	0.51	2.80
November	52.80	1968	10.700	1978	26.84	9.89	0.37	3.49
December	125.50	1988	12.300	1960	37.04	25.43	0.69	4.81
January	145.10	1988	17.000	1961	39.88	25.16	0.63	5.18
February	112.40	1988	17.400	1971	49.55	20.62	0.42	6.44
March	246.00	1988	31.800	1961	85.18	48.00	0.56	11.07
April	413.20	1963	53.700	1989	169.93	77.89	0.46	22.08
May	379.50	1963	59.100	1989	181.92	79.93	0.44	23.63
June	248.40	1963	26.600	1989	87.58	47.56	0.54	11.38
July	85.40	1963	15.800	1961	32.81	15.57	0.47	4.26
August	32.70	1988	9.770	1984	19.63	6.94	0.35	2.55
September	31.50	1965	4.370	1984	17.89	7.51	0.42	2.32
Annual	136.33	1988	29.267	1989	63.84	25.99	0.41	100.00



**Figure 6.** Monthly discharge at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.



**Table 8.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1958	—	26	34.6	44.1	52	79.8	154.4	150.6	70.4	24	14	11.3	60.11
1959	11.6	12.1	22.1	20.6	17.9	46.1	163.7	148.6	54.4	18.9	12.8	13	45.15
1960	13.4	13.7	12.3	26.9	32.6	56.6	151.3	180.3	45.7	16.6	10.3	9.3	47.42
1961	10.3	20.7	13.9	17	22.6	31.8	106.2	147.1	49.5	15.8	10.9	9.8	37.97
1962	8.81	22.2	35.4	37.5	43.1	91	125.2	136.9	67.6	23	14.2	15.9	51.73
1963	22.3	25.9	47.5	67.9	67.8	96	413.2	379.5	248.4	85.4	27.8	16.2	124.83
1964	42.4	40.8	44	34.1	76.2	166	191.6	224	113.5	40	19.8	15.5	83.99
1965	17.1	24.6	24.5	33.8	65.6	78.1	149.3	173.6	97.7	38.4	20.9	31.5	62.93
1966	50.3	38.1	50.9	72.6	73.3	89.7	145.1	155.2	75.6	26.9	32	29.7	69.95
1967	33.2	30.8	39.3	43.4	57.9	95.1	147.7	303	122.1	42.9	26.1	21.1	80.22
1968	47.5	52.8	79.2	59.8	59.7	109.3	250.3	216.9	99.7	36.9	26.6	28.9	88.97
1969	29	36.9	115.9	85.7	81.1	212.5	302.2	335.4	146.2	47.6	26.9	25.4	120.40
1970	27.6	30.1	32.7	34.8	39.9	55.7	115.9	81.6	31.8	27.6	27.6	28	44.44
1971	18.4	20.5	19.8	17.3	17.4	39.5	155.1	143.8	54.4	23.1	25.1	27.3	46.81
1972	32.2	35.2	43.8	53.6	50.9	90.6	191.4	266.4	135.4	50.4	28	13.7	82.63
1973	19.5	33.8	20.3	19	39.5	47.3	107.3	163.3	71.7	28.1	23.1	25.7	49.88
1974	29.7	26.9	28.4	28.1	32.5	—	—	80.3	46.3	30.5	29.3	25.2	35.72
1975	24.4	27.6	28.8	28	46.4	47.3	141.1	120.7	68.7	28.5	16.2	18.1	49.65
1976	8.74	13	20.2	25.3	55.6	54	217	263.9	148.1	43.5	19.7	14.9	73.66
1977	18.9	18.1	21.1	27	41.2	61	109.3	127.2	61	16.3	11.2	—	46.57
1978	11.9	10.7	22.9	38.7	59.7	95.7	154.8	159.3	78.4	32.7	15.2	12	57.67
1979	13.6	14.5	24.9	32.7	37.2	62.4	110.5	118.4	65.5	24.7	15.7	28.3	45.70
1980	30.5	42.4	39.2	33.3	38.4	89.8	268	214.2	76.9	28.3	21.2	19.5	75.14
1981	19.3	23.1	28.4	35.5	62.1	99.6	145.9	166.7	112.2	41.2	16.9	12	63.58
1982	14	32.8	30.7	35.4	39.5	57.6	173	196.6	85.9	38.2	14.4	10.8	60.74
1983	19	25.4	36.8	46.6	43	70.9	98	162.5	70.9	16.8	10.6	7.97	50.71
1984	10.3	34	33.3	18.8	26	60.6	105.1	117	76.1	27.6	9.77	4.37	43.58
1985	8.81	36.7	30	31.9	69.7	90.7	237.1	169.7	46	18	13.5	14.1	63.85
1986	18.4	16	17.6	25.7	54.4	65	67.4	66.4	36.8	17	14.5	15.2	34.53
1987	16.3	25.8	33.5	32.4	49.4	122.1	193.8	255.7	147.7	36.4	17.8	15.8	78.89
1988	18	28.1	125.5	145.1	112.4	246	323.1	337.6	171.5	72.3	32.7	23.6	136.33
1989	21.6	19.7	27.7	23.5	20.6	32.8	53.7	59.1	26.6	32.2	23.4	10.3	29.27

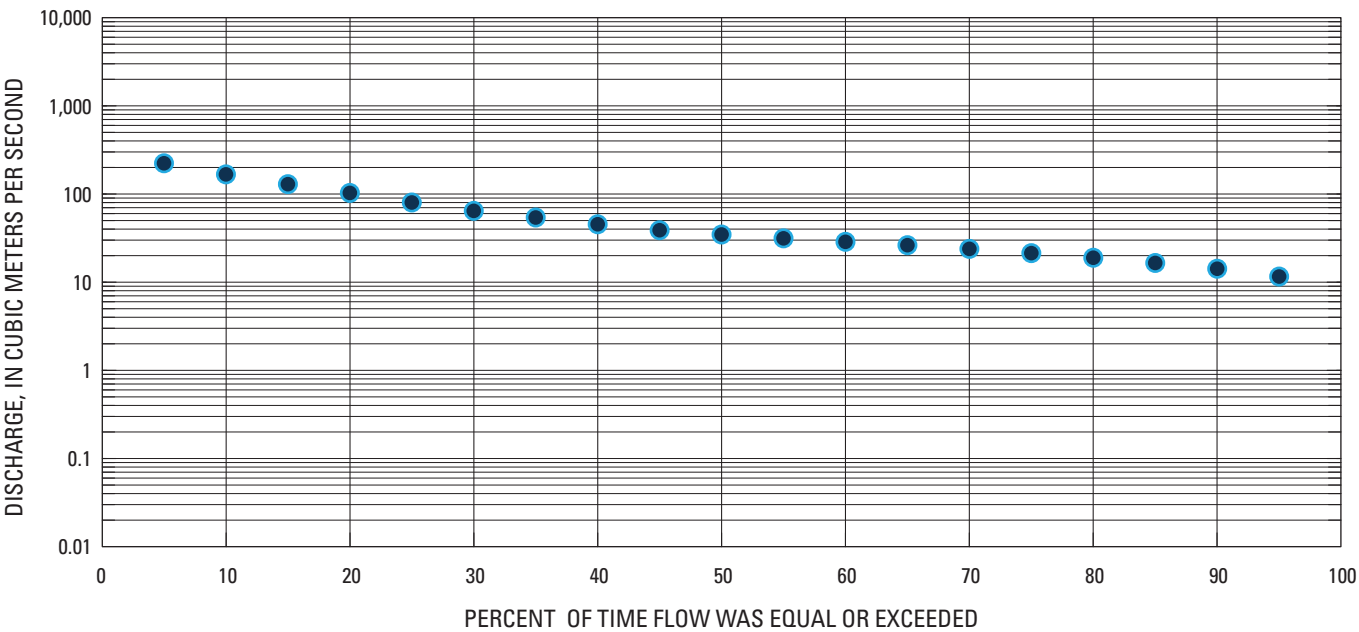


Figure 7. Annual flow duration at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq., water years 1958–89.

Table 9. Monthly and annual flow duration at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	8.32	11.00	13.30	16.10	18.00	28.20	61.30	67.60	26.60	14.60	10.30	7.99	11.50
90	9.50	12.60	16.10	18.40	21.60	34.70	73.90	83.00	31.00	16.00	11.40	9.45	14.10
85	10.80	14.00	17.80	20.30	25.20	39.80	83.70	101.10	38.40	17.40	12.30	10.50	16.40
80	12.20	15.70	18.90	22.20	27.60	43.30	94.60	112.00	44.10	19.30	13.00	11.30	18.80
75	14.10	17.10	20.20	23.80	29.80	46.90	104.50	120.10	49.10	21.40	13.70	12.20	21.20
70	15.10	18.40	21.50	25.30	32.20	51.10	112.20	127.90	53.50	22.70	14.30	12.80	23.70
65	16.20	20.40	23.10	26.70	34.60	55.60	119.50	139.00	58.00	24.30	15.00	14.00	26.10
60	17.30	22.60	24.80	28.00	36.70	59.70	125.60	145.90	63.20	26.20	16.20	14.80	28.50
55	18.30	24.60	26.60	29.40	39.40	63.60	132.00	154.00	68.80	27.90	17.30	15.40	31.20
50	19.10	26.10	28.10	30.70	42.40	67.70	140.90	164.80	74.90	29.40	18.60	16.00	34.50
45	19.90	27.50	29.70	32.20	45.70	72.20	150.20	174.60	81.20	31.00	20.40	17.00	38.60
40	21.60	28.90	31.50	33.90	49.60	78.30	160.30	185.90	87.20	32.60	22.40	19.10	45.10
35	23.20	30.40	33.30	36.10	52.80	85.20	174.40	198.20	93.20	34.40	23.40	22.20	53.80
30	24.90	31.70	36.20	38.60	56.60	92.90	190.70	209.90	99.80	36.70	24.60	24.00	64.00
25	26.70	32.90	39.50	43.80	61.20	101.80	206.80	228.80	108.40	39.50	26.10	25.30	79.70
20	28.60	34.10	43.30	50.50	66.30	113.70	222.30	245.00	121.40	43.00	27.60	27.20	102.30
15	31.10	37.30	51.10	55.50	73.10	131.30	241.30	268.80	143.50	48.00	28.80	28.10	128.60
10	34.50	43.10	65.40	62.40	88.20	159.20	277.40	305.50	168.30	54.60	30.60	29.00	166.20
5	43.00	52.40	95.90	109.60	106.90	200.00	369.80	346.00	200.50	67.50	34.20	30.50	222.10

**Table 10.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	175.01	160.08	148.90	135.00
0.50	2	285.95	251.35	225.68	201.33
0.20	5	467.39	388.28	324.73	287.97
0.10	10	604.32	484.27	385.07	341.70
0.05	20	747.23	579.30	438.93	390.41
0.02	50	948.93	706.25	503.40	449.76
0.01	100	1,112.90	804.32	548.32	491.86

**Table 11.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T2, Khabur River at Zakho, Iraq, water years 1958–89.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	12.95	13.24	13.73	14.63	15.89	17.06	22.54
0.2	5	8.73	8.93	9.30	9.97	11.09	12.30	17.24
0.1	10	6.76	6.90	7.23	7.83	8.98	10.26	15.08
0.05	20	5.32	5.41	5.71	6.28	7.44	8.79	13.55
0.02	50	3.94	3.99	4.26	4.78	5.95	7.34	12.06
0.01	100	3.17	3.20	3.44	3.92	5.08	6.49	11.18

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## Tigris River Basin

### TIGRIS RIVER AT MOSUL (IRQ\_T3)

(U.S. Geological Survey identification number:36375704249030)

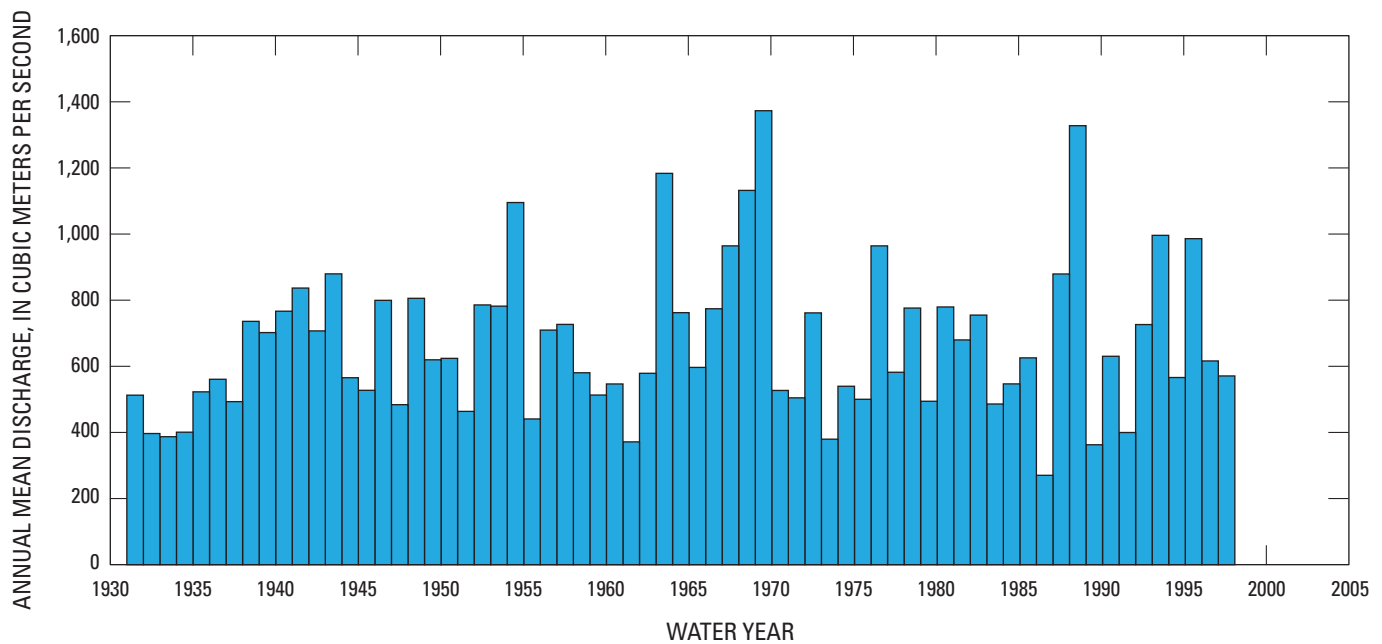
LOCATION: Latitude 36° 37' 57" N, Longitude 42° 49' 03" E.

DRAINAGE AREA: 54,900 square kilometers.

PERIOD OF RECORD: October 1931 to August 1997.

GAGE: The staff gage is located on the right bank of the Tigris River, 40 meters upstream of the old bridge. The gage is set to GTS datum.

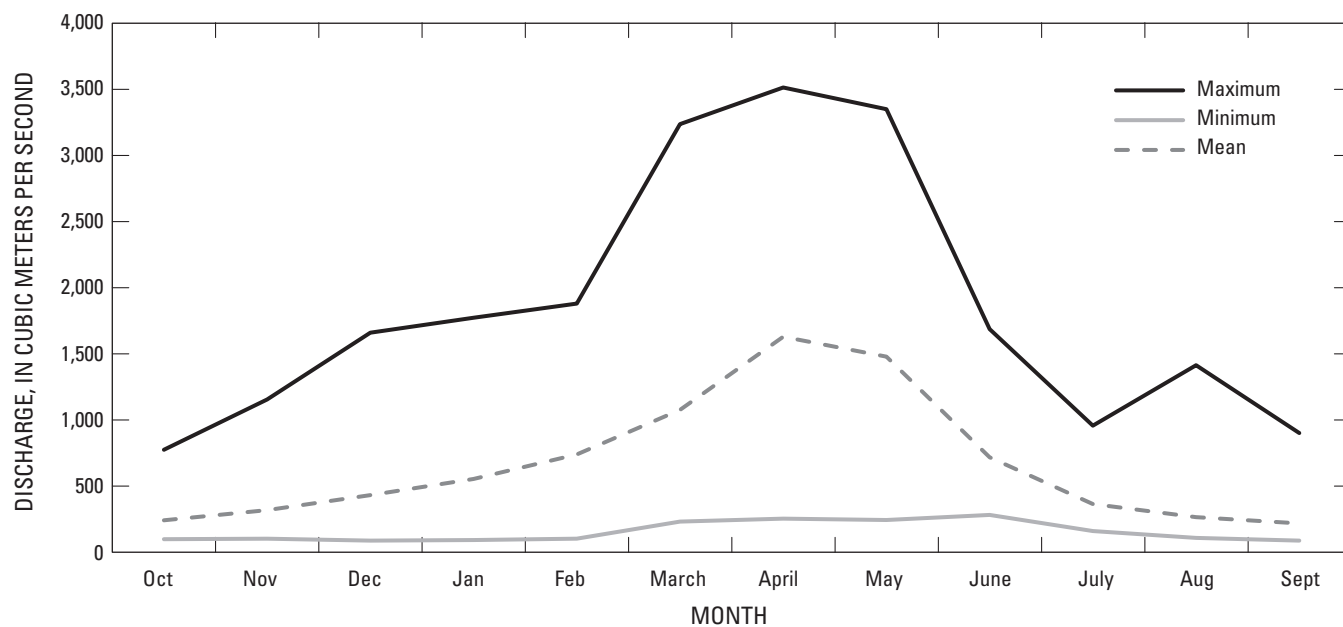
RECORDS: Discharge measurements are complete. Discharge measurements were taken regularly from the old bridge.



**Figure 8.** Annual mean discharge at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

**Table 12.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean Discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	774.70	1995	98.50	1948	241.40	167.50	0.69	3.00
November	1,155.00	1943	102.30	1986	318.32	188.95	0.59	3.96
December	1,660.00	1969	87.70	1986	431.77	269.68	0.62	5.37
January	1,773.00	1969	92.10	1986	553.93	341.21	0.62	6.89
February	1,880.00	1978	102.50	1986	739.28	351.61	0.48	9.20
March	3,237.00	1969	231.60	1991	1,076.22	546.84	0.51	13.40
April	3,514.00	1954	253.90	1989	1,629.11	726.24	0.45	20.28
May	3,350.00	1963	243.60	1991	1,478.86	681.34	0.46	18.41
June	1,687.00	1963	282.00	1989	717.72	286.11	0.40	8.93
July	957.00	1995	160.10	1985	364.34	186.63	0.51	4.53
August	1,414.00	1990	108.30	1961	265.16	234.65	0.88	3.30
September	901.10	1988	87.70	1935	217.93	184.97	0.85	2.71
Annual	1,370.98	1969	269.88	1986	669.75	229.16	0.34	100.00

**Figure 9.** Monthly discharge at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.



**Table 13.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

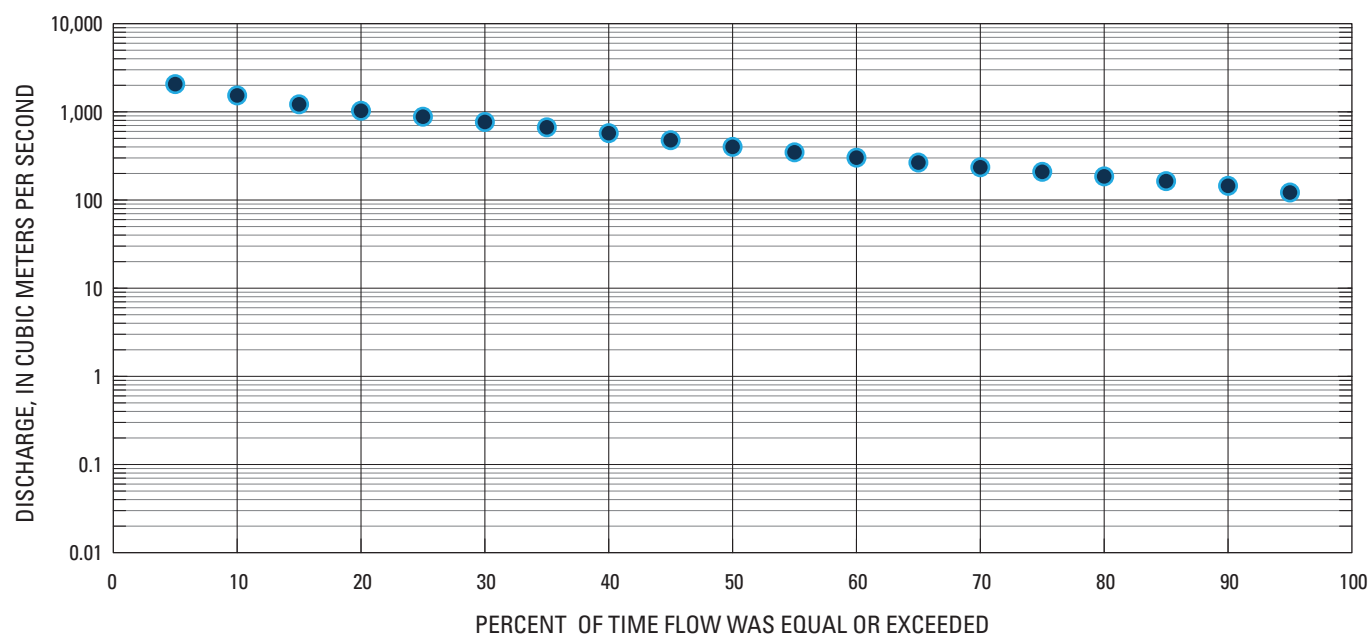
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	103.00	166.90	348.70	704.80	442.20	698.90	1,423.00	1,049.00	653.20	288.70	154.60	109.80	511.90
1932	102.10	149.50	286.00	200.40	463.40	796.80	839.30	968.90	520.00	205.10	120.10	101.20	396.07
1933	99.20	163.70	135.80	181.10	282.40	616.70	846.20	1,187.00	644.30	239.70	138.70	103.20	386.50
1934	114.40	121.30	341.80	240.10	424.20	578.50	1,062.00	896.50	582.30	218.60	121.80	100.30	400.15
1935	107.90	135.50	151.90	529.60	1,204.00	943.70	1,342.00	996.30	454.80	199.00	111.70	87.70	522.01
1936	103.40	283.70	734.70	268.20	953.80	686.50	1,366.00	1,225.00	578.30	267.70	146.80	105.00	559.93
1937	102.00	307.70	370.70	295.50	664.20	748.00	1,506.00	930.60	508.30	248.50	130.50	96.80	492.40
1938	103.30	379.60	419.90	778.70	933.10	850.70	2,084.00	1,736.00	787.60	380.80	205.10	159.00	734.82
1939	158.70	324.30	310.10	585.90	640.20	1,371.00	1,987.00	1,705.00	674.10	303.90	193.00	158.00	700.93
1940	162.30	232.10	398.90	1,213.00	1,203.00	935.30	2,153.00	1,452.00	750.90	350.90	191.20	143.50	765.51
1941	299.10	270.30	584.50	879.10	1,552.00	1,981.00	1,756.00	1,499.00	614.30	286.00	163.10	140.30	835.39
1942	152.50	165.20	206.60	629.50	731.20	1,594.00	1,849.00	1,663.00	791.50	349.50	191.10	149.20	706.03
1943	210.20	1,155.00	995.50	1,009.00	811.50	1,109.00	1,817.00	1,903.00	797.10	370.50	204.90	156.80	878.29
1944	166.60	198.50	251.60	383.00	533.20	916.00	1,562.00	1,603.00	583.40	258.50	167.30	152.20	564.61
1945	137.50	357.70	210.10	788.90	620.20	740.00	1,197.00	1,108.00	620.10	256.50	148.90	134.00	526.58
1946	132.00	163.70	327.60	561.90	766.70	1,320.00	1,894.00	2,456.00	1,046.00	457.00	253.30	201.50	798.31
1947	371.60	230.70	214.00	724.00	704.30	1,096.00	966.70	702.70	388.80	182.90	119.80	97.00	483.21
1948	98.50	331.90	372.30	379.80	1,008.00	821.60	2,145.00	2,428.00	1,224.00	457.90	227.00	158.70	804.39
1949	166.00	174.00	255.20	252.20	494.00	844.70	1,901.00	1,795.00	837.20	350.10	195.50	160.00	618.74
1950	158.30	170.00	234.70	379.80	446.00	1,129.00	1,496.00	1,981.00	778.50	344.30	206.40	153.00	623.08
1951	197.50	185.80	239.20	593.50	488.10	739.60	1,082.00	996.50	500.70	237.00	153.50	142.00	462.95
1952	256.90	307.80	359.20	377.30	1,680.00	1,342.00	1,937.00	1,718.00	754.10	340.20	193.00	148.20	784.48
1953	142.80	161.70	248.40	404.40	1,040.00	1,638.00	2,278.00	1,722.00	907.60	422.10	234.90	169.30	780.77
1954	177.10	297.80	308.30	726.40	1,114.00	2,309.00	3,514.00	2,458.00	1,235.00	511.00	267.90	205.50	1,093.67
1955	203.50	267.80	421.00	442.60	458.00	691.90	957.30	1,035.00	347.10	188.30	148.80	120.00	440.11
1956	135.70	172.20	648.10	553.60	1,060.00	1,312.00	1,593.00	1,406.00	909.10	371.10	178.80	162.00	708.47
1957	178.80	218.80	285.10	297.90	651.00	1,825.00	1,086.00	2,262.00	986.10	438.70	260.40	217.80	725.63
1958	205.10	262.70	347.70	592.90	613.40	1,157.00	1,430.00	1,063.00	641.70	308.20	181.10	152.70	579.63
1959	149.60	168.30	345.00	466.40	330.50	781.90	1,557.00	1,243.00	574.60	240.20	156.10	135.30	512.33
1960	162.30	185.10	185.90	512.10	500.70	942.80	1,772.00	1,391.00	459.80	197.00	128.90	111.50	545.76
1961	107.10	160.30	191.80	300.40	370.60	455.40	1,022.00	1,069.00	392.40	175.20	108.30	98.10	370.88
1962	116.90	270.20	711.00	445.30	835.50	1,246.00	1,270.00	1,101.00	484.40	211.10	129.90	114.30	577.97
1963	149.60	177.00	718.80	1,038.00	1,273.00	1,170.00	3,385.00	3,350.00	1,687.00	655.40	330.10	247.50	1,181.78
1964	392.30	443.70	430.60	338.20	760.60	2,173.00	1,692.00	1,428.00	791.50	315.50	203.20	164.90	761.13
1965	173.30	332.50	291.80	306.50	739.80	1,094.00	1,641.00	1,379.00	686.30	258.00	130.20	116.70	595.76
1966	374.50	360.30	675.80	1,359.00	1,328.00	950.70	1,635.00	1,348.00	663.20	296.70	152.30	131.60	772.93
1967	224.90	243.20	481.40	658.60	706.50	1,592.00	2,439.00	3,273.00	1,132.00	417.10	206.00	181.00	962.89
1968	211.60	672.70	1,230.00	1,154.00	987.70	2,402.00	2,857.00	2,238.00	1,048.00	375.50	211.60	175.70	1,130.32
1969	191.10	331.40	1,660.00	1,773.00	1,173.00	3,237.00	3,080.00	3,037.00	1,051.00	429.00	259.20	230.10	1,370.98
1970	296.10	311.30	383.00	474.30	968.20	1,044.00	1,191.00	618.70	360.40	263.40	208.20	195.50	526.18

**Table 13.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1971	237.80	292.00	419.10	337.90	373.50	732.90	1,788.00	945.40	407.90	201.90	159.40	150.50	503.86
1972	207.00	209.00	341.30	243.20	497.60	876.90	1,916.00	2,971.00	1,014.00	378.90	257.30	213.10	760.44
1973	185.60	256.00	222.80	203.30	386.50	593.90	853.30	901.20	473.50	220.80	131.40	119.90	379.02
1974	157.90	230.50	271.70	274.00	298.20	1,612.00	1,806.00	922.50	426.40	200.80	130.70	135.20	538.83
1975	137.50	193.60	273.20	268.00	607.30	822.60	1,461.00	1,262.00	502.70	207.00	133.20	126.20	499.53
1976	136.60	197.30	306.40	803.10	997.70	1,081.00	3,494.00	2,520.00	1,153.00	429.30	237.20	198.10	962.81
1977	325.30	407.90	564.10	388.20	596.90	953.70	1,458.00	1,268.00	512.40	237.10	146.80	115.00	581.12
1978	150.60	173.50	469.20	664.20	1,880.00	1,564.00	1,621.00	1,414.00	731.50	311.80	174.00	146.00	774.98
1979	157.20	171.00	375.50	771.80	627.20	753.40	1,131.00	934.70	508.00	215.50	143.70	133.10	493.51
1980	323.70	506.50	576.40	526.90	704.10	1,412.00	2,538.00	1,471.00	581.40	287.50	214.30	197.80	778.30
1981	210.50	265.80	450.30	649.00	981.00	1,392.00	1,436.00	1,327.00	784.90	322.80	174.60	151.50	678.78
1982	159.10	323.00	400.50	621.10	751.10	849.10	2,230.00	2,183.00	858.10	326.20	192.90	150.70	753.73
1983	247.20	250.90	215.60	262.70	383.30	966.70	1,179.00	1,257.00	520.10	223.90	165.20	151.30	485.24
1984	191.10	858.40	659.30	330.80	573.10	895.80	1,104.00	899.30	535.40	251.90	134.90	118.00	546.00
1985	152.90	321.40	283.70	350.60	807.80	1,058.00	2,328.00	1,291.00	502.10	160.10	126.70	112.50	624.57
1986	100.70	102.30	87.70	92.10	102.50	322.40	515.40	553.50	503.10	252.30	296.50	310.00	269.88
1987	356.60	379.00	376.80	425.10	1,018.00	1,602.00	2,084.00	1,955.00	1,257.00	507.70	272.00	301.90	877.93
1988	446.70	688.80	868.90	1,708.00	797.40	1,818.00	3,380.00	2,240.00	1,275.00	872.60	912.40	901.10	1,325.74
1989	747.20	630.00	432.90	367.10	273.90	236.20	253.90	257.30	282.00	282.30	294.20	289.10	362.18
1990	458.00	434.80	489.80	317.90	521.90	804.00	418.00	968.40	633.00	596.40	1,414.00	496.40	629.38
1991	385.20	337.80	292.50	—	855.10	231.60	267.60	243.60	349.00	543.20	507.00	378.10	399.15
1992	317.90	567.70	374.40	396.60	740.60	875.30	1,037.00	1,586.00	544.40	834.80	747.10	680.20	725.17
1993	394.70	299.60	795.20	807.50	691.60	908.60	1,718.00	2,401.00	1,290.00	915.40	898.60	814.80	994.58
1994	770.80	522.50	308.80	260.00	312.20	433.90	890.30	769.10	568.60	613.80	637.60	695.10	565.23
1995	774.70	724.60	1,073.00	985.00	1,092.00	764.10	1,369.00	1,454.00	1,093.00	957.00	742.70	785.80	984.58
1996	744.40	494.80	382.80	364.80	402.50	386.20	1,398.00	793.40	573.20	591.70	626.30	625.30	615.28
1997	601.30	476.90	304.30	341.40	302.40	280.00	865.40	874.10	760.60	801.30	662.10	—	569.98



**Figure 10.** Annual flow duration at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

**Table 14.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	99.00	117.90	155.40	195.10	246.50	297.40	428.60	566.40	295.00	168.80	114.80	97.40	121.70
90	106.00	137.40	180.70	222.80	282.80	393.20	729.50	720.50	346.20	180.40	125.00	104.00	144.90
85	116.20	154.30	199.50	246.60	315.40	472.80	834.20	804.70	388.50	194.30	132.10	111.90	163.70
80	132.40	165.20	215.40	269.00	341.50	545.30	918.60	874.90	429.60	210.90	138.10	118.10	185.40
75	137.90	173.80	229.00	289.90	371.50	607.30	998.00	943.60	468.60	225.70	144.00	123.00	208.80
70	143.50	182.90	242.00	309.70	405.50	666.60	1,106.90	1,008.70	513.00	240.20	150.90	130.10	235.20
65	151.00	192.40	254.60	329.30	445.30	720.90	1,186.30	1,069.10	548.10	254.40	159.60	137.70	266.00
60	158.40	203.70	268.70	348.80	491.10	773.90	1,261.60	1,125.10	578.30	268.20	167.60	145.00	302.30
55	165.80	219.00	286.90	368.60	539.90	825.50	1,342.00	1,189.00	611.40	282.50	175.00	149.40	347.50
50	173.80	236.60	306.30	389.40	588.60	879.90	1,433.50	1,259.20	648.30	300.20	182.30	153.40	400.70
45	183.20	254.00	327.40	410.20	640.60	954.00	1,553.80	1,345.60	681.00	316.00	194.20	157.30	476.80
40	195.10	270.20	351.20	442.90	698.40	1,027.50	1,686.40	1,450.70	717.70	339.00	206.60	163.70	573.30
35	208.50	291.00	377.00	481.80	767.40	1,100.40	1,822.80	1,591.90	760.80	364.80	218.90	170.60	667.60
30	223.40	318.60	413.20	538.00	838.00	1,193.00	1,961.20	1,710.80	827.20	397.90	233.00	187.30	767.70
25	253.20	357.40	459.90	627.40	919.80	1,302.00	2,079.10	1,848.50	887.30	432.60	249.70	203.70	881.00
20	307.50	404.80	524.50	726.70	1,019.00	1,442.80	2,203.00	2,019.90	950.00	493.80	280.60	225.40	1,028.90
15	379.30	499.40	630.80	862.10	1,142.80	1,622.10	2,420.80	2,218.90	1,041.00	568.40	319.60	282.80	1,217.20
10	522.50	576.40	785.40	1,080.30	1,330.40	1,972.30	2,758.10	2,566.50	1,153.90	643.40	611.00	497.00	1,534.80
5	732.80	733.50	1,040.90	1,478.50	1,728.60	2,496.00	3,346.60	3,112.10	1,438.80	857.00	758.40	715.60	2,062.70

**Table 15.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.8	1.25	1,963.20	1,689.50	1,482.80	1,302.90
0.5	2	2,927.70	2,470.30	2,125.50	1,827.20
0.2	5	4,181.80	3,499.90	2,960.60	2,523.10
0.1	10	4,955.80	4,148.20	3,481.70	2,968.60
0.05	20	5,654.90	4,743.80	3,958.20	3,384.70
0.02	50	6,503.40	5,481.20	4,545.70	3,910.10
0.01	100	7,102.90	6,012.50	4,967.80	4,296.50

**Table 16.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T3, Tigris River at Mosul, Iraq, water years 1931–97.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	137.570	140.540	143.240	146.610	153.680	165.820	238.090
0.2	5	109.230	110.520	111.770	113.240	117.740	125.770	179.370
0.1	10	99.706	100.200	100.900	101.700	105.260	111.800	157.090
0.05	20	93.727	93.600	93.923	94.279	97.201	102.750	141.880
0.02	50	88.582	87.803	87.758	87.706	90.024	94.649	127.540
0.01	100	85.903	84.717	84.455	84.173	86.142	90.244	119.340

## Tigris River Basin

### RAWANDUZ RIVER AT JINDIAN (IRQ\_T4)

(U.S. Geological Survey identification number:36380004434000)

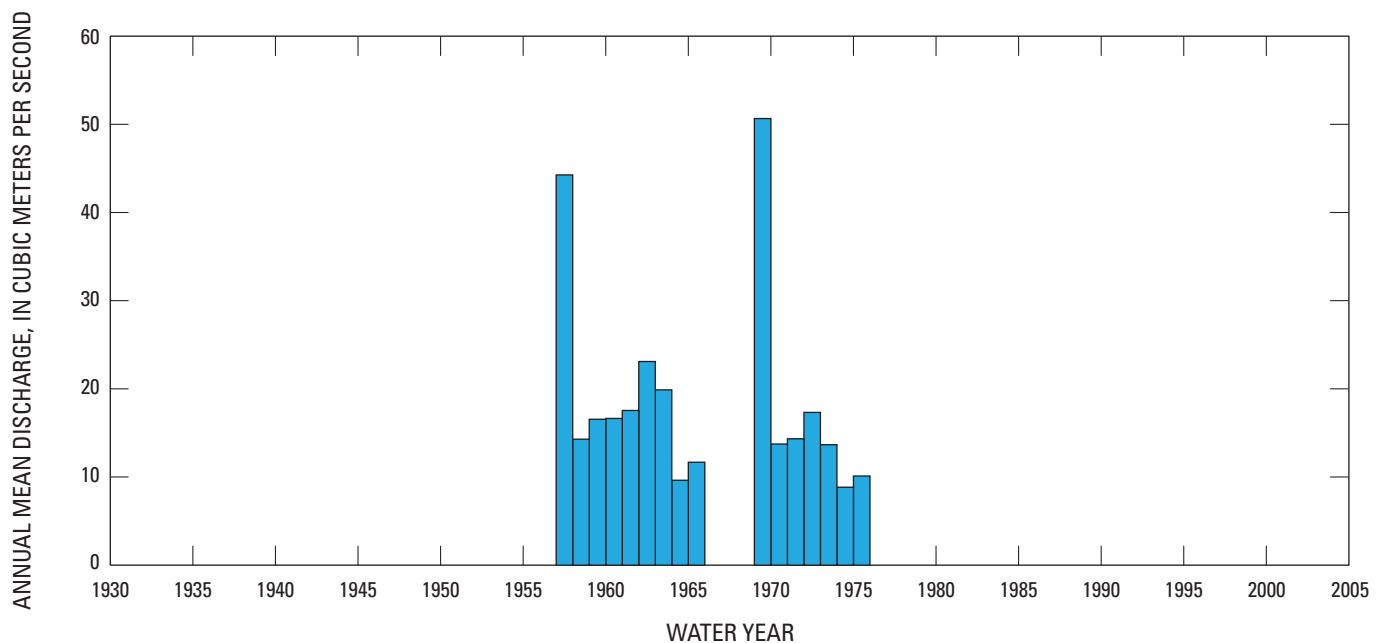
LOCATION: Latitude 36° 38' 00" N, Longitude 44° 34' 00" E.

DRAINAGE AREA: 1,160 square kilometers.

PERIOD OF RECORD: February 1957 to September 1975.

GAGE: The staff gage is fixed inside the well of the automatic water-stage recorder on the right bank of the Rawanduz River. An auxiliary external staff gage consisting of a standard gage plate attached to a timber backboard mounted on a 2-inch galvanized pipe set in concrete also is on the right bank. Gage height is set to an arbitrary datum.

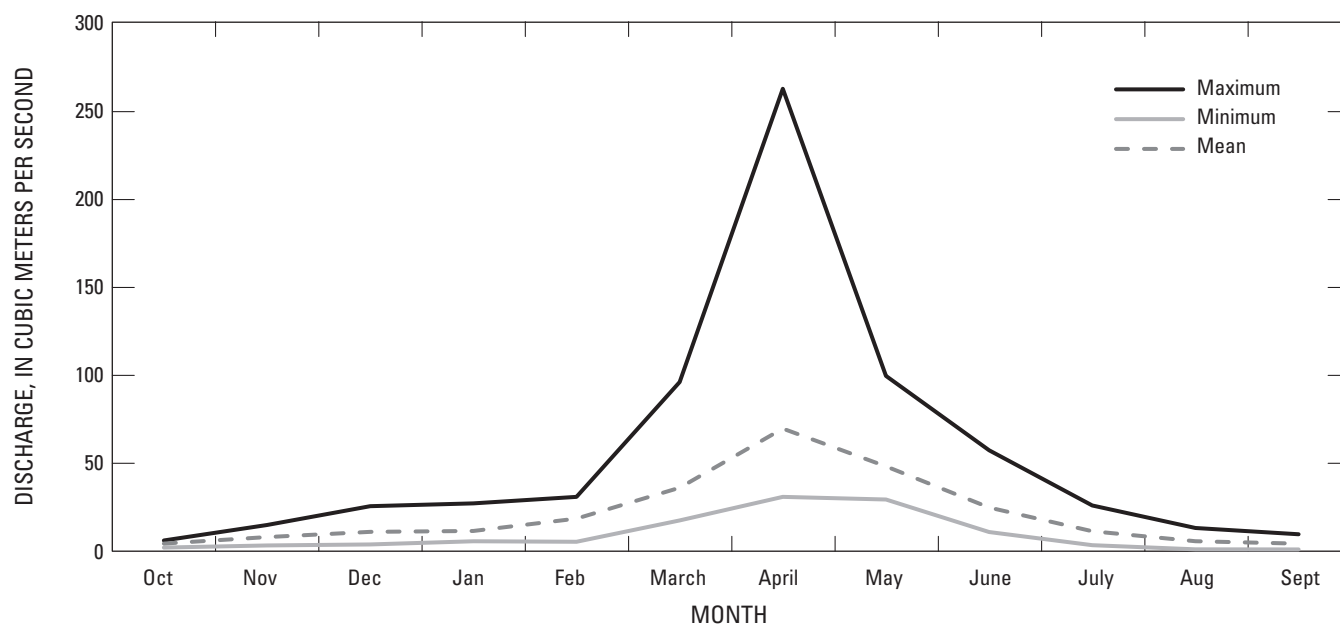
RECORDS: Discharge measurements were made regularly until January 1965 from a cableway or by wading. Records show missing discharge data because of damage to gage during 1965 to 1970 time periods.



**Figure 11.** Annual mean discharge at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

**Table 17.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	6.10	1958	2.06	1972	4.33	1.50	0.35	1.71
November	14.90	1972	3.27	1959	8.03	3.40	0.42	3.17
December	25.60	1972	3.84	1960	11.00	5.77	0.52	4.34
January	27.20	1963	5.65	1971	11.51	6.20	0.54	4.54
February	30.90	1963	5.36	1959	18.53	8.28	0.45	7.31
March	96.20	1969	17.50	1961	36.09	23.06	0.64	14.23
April	263.00	1969	30.90	1970	69.73	68.78	0.99	27.49
May	99.70	1957	29.40	1958	48.25	20.15	0.42	19.02
June	57.40	1957	10.90	1972	24.84	12.19	0.49	9.79
July	26.00	1957	3.42	1971	11.35	6.27	0.55	4.47
August	13.20	1957	1.06	1971	5.67	3.15	0.56	2.24
September	9.63	1964	1.00	1970	4.29	2.34	0.55	1.69
Annual	50.66	1969	8.84	1974	18.89	11.83	0.63	100.00

**Figure 12.** Monthly discharge at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.



**Table 18.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1957	—	—	—	—	15.20	65.90	69.40	99.70	57.40	26.00	13.20	7.30	44.26
1958	6.10	7.24	7.69	9.29	13.70	27.30	36.30	29.40	17.70	8.14	5.01	3.60	14.29
1959	3.00	3.27	9.52	5.71	5.36	17.70	60.00	44.70	26.10	13.30	6.06	3.87	16.55
1960	3.90	4.40	3.84	7.03	16.00	20.70	50.70	51.90	24.60	9.52	3.90	3.20	16.64
1961	2.97	7.37	7.58	8.90	13.40	17.50	46.80	55.20	26.90	13.10	6.55	4.27	17.55
1962	3.97	8.87	11.90	17.90	30.80	36.50	50.90	52.70	33.50	17.50	8.00	4.63	23.10
1963	5.03	5.87	11.00	27.20	30.90	39.30	—	—	—	—	—	—	19.88
1964	—	—	—	—	—	—	—	—	—	—	—	9.63	9.63
1965	6.00	6.77	6.00	14.20	25.40	—	—	—	—	—	—	—	11.67
1966	—	—	—	—	—	—	—	—	—	—	—	—	—
1967	—	—	—	—	—	—	—	—	—	—	—	—	—
1968	—	—	—	—	—	—	—	—	—	—	—	—	—
1969	—	—	18.30	12.10	25.60	96.20	263.00	41.30	25.30	12.40	6.74	5.63	50.66
1970	5.77	6.10	8.58	17.10	17.20	25.30	30.90	31.00	15.20	4.74	2.00	1.00	13.74
1971	2.23	12.30	15.10	5.65	11.90	25.90	44.70	35.80	12.90	3.42	1.06	1.00	14.33
1972	2.06	14.90	25.60	7.06	15.40	35.70	44.60	40.80	10.90	4.55	3.32	3.00	17.32
1973	5.81	7.50	9.13	8.45	29.10	25.10	—	—	26.20	13.40	6.77	5.13	13.66
1974	5.13	11.80	8.81	9.00	9.46	—	—	—	—	—	—	—	8.84
1975	—	—	—	—	—	—	—	—	21.40	10.10	5.42	3.53	10.11

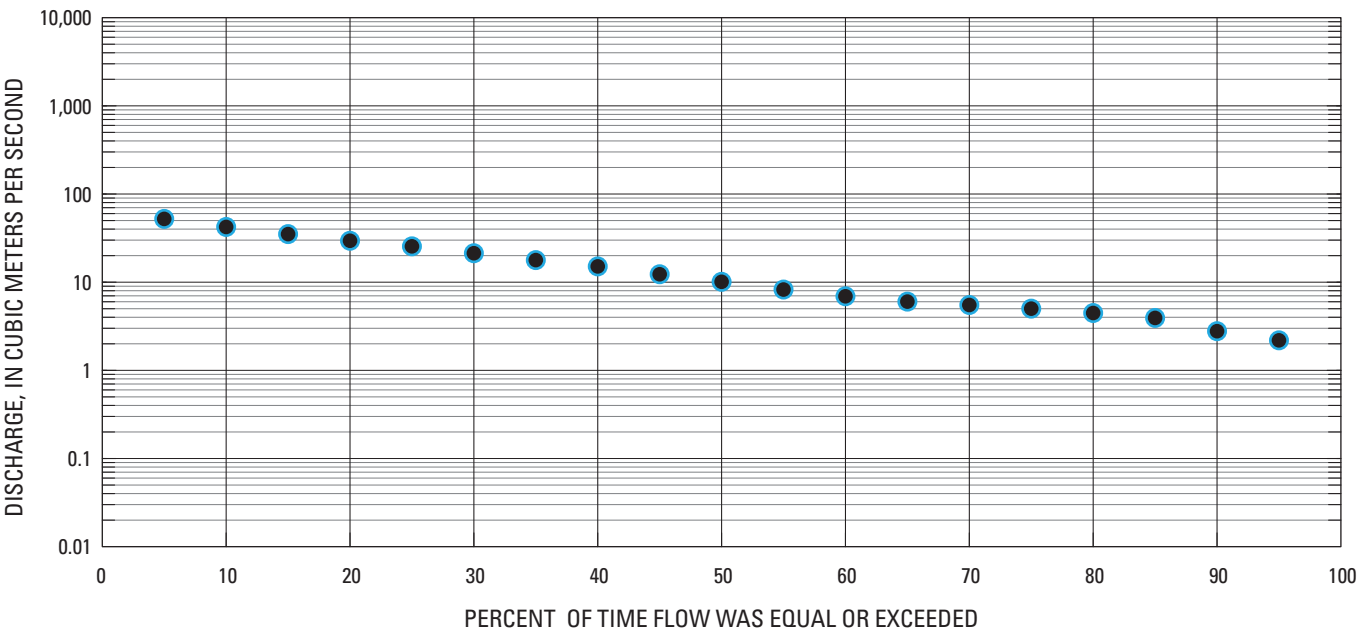


Figure 13. Annual flow duration at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

Table 19. Monthly and annual flow duration at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	1.07	3.10	3.94	4.85	5.38	13.60	28.40	26.50	7.95	2.99	1.06	1.03	2.19
90	2.04	3.19	4.94	5.08	8.08	16.30	30.50	28.50	10.50	3.83	2.04	1.07	2.78
85	2.91	4.08	5.81	5.81	9.34	17.90	32.30	30.30	13.60	4.05	2.14	1.10	3.93
80	2.96	4.86	6.00	6.04	10.30	21.20	34.10	31.90	16.10	5.16	3.09	3.08	4.47
75	3.02	5.02	6.19	6.93	10.80	22.80	35.90	33.40	17.70	6.17	3.30	3.16	5.01
70	3.07	5.18	6.91	7.32	11.70	24.10	38.30	35.80	19.10	7.38	4.16	3.24	5.51
65	3.93	5.99	7.09	7.71	12.90	25.40	40.80	38.40	19.90	8.18	4.46	3.43	6.02
60	3.99	6.09	7.27	8.09	14.40	26.40	43.40	39.60	20.70	8.83	4.83	3.78	6.92
55	4.05	6.18	8.03	9.22	15.20	27.50	46.00	41.40	22.00	10.30	4.98	4.05	8.25
50	4.92	6.28	8.40	9.57	16.10	28.80	47.80	43.50	23.60	11.00	5.31	4.11	10.10
45	5.00	6.87	8.87	10.20	17.50	30.20	49.20	45.80	24.90	11.50	5.72	4.18	12.30
40	5.07	7.04	10.10	11.00	18.80	31.60	50.60	48.10	26.30	12.00	5.88	4.24	15.10
35	5.15	7.33	11.40	11.70	20.00	33.50	52.00	50.20	27.60	13.00	6.03	5.01	17.80
30	5.92	8.05	12.70	12.40	22.00	35.70	53.40	52.70	28.70	14.20	6.73	5.11	21.30
25	5.98	9.12	14.80	13.20	24.00	39.00	56.00	55.50	30.00	15.40	6.96	5.21	25.50
20	6.03	11.10	16.30	14.50	25.90	42.10	59.80	59.30	31.20	16.70	7.18	5.74	29.50
15	6.09	13.60	18.40	15.90	28.30	45.00	65.00	63.60	33.20	18.20	8.43	7.05	35.10
10	6.15	14.70	20.00	17.60	34.50	48.90	73.30	77.00	42.00	20.40	10.10	7.85	42.30
5	6.26	19.50	25.60	21.00	43.20	57.50	86.50	97.60	50.80	23.80	12.90	9.22	52.20

**Table 20.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	48.51	44.96	42.67	40.18
0.50	2	62.38	56.65	54.06	50.91
0.20	5	79.16	70.60	66.68	61.70
0.10	10	89.18	78.87	73.65	67.11
0.05	20	98.15	86.23	79.54	71.37
0.02	50	109.01	95.11	86.28	75.87
0.01	100	116.72	101.40	90.80	78.68

**Table 21.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T4, Rawanduz River at Jindian, Iraq, water years 1957–75.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	2.97	3.08	3.26	3.35	3.49	3.78	6.19
0.2	5	1.70	1.77	1.85	1.88	1.96	2.28	5.20
0.1	10	1.21	1.25	1.29	1.29	1.35	1.66	4.77
0.05	20	0.89	0.91	0.92	0.91	0.95	1.24	4.46
0.02	50	0.61	0.61	0.60	0.59	0.62	0.86	4.14
0.01	100	0.47	0.46	0.44	0.43	0.45	0.66	3.95

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Tigris River Basin

BALIKIAN RIVER AT BALIKIAN (IRQ\_T5)

(U.S. Geological Survey identification number:36390004430000)

LOCATION: Latitude 36° 39' 00" N, Longitude 44° 30' 00" E.

DRAINAGE AREA: 1,060 square kilometers.

PERIOD OF RECORD: April 1958 to March 1974.

GAGE: The staff gage is located on the left bank of the Balikian River, 400 meters upstream of the Balikian Road Bridge and about 3 meters upstream of the confluence of the Balikian and Ruwanduz Rivers. The gage was damaged on March 30, 1974; therefore, data are not available after March 30, 1974.

RECORDS: Discharge measurements were made regularly until January 1965 from a cableway or by wading. Only a few measurements were made after January 1965.

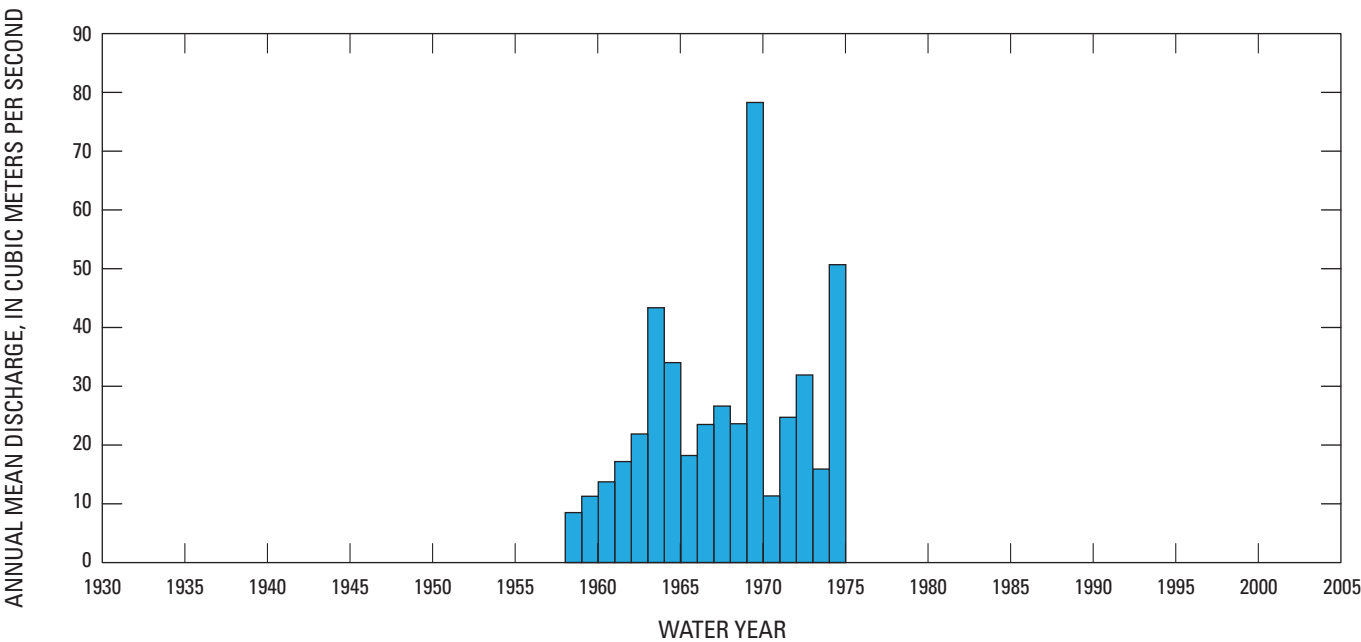
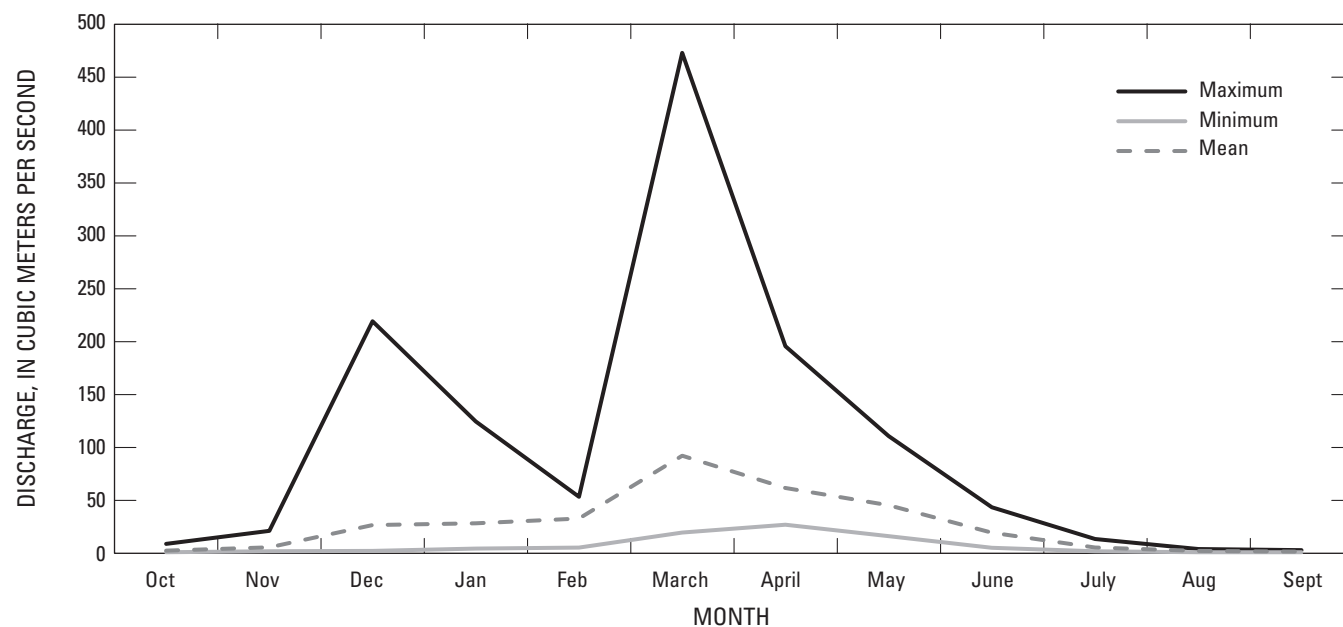


Figure 14. Annual mean discharge at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

**Table 22.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.[m<sup>3</sup>/s, cubic meters per second]

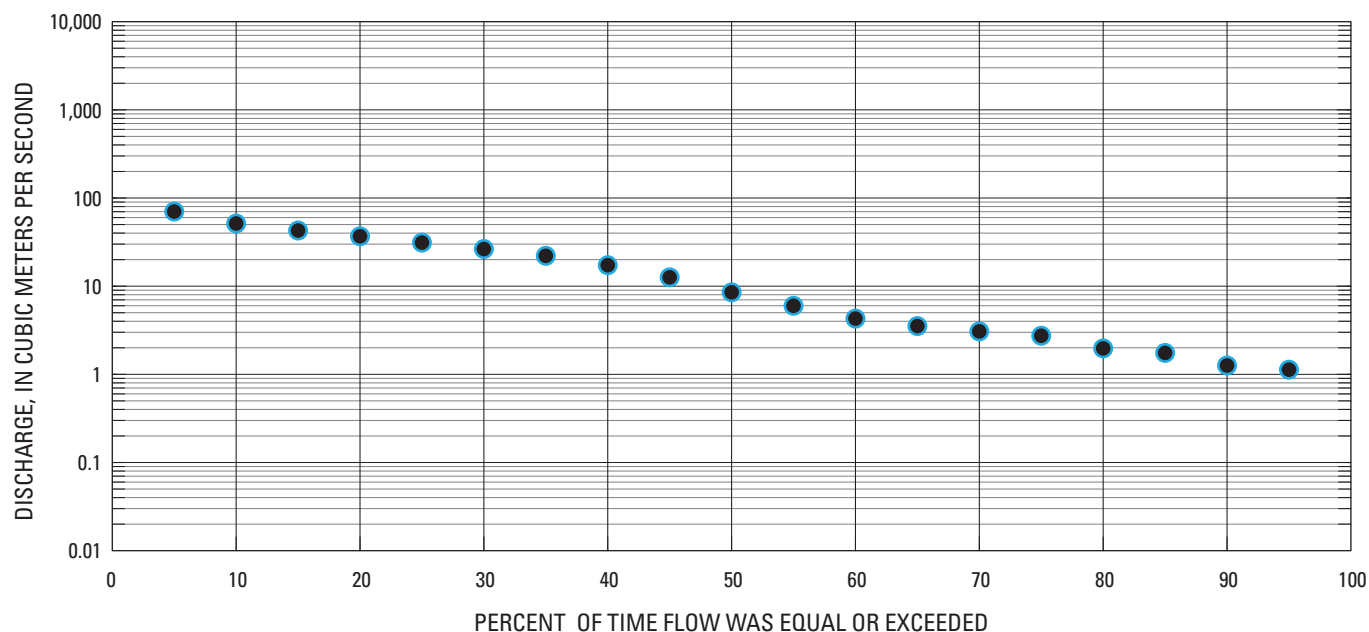
Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	8.90	1966	1.00	1962	2.52	2.39	0.95	0.78
November	21.20	1962	1.93	1971	5.63	4.69	0.83	1.74
December	219.30	1969	2.26	1960	26.68	53.12	1.99	8.23
January	124.60	1963	4.45	1971	28.34	34.25	1.21	8.74
February	53.40	1964	5.39	1959	32.85	14.40	0.44	10.13
March	473.00	1964	19.60	1970	92.23	122.00	1.32	28.45
April	195.70	1971	27.00	1970	61.73	40.99	0.66	19.04
May	110.80	1963	16.20	1959	45.43	26.59	0.59	14.01
June	43.50	1963	5.20	1970	19.48	10.81	0.55	6.01
July	13.50	1963	1.90	1970	5.46	3.06	0.56	1.68
August	4.03	1963	1.00	1958	2.26	0.93	0.41	0.70
September	2.97	1963	1.00	1958	1.56	0.66	0.42	0.48
Annual	78.28	1969	8.50	1958	26.75	17.49	0.65	100.00

**Figure 15.** Monthly discharge at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

**Table 23.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1958	—	—	—	—	—	—	22.00	18.00	7.00	2.00	1.00	1.00	8.50
1959	1.00	2.10	7.61	4.90	5.39	24.80	42.50	28.20	12.50	3.77	1.58	1.00	11.28
1960	1.29	2.30	2.26	14.90	25.70	31.60	39.10	31.00	11.40	3.00	1.26	1.00	13.73
1961	1.03	6.53	5.74	10.50	24.50	24.50	51.90	56.10	18.80	4.19	1.39	1.00	17.18
1962	1.00	21.20	25.30	42.00	48.50	32.90	36.30	30.80	16.30	4.81	2.19	1.23	21.88
1963	1.94	2.67	18.00	124.60	43.20	61.80	93.30	110.80	43.50	13.50	4.03	2.97	43.36
1964	7.45	7.97	11.40	10.90	53.40	195.00	59.20	34.20	18.90	5.23	2.58	1.97	34.02
1965	2.00	3.83	4.06	14.90	41.00	35.30	45.90	37.50	22.50	6.32	3.26	2.00	18.21
1966	8.90	5.60	9.84	14.60	43.90	83.30	58.30	37.00	11.70	4.13	2.48	2.17	23.49
1967	3.94	3.07	9.32	97.70	37.10	60.70	36.40	43.00	18.70	4.87	2.68	2.00	26.62
1968	2.68	8.03	55.20	21.20	27.00	51.30	54.60	35.30	19.40	5.16	2.48	1.07	23.62
1969	2.06	5.70	219.30	36.20	44.60	473.00	60.00	52.20	31.30	9.03	3.48	2.53	78.28
1970	3.00	4.03	11.10	23.00	23.00	19.60	27.00	16.20	5.20	1.90	1.00	1.00	11.34
1971	1.00	1.93	5.23	4.45	11.80	28.20	195.70	32.80	9.83	3.23	1.42	1.00	24.72
1972	1.00	8.37	30.70	14.20	28.20	62.50	82.70	102.30	39.10	9.61	2.84	1.43	31.91
1973	1.03	3.77	3.19	11.10	50.20	26.10	43.10	34.00	13.10	3.16	1.16	1.00	15.91
1974	1.00	3.03	8.61	8.35	18.10	265.00	—	—	—	—	—	—	50.68



**Figure 16.** Annual flow duration at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

**Table 24.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	1.01	1.18	2.31	3.36	5.21	13.20	23.30	19.40	4.89	2.06	1.02	1.01	1.13
90	1.02	1.85	3.12	3.78	7.79	16.70	25.50	23.60	6.03	2.15	1.04	1.02	1.26
85	1.03	1.90	3.30	4.30	11.80	19.50	27.40	25.90	7.30	3.04	1.05	1.03	1.75
80	1.04	1.95	3.47	4.99	14.80	22.10	30.30	27.90	9.00	3.12	1.07	1.04	1.97
75	1.05	2.00	3.67	5.83	17.10	24.20	32.80	29.90	10.20	3.20	1.09	1.04	2.74
70	1.07	2.05	3.93	6.73	19.20	26.00	35.00	31.80	11.40	3.29	2.01	1.05	3.07
65	1.08	2.81	4.20	7.42	21.60	27.60	37.20	33.50	12.60	4.09	2.02	1.06	3.53
60	1.09	2.88	4.49	8.13	24.20	29.20	39.30	34.80	14.20	4.20	2.04	1.07	4.29
55	1.10	2.95	4.90	9.75	26.80	31.40	41.30	36.10	15.60	4.30	2.05	1.08	5.99
50	2.03	3.02	5.35	11.60	29.50	34.30	43.30	37.50	17.10	4.41	2.07	1.09	8.52
45	2.07	3.09	6.63	13.30	32.80	37.60	45.20	39.00	18.50	4.93	2.08	1.10	12.60
40	2.11	3.16	8.46	15.00	35.70	41.60	47.60	40.60	19.90	5.12	2.90	0.05	17.30
35	2.15	3.85	10.40	17.60	38.60	45.20	50.20	42.30	21.60	5.31	2.94	0.05	22.10
30	2.20	4.22	13.10	20.10	41.80	48.70	53.20	45.40	23.70	6.01	2.97	0.05	26.40
25	2.88	5.32	16.60	23.00	44.90	52.20	57.20	49.00	25.90	6.54	3.01	0.05	31.20
20	2.96	5.72	23.10	27.00	48.80	61.20	62.30	55.00	29.40	7.13	3.04	0.05	36.80
15	3.05	6.48	30.90	32.20	54.10	69.20	68.80	61.50	32.40	7.82	3.08	0.05	42.80
10	4.03	8.70	44.90	41.30	61.30	80.60	80.50	70.10	38.40	11.50	3.93	0.05	51.40
5	6.20	14.50	65.60	54.10	76.20	108.80	113.00	88.00	48.20	14.10	4.04	0.05	70.20



**Table 25.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.50	2	277.43	160.63	104.96	78.57
0.20	5	686.03	345.18	198.27	132.78
0.10	10	1,088.40	515.11	278.45	175.38
0.05	20	1,583.70	717.11	369.97	221.14
0.02	50	2,400.00	1,040.90	511.45	287.71
0.01	100	3,154.50	1,334.70	636.22	343.34

**Table 26.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T5, Balikian River at Balikian, Iraq, water years 1958–74.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	1.27	1.30	1.31	1.33	1.48	1.67	3.69
0.2	5	0.97	0.97	0.97	0.99	1.05	1.15	2.53
0.1	10	0.87	0.85	0.85	0.87	0.89	0.96	2.08
0.05	20	0.79	0.77	0.77	0.78	0.78	0.84	1.76
0.02	50	0.72	0.70	0.70	0.71	0.68	0.73	1.47
0.01	100	0.68	0.66	0.65	0.67	0.62	0.66	1.30

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## Tigris River Basin

### KHAZIR RIVER AT BAKRMAN DAM-IMRP (IRQ\_T6)

(U.S. Geological Survey identification number:000)

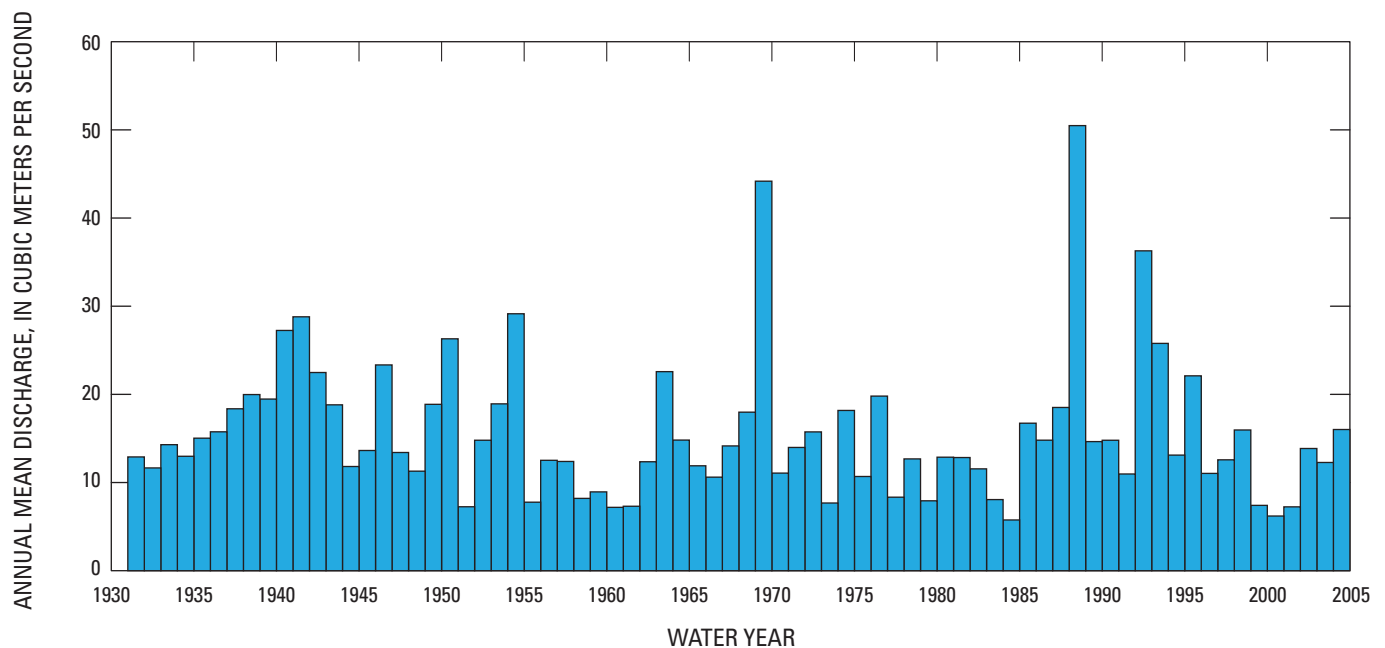
LOCATION: No information was available for this site.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: November 1931 to September 2004.

GAGE: No information available for this site.

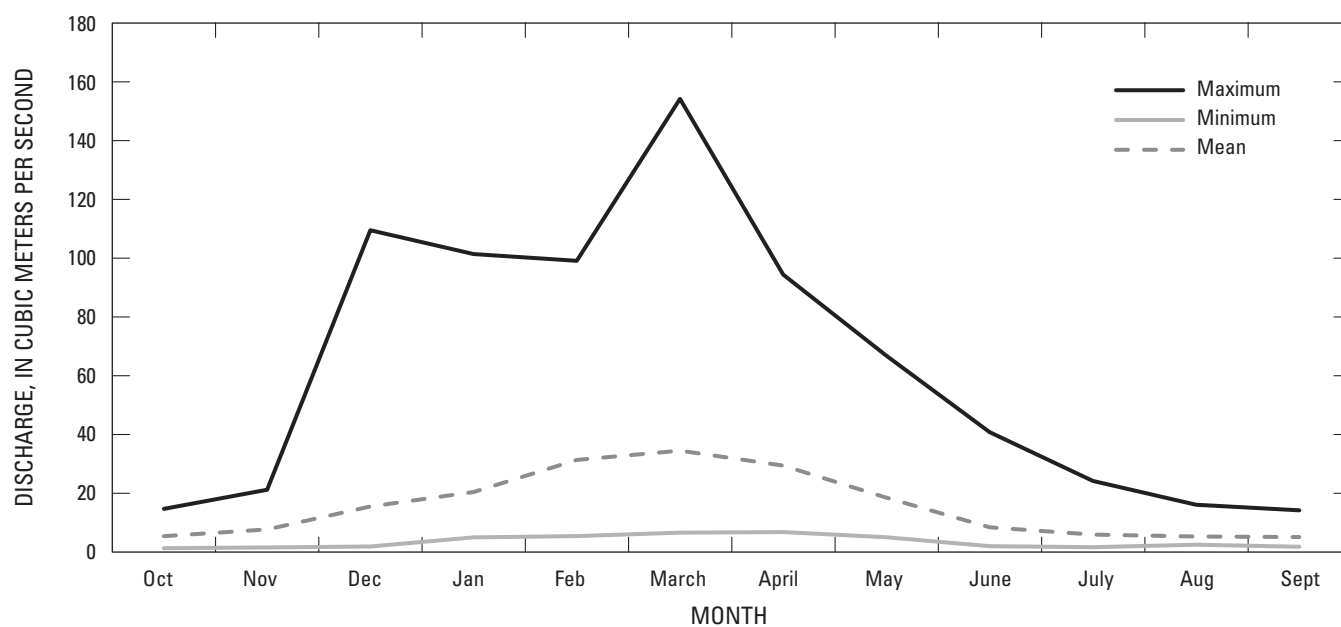
RECORDS: No information available for this site.



**Figure 17.** Annual mean discharge at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

**Table 27.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	14.70	1989	1.310	1994	5.41	2.34	0.43	2.88
November	21.20	1969	1.570	1994	7.70	3.68	0.48	4.10
December	109.50	1969	1.890	1994	15.51	15.81	1.02	8.27
January	101.40	1988	4.990	2000	20.43	16.27	0.80	10.89
February	99.10	1941	5.440	2001	31.35	20.54	0.66	16.71
March	154.20	1988	6.600	2000	34.50	26.49	0.77	18.39
April	94.40	1971	6.800	1984	29.42	18.54	0.63	15.68
May	66.80	1993	5.040	1958	18.50	13.23	0.72	9.86
June	40.80	1992	2.000	1994	8.43	5.37	0.64	4.49
July	24.20	1992	1.650	1994	5.94	3.48	0.59	3.17
August	16.10	1988	2.500	1948	5.29	2.51	0.47	2.82
September	14.20	1988	1.800	1993	5.11	2.29	0.45	2.72
Annual	50.48	1988	5.755	1984	15.64	8.04	0.51	100.00

**Figure 18.** Monthly discharge at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

**Table 28.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

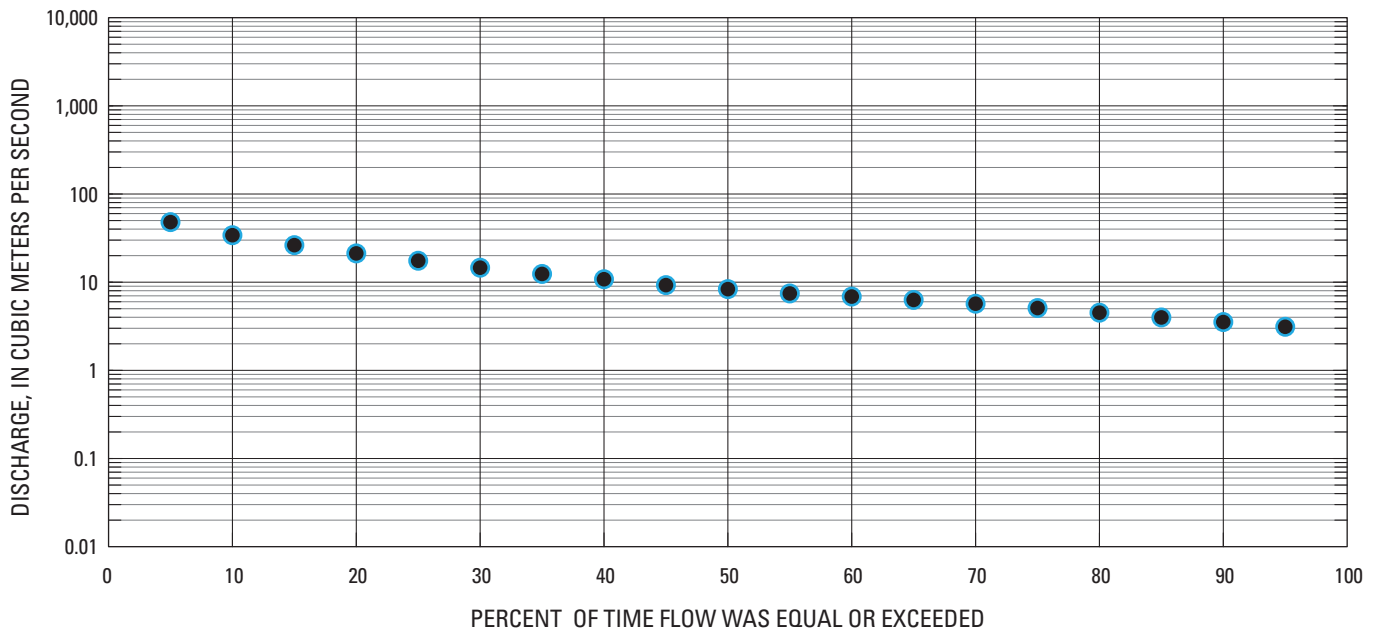
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	—	4.65	6.17	17.40	16.00	21.60	29.30	22.30	9.57	5.77	4.76	4.43	12.90
1932	4.39	4.41	3.45	7.02	22.40	28.30	25.20	21.70	8.96	5.21	4.51	4.34	11.66
1933	4.36	5.64	11.50	10.80	17.40	29.90	36.00	30.60	10.80	5.51	4.63	4.39	14.29
1934	4.40	5.89	14.00	9.25	16.50	20.10	33.30	28.00	10.10	5.34	4.53	4.33	12.98
1935	4.41	5.04	9.21	18.80	44.10	26.40	27.00	22.80	8.75	5.12	4.45	4.30	15.03
1936	4.46	7.04	16.40	9.85	31.40	26.60	38.20	30.10	10.30	5.58	4.70	4.42	15.75
1937	4.48	7.42	19.30	19.40	39.60	33.00	42.70	30.20	9.91	5.43	4.60	4.35	18.37
1938	4.64	6.27	10.90	26.50	42.60	34.00	47.90	38.10	12.60	6.36	5.13	4.74	19.98
1939	4.83	6.28	12.60	27.00	36.00	38.00	47.10	34.80	11.40	5.88	4.99	4.73	19.47
1940	4.76	6.28	18.90	56.00	78.00	49.20	49.10	36.70	12.10	6.18	5.02	4.76	27.25
1941	5.45	6.77	18.90	51.70	99.10	58.00	43.40	35.50	11.60	5.73	4.82	4.61	28.80
1942	4.66	4.86	9.65	36.30	51.20	51.90	44.40	38.00	12.80	6.21	5.02	4.75	22.48
1943	5.87	12.30	25.40	25.20	25.50	52.20	32.60	18.00	10.60	6.70	5.70	5.70	18.81
1944	6.45	6.38	8.59	23.80	23.10	26.10	25.40	9.06	4.29	2.45	3.10	3.10	11.82
1945	3.28	11.20	5.83	39.00	21.20	24.00	25.90	13.00	7.31	5.85	4.02	3.02	13.63
1946	5.30	8.93	16.00	17.40	47.10	82.70	39.00	27.70	11.90	9.78	7.07	7.20	23.34
1947	7.64	8.85	13.20	38.30	23.40	31.30	14.60	8.66	5.28	3.28	3.10	3.27	13.41
1948	3.81	8.58	10.80	8.93	11.60	17.70	35.40	25.50	5.32	3.16	2.50	2.18	11.29
1949	2.62	3.70	5.61	10.40	24.70	73.30	60.30	21.80	8.03	5.86	5.52	4.60	18.87
1950	4.80	5.70	14.10	32.00	49.90	102.40	35.00	46.50	9.47	6.09	4.94	4.73	26.30
1951	6.25	6.70	6.77	10.30	19.00	11.50	9.24	6.22	3.42	2.44	2.60	2.60	7.25
1952	2.78	4.03	8.42	7.65	78.90	32.90	13.40	12.50	5.78	4.02	3.60	3.60	14.80
1953	3.78	4.30	6.07	13.30	38.30	72.10	51.00	13.70	7.95	6.20	5.20	5.20	18.93
1954	5.20	15.00	9.49	24.60	58.20	97.30	86.00	20.80	11.80	8.43	6.62	6.28	29.14
1955	7.40	9.13	11.50	9.97	14.80	11.00	9.76	6.71	3.68	3.10	3.10	3.10	7.77
1956	3.10	5.02	31.40	22.80	18.00	29.20	19.40	8.70	4.33	3.02	2.68	2.60	12.52
1957	2.60	3.32	5.59	7.19	23.20	42.70	16.80	25.10	8.97	5.01	4.33	3.87	12.39
1958	4.60	7.24	12.90	17.40	15.40	13.10	8.85	5.04	3.60	3.60	3.60	3.10	8.20
1959	3.57	4.07	9.46	8.04	7.09	22.20	24.70	12.10	5.24	3.68	3.60	3.53	8.94
1960	3.57	3.99	5.26	11.70	11.40	16.50	14.80	6.27	3.42	3.12	3.10	3.10	7.19
1961	3.12	10.30	5.91	9.49	14.90	11.60	13.00	7.00	3.32	2.91	3.08	3.10	7.31
1962	3.08	8.26	34.70	32.40	21.00	17.60	12.50	6.99	3.60	2.95	2.62	2.60	12.36
1963	2.62	3.05	19.20	31.50	29.20	22.00	60.40	63.20	16.50	9.80	7.07	6.40	22.58
1964	7.86	8.50	11.00	11.50	34.80	49.60	23.80	11.40	5.97	4.96	4.29	4.11	14.82
1965	4.77	5.99	6.47	13.60	30.00	16.10	36.00	12.70	5.42	4.56	3.62	3.57	11.90
1966	5.84	6.65	7.97	12.10	22.10	29.40	21.20	7.87	4.23	3.47	3.10	3.40	10.61

**Table 28.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1967	4.45	5.67	7.82	9.99	30.90	47.40	25.50	14.10	7.19	6.10	5.52	5.20	14.15
1968	5.76	13.90	32.80	22.60	25.10	33.60	26.40	17.30	12.20	9.41	8.41	8.30	17.98
1969	9.65	21.20	109.50	79.10	51.40	111.70	68.70	32.50	16.00	12.10	9.52	8.80	44.18
1970	10.30	12.10	15.50	26.00	16.40	21.30	11.60	6.05	4.17	3.20	3.12	3.10	11.07
1971	3.79	5.68	7.50	5.64	8.09	11.30	94.40	9.60	6.02	5.38	5.20	5.16	13.98
1972	5.49	7.00	15.40	13.40	29.20	33.60	22.50	32.20	9.27	7.38	6.74	6.75	15.74
1973	7.16	8.08	7.85	8.59	13.80	10.30	9.80	6.72	5.19	4.72	4.72	5.20	7.68
1974	5.35	6.40	9.62	12.40	25.20	86.10	50.40	8.31	4.77	3.34	3.13	3.10	18.18
1975	3.99	5.03	5.79	6.05	44.40	25.20	14.50	9.45	4.01	3.28	3.10	3.43	10.69
1976	3.10	4.14	29.90	17.60	60.30	38.70	44.50	18.20	7.81	5.12	4.18	4.10	19.80
1977	4.97	7.00	7.39	9.87	26.40	10.50	13.00	7.43	4.20	3.10	3.10	3.10	8.34
1978	3.33	3.50	10.70	28.40	47.40	25.90	12.70	6.74	4.12	3.18	3.10	3.10	12.68
1979	4.00	5.38	9.27	14.00	16.10	12.70	9.93	6.46	4.80	4.10	4.10	4.30	7.93
1980	5.15	5.94	10.90	9.59	28.40	23.50	44.30	8.39	5.55	4.57	4.10	4.10	12.87
1981	3.62	6.71	8.76	15.50	23.10	45.20	19.80	11.90	7.36	4.24	3.73	4.10	12.84
1982	4.09	6.09	8.13	16.10	34.20	16.00	21.00	14.30	6.32	4.70	4.10	3.60	11.55
1983	6.15	10.60	7.74	10.00	16.10	17.50	9.09	6.80	3.94	3.18	2.74	2.96	8.07
1984	3.58	5.42	5.44	5.20	11.40	14.50	6.80	5.44	3.37	2.71	2.60	2.60	5.76
1985	3.07	12.20	7.75	6.44	49.10	24.90	40.30	11.20	13.20	12.10	10.40	10.10	16.73
1986	9.78	11.20	13.30	22.30	41.70	23.70	12.60	13.10	9.02	6.24	7.25	7.46	14.80
1987	8.22	16.90	29.50	19.70	20.10	46.30	29.10	13.40	9.26	8.80	10.90	10.00	18.52
1988	11.30	14.80	73.20	101.40	82.70	154.20	58.10	37.80	22.80	19.20	16.10	14.20	50.48
1989	14.70	17.90	24.20	19.40	17.20	28.40	17.60	14.70	7.47	4.76	4.70	4.70	14.64
1990	2.09	11.50	23.70	12.00	57.30	25.20	20.80	10.70	5.18	3.38	2.91	2.79	14.80
1991	3.06	4.40	7.27	8.68	14.80	34.80	15.30	11.80	9.35	7.24	7.04	7.90	10.97
1992	7.47	8.33	34.10	32.10	98.00	60.20	63.70	44.90	40.80	24.20	12.50	9.06	36.28
1993	8.36	13.70	46.60	32.70	43.50	28.50	44.60	66.80	15.50	4.72	2.60	1.80	25.78
1994	1.31	1.57	1.89	32.10	20.40	40.00	36.20	6.34	2.00	1.65	5.69	8.19	13.11
1995	8.58	11.80	33.80	36.50	46.10	28.80	32.60	27.00	12.90	9.76	8.70	8.70	22.10
1996	8.34	7.02	6.95	11.30	14.60	20.10	17.70	15.00	8.51	7.53	7.68	7.70	11.04
1997	7.49	7.53	12.40	17.30	16.40	18.60	19.00	17.70	9.99	8.72	8.06	7.74	12.58
1998	7.44	8.41	17.00	21.50	29.50	28.00	28.60	19.20	8.95	8.01	7.90	7.02	15.96
1999	6.51	6.10	6.82	7.92	10.00	9.22	10.10	8.49	5.66	5.72	6.11	6.27	7.41
2000	6.30	5.97	3.75	4.99	5.92	6.60	8.84	7.43	5.88	6.12	6.36	6.26	6.20
2001	6.10	6.67	9.11	6.88	5.44	9.99	8.41	6.24	6.39	7.04	7.37	7.27	7.24
2002	6.53	6.37	10.10	33.50	21.40	17.40	21.80	17.80	8.92	7.25	7.73	7.53	13.86
2003	7.10	7.71	13.40	12.70	16.90	19.20	21.10	18.50	9.77	7.25	6.93	6.75	12.28
2004	6.42	8.13	20.10	33.50	44.00	22.70	13.20	13.70	7.67	7.46	7.75	7.54	16.01



**Figure 19.** Annual flow duration at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

**Table 29.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	2.68	3.25	3.82	5.27	6.31	8.99	8.46	5.19	3.51	2.72	2.61	2.68	3.12
90	3.04	3.82	5.04	6.18	8.47	10.50	9.89	5.95	3.72	3.17	2.92	2.91	3.53
85	3.18	4.26	5.58	6.93	10.10	12.60	11.00	6.69	3.95	3.26	3.06	3.09	3.98
80	3.49	4.52	6.09	7.60	11.70	14.90	12.40	7.58	4.27	3.36	3.12	3.18	4.51
75	3.81	4.78	6.48	8.30	13.70	16.40	13.80	8.20	4.87	3.54	3.19	3.28	5.09
70	4.06	5.28	6.86	9.02	15.40	17.70	15.40	9.14	5.45	4.18	3.67	3.63	5.70
65	4.35	5.65	7.25	9.77	16.70	19.00	17.20	10.30	5.72	4.58	3.90	4.11	6.29
60	4.57	5.89	7.74	11.00	17.70	20.40	18.80	11.60	6.14	4.83	4.15	4.25	6.87
55	4.79	6.14	8.42	12.40	18.70	22.20	20.50	12.90	6.62	5.10	4.56	4.38	7.45
50	5.01	6.39	9.09	13.70	19.80	24.30	22.70	14.10	7.08	5.40	4.72	4.58	8.34
45	5.25	6.70	10.10	15.30	21.80	27.00	24.60	15.40	7.55	5.66	4.88	4.77	9.26
40	5.53	7.05	11.30	17.20	24.10	29.30	26.60	16.90	8.03	5.89	5.11	4.94	10.80
35	6.07	7.40	12.50	19.00	28.00	31.20	29.40	19.00	8.52	6.20	5.37	5.22	12.40
30	6.40	7.84	13.80	20.80	32.20	33.30	32.50	21.20	9.20	6.56	5.94	6.31	14.60
25	6.85	8.37	15.40	23.30	36.80	36.90	36.10	23.90	9.95	7.16	6.68	6.81	17.50
20	7.38	8.91	17.30	26.90	42.00	43.20	40.30	26.80	11.30	7.61	7.27	7.22	21.20
15	7.76	10.50	20.20	31.60	48.30	50.90	45.00	31.50	12.80	8.23	7.77	7.66	26.30
10	8.48	12.50	25.70	37.80	63.60	62.50	50.20	37.10	15.20	9.33	8.22	8.31	34.10
5	9.91	16.50	37.40	53.70	90.30	88.80	67.40	44.60	19.10	11.70	10.40	8.87	48.00

**Table 30.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	42.67	34.09	28.20	24.23
0.50	2	96.58	67.81	51.43	41.82
0.20	5	202.82	129.01	90.98	69.71
0.10	10	290.38	177.47	121.13	89.84
0.05	20	384.92	228.91	152.48	110.01
0.02	50	520.51	302.02	196.28	137.16
0.01	100	630.86	361.33	231.38	158.22

**Table 31.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T6, Khazir River at Bakrman Dam-IMRP, Iraq, water years 1931–2004.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	4.10	4.16	4.21	4.24	4.36	4.48	5.32
0.2	5	2.75	2.81	2.86	2.94	3.07	3.20	3.88
0.1	10	2.21	2.27	2.31	2.42	2.57	2.71	3.33
0.05	20	1.83	1.89	1.93	2.06	2.22	2.37	2.96
0.02	50	1.47	1.52	1.57	1.71	1.89	2.06	2.61
0.01	100	1.26	1.32	1.36	1.52	1.69	1.87	2.41



## Tigris River Basin

### GREATER ZAB RIVER AT BEKHME DAM-IMRP (IRQ\_T7)

(U.S. Geological Survey identification number:36382904429420)

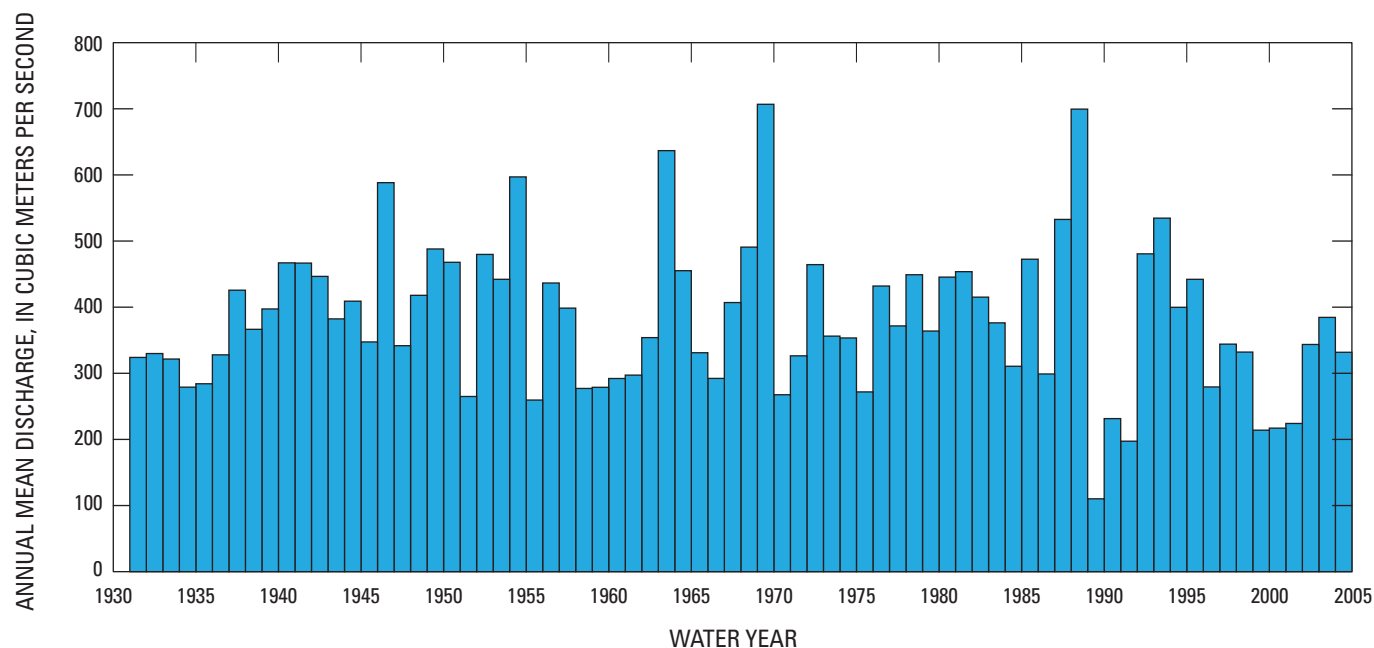
LOCATION: Latitude 36° 38' 29" N, Longitude 44° 29' 42" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: November 1931 to September 2004.

GAGE: No information available for this site.

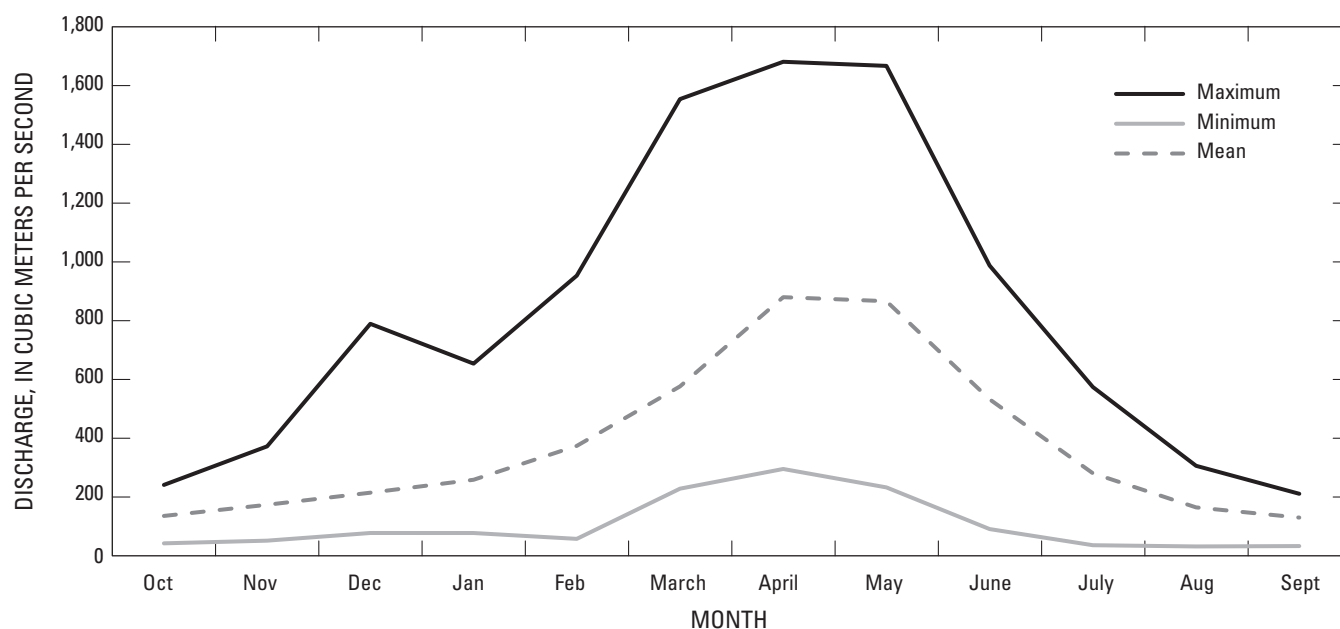
RECORDS: No information available for this site.



**Figure 20.** Annual mean discharge at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

**Table 32.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	241.20	1994	42.40	1990	135.65	44.26	0.33	2.96
November	372.40	1943	51.50	1991	173.59	65.70	0.38	3.78
December	789.30	1969	77.60	1991	214.75	116.96	0.54	4.68
January	653.90	1988	77.50	1989	258.69	119.51	0.46	5.64
February	953.30	1941	57.60	1989	374.00	157.15	0.42	8.15
March	1,554.00	1969	228.40	1989	576.38	253.87	0.44	12.56
April	1,681.00	1969	295.40	1989	879.97	304.25	0.35	19.18
May	1,667.00	1946	232.70	1989	866.42	337.70	0.39	18.89
June	987.40	1963	90.90	1989	532.44	184.23	0.35	11.61
July	574.30	1963	36.00	1989	280.84	96.63	0.34	6.12
August	306.20	1963	31.80	1989	164.70	49.39	0.30	3.59
September	211.00	2001	33.10	1989	130.01	38.11	0.29	2.83
Annual	706.82	1969	110.20	1989	382.50	111.78	0.29	100.00

**Figure 21.** Monthly discharge at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

**Table 33.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

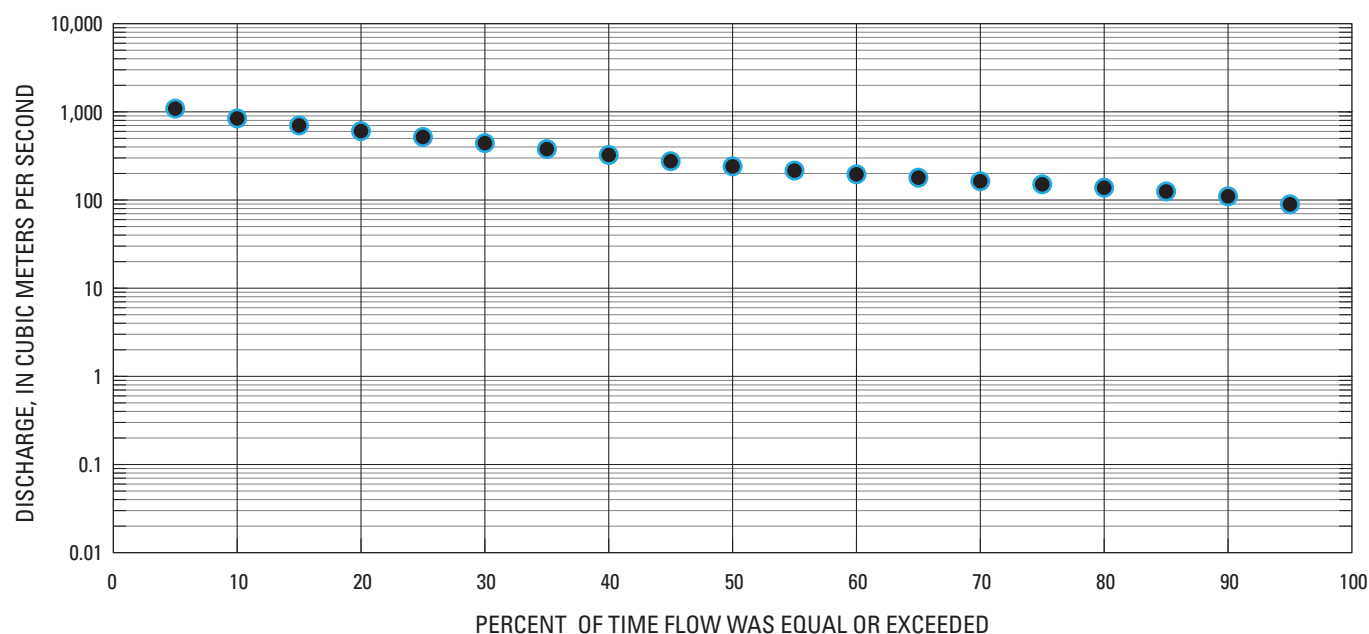
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	—	147.7	157.5	241.9	243.7	451.3	716	620.9	437.8	254.3	161.5	131.3	323.99
1932	130.3	135.8	128	132.3	351.1	581.5	722	804.4	533.8	225.7	125.7	87.8	329.87
1933	69.8	128.8	87.9	138.4	226.1	525.1	703.1	948.4	516	279	143.3	92.8	321.56
1934	76.5	69.5	258.5	141.2	262.1	350.2	725.3	642.8	456.3	184.5	102.7	79	279.05
1935	78.7	81	97.9	191.2	366.9	452.7	685	672.6	409.4	189	104.3	81.5	284.18
1936	85.4	129.5	134.1	129.3	297	405.5	883.9	887.2	509.6	255.2	128.1	90.5	327.94
1937	111.3	284.3	217.5	237.8	547.6	672.5	1,103	848.3	621.9	252.8	118.3	92.8	425.68
1938	125	157.5	156.9	284.4	387.9	375.7	1,005	860.6	516.2	271.2	146	111.7	366.51
1939	99.5	157.3	202.1	224	325.4	539.1	1,027	1,063	602.2	283.5	137.7	107	397.32
1940	94.4	130.3	203.3	536.9	626.6	558.2	1,388	902.6	578.4	305.3	164.2	116.3	467.04
1941	136.2	112	207.5	360.2	953.3	815.1	959.4	1,070	482	248	143.1	113.3	466.68
1942	108.3	99	123.7	392.5	372.2	817.2	1,113	1,232	578.8	258.1	149.1	114.7	446.55
1943	123	372.4	237	230.8	261.7	373.4	745.7	1,001	613.4	334.8	173	121.2	382.28
1944	113.6	111.3	124.5	269.3	303.8	683.1	1,149	1,025	505.3	305.3	181.4	137	409.05
1945	123.6	284.1	157.5	430.4	384.1	369.1	689	711.5	492.5	272.8	146.7	107.8	347.43
1946	104.4	124.9	204.6	219.1	502.9	961.4	1,358	1,667	981.1	512	277.3	146.8	588.29
1947	190.5	152.2	147.6	387.7	445.4	732.9	746	585.1	336.3	174.1	111.7	91.3	341.73
1948	96.2	194	193.9	170.3	249.3	392.9	952.9	1,230	858.5	375	178.4	123.5	417.91
1949	130.6	154.5	209.2	199	300.8	717.1	1,155	1,461	863.1	355.1	179.9	130.9	488.02
1950	136.2	144.1	160.4	304.1	305.9	859.5	1,021	1,354	670.5	342	182.3	134.3	467.86
1951	141.5	140.2	152.2	219.1	285.7	387.9	528	530.3	353.9	202.1	126.1	112.2	264.93
1952	185.8	184.5	228.5	206	684	795	1,150	1,139	586.7	311.4	164.4	122	479.78
1953	122	121.2	136.5	232.8	418.1	713.2	1,168	1,075	634.3	340.9	196.6	147.1	442.14
1954	132.6	200.1	158.5	298.2	508.7	1,175	1,588	1,340	858.5	452.8	253.2	198.5	597.01
1955	179.5	178.3	186	178.4	212.2	286.3	558.7	584.5	340.2	182.4	125.8	102.2	259.54
1956	96.1	137.4	308	240.2	474.4	642.3	1,118	843.5	686.3	368.6	188.5	135.2	436.54
1957	106.7	111.3	161.5	167.9	317	773.5	734	1,052	680	346.8	191.5	140.4	398.55
1958	134.1	165	181.5	225.1	277.5	425	610.9	566.5	334.9	179.3	124.9	100.4	277.09
1959	66.7	63.1	144.3	94.7	93.4	277.1	958.7	761.7	436.3	213.8	129.7	106.5	278.83
1960	101.2	106.2	109.4	202.1	324.1	426.1	717.5	800.1	364.8	154.8	109.4	89.9	292.13
1961	79.2	180.2	138.8	164.7	262	328	786.5	828.1	436.3	180.9	96.6	85.7	297.25
1962	73.3	180.5	291.9	313.6	487.6	584	704.3	682.5	473	241.6	127.2	88	353.96
1963	82.6	109.5	292.4	592.6	637.2	680.7	1,663	1,522	987.4	574.3	306.2	192.8	636.73
1964	218.6	213.4	207.6	183.2	426.9	1,166	977.9	894.4	625.5	260.1	155.8	132.6	455.17
1965	135.9	143.5	149.3	182.3	321.6	513.1	766.3	808.3	508.6	206.6	132.3	105.4	331.10
1966	196.6	143.9	147	205.8	330.2	498	635	576.3	353	173.8	128.7	118.9	292.27
1967	137.4	135	148.6	212.9	264.3	464.7	739.7	1,455	663.1	324.5	182.7	155.9	406.98
1968	158.1	231	341	278.6	306.9	718.6	1,276	1,111	742.9	354.5	206.6	164.8	490.83
1969	159.1	290.9	789.3	569.6	522.9	1,554	1,681	1,540	658.6	331.9	214.3	170.2	706.82
1970	165.9	162.8	223.7	278.8	281.9	357.2	561.2	448.2	288.8	172.7	142.8	127	267.58

**Table 33.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1971	134.3	147.4	173.5	127.8	132.1	330	1,140	795.4	471.2	220.7	126.3	118.4	326.43
1972	125.3	144.9	177.8	158.9	282.3	541.8	1,139	1,303	794.3	422.7	273.6	208.5	464.34
1973	169.1	211.1	171.7	167.2	361.7	402.6	807.4	876	499.3	295.6	178	134.8	356.21
1974	129.9	147	168.8	173.5	208.6	699.4	942.1	678.6	477.9	305.7	175.1	134.7	353.44
1975	126.6	139	143.4	146	346.5	355.9	530.7	498.4	364.6	254.6	201.9	154.8	271.87
1976	104.1	103.7	161.1	219.4	481.7	414.2	1,104	1,074	675.1	451.2	242.6	152.7	431.98
1977	194.6	211.2	216.6	238.5	384.9	544.2	658.9	686.9	555.7	372.4	228.3	167.9	371.68
1978	161.6	151.9	380.2	490.3	585.9	686.5	784.9	705.4	650.9	420.4	212.5	158.1	449.05
1979	147.6	146.8	272.8	341.7	504.8	494.9	722.9	640.1	534	282.8	155.3	123.2	363.91
1980	185	249.2	301.5	302	362.7	595.9	1,092	872.7	641.3	358.1	215.5	169.7	445.47
1981	128.3	242.8	192.6	368.2	532.1	790	848.7	848.8	684.3	423.6	215.8	169.2	453.70
1982	159.7	197.6	236	330.3	400.1	492.5	857.5	948	643.8	346.2	197.1	173.2	415.17
1983	204.8	217.9	186	215.5	303.2	578.8	813.8	879.9	578	221.8	163.3	152.5	376.29
1984	122.4	164	226.9	158.3	273.1	520.6	633.4	616.5	538.3	250.8	123.9	99.3	310.63
1985	103.8	316.8	216	332.6	736.1	786.1	1,190	995.8	515.7	214.6	140.4	122.5	472.53
1986	107.8	125.7	192.2	290.2	413	429.2	661.4	553.6	414.9	216.9	97.2	85.8	298.99
1987	122.9	273	345.7	317.5	547.2	714.9	1,147	1,631	632	337.2	187.9	136.1	532.70
1988	171.8	249.6	754.3	653.9	656.7	1,544	1,595	1,472	660.5	381.2	163.3	91.9	699.52
1989	63.5	78.7	96.8	77.5	57.6	228.4	295.4	232.7	90.9	36	31.8	33.1	110.20
1990	42.4	114.9	256	136.5	246.7	316.6	625.7	521.7	304.6	111.9	54.2	46.5	231.48
1991	46.5	51.5	77.6	110.5	290.7	501.3	526.2	363.6	173.8	110.4	62.9	52.7	197.31
1992	130.2	190.9	243.4	308.4	611.6	641.5	1,047	1,175	720.9	384.1	189.3	125.8	480.68
1993	124.7	236	380.6	386.2	423.3	604.4	1,070	1,312	974.4	486	241.9	176.3	534.65
1994	241.2	325.7	302.4	341.3	398.2	594.3	876.6	717.5	435.7	248.6	175.5	140.8	399.82
1995	154.3	318.5	407.2	410.2	521.5	620.1	910	902.3	562	267.3	133.4	98.6	442.12
1996	127.5	125.7	97.1	176.3	226.2	399.9	663.7	603.2	359.2	215.5	159	199.2	279.38
1997	196	175.8	203.9	243.8	254.4	433	679.4	742	533.4	307.6	200.5	159.3	344.09
1998	200.8	260.9	252.3	269.3	357.5	465.4	730.1	513.2	356.2	238.8	184.6	155.9	332.08
1999	193.4	191.3	156	157.5	194.8	261.6	321.3	287.4	222.3	191.6	190.3	200.5	214.00
2000	201.4	191.1	147.2	151.2	174.8	283.7	361.9	308.9	219.9	190.1	180.5	194.1	217.07
2001	209.6	213.4	187	115.4	159.6	303	324.3	291.4	239	225.8	210	211	224.13
2002	199.5	199.3	201.7	400.4	313.9	427.3	695.2	625.9	452.3	256.6	179.9	171.1	343.59
2003	176.9	175.7	203.8	198.4	270.3	595.8	1,024	863.5	520.6	256.6	172.5	156.4	384.54
2004	188.9	188.8	255.5	361	512.1	655.2	528.3	432.8	327.6	226.9	165.3	139	331.78



**Figure 22.** Annual flow duration at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

**Table 34.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	66.60	72.00	87.70	102.10	130.60	241.50	371.50	321.80	225.40	134.90	90.30	77.20	89.40
90	78.90	93.20	105.00	130.50	170.40	284.40	479.10	471.80	277.90	162.90	105.80	86.40	110.10
85	87.00	102.50	121.90	144.80	195.20	312.90	527.40	519.80	323.30	178.20	114.30	91.90	125.00
80	95.90	111.20	132.40	152.20	211.60	336.90	566.90	569.80	356.20	191.20	121.60	97.20	138.00
75	100.90	120.20	139.20	159.00	226.20	361.60	606.40	617.50	385.90	203.10	128.60	102.60	150.70
70	107.70	129.70	145.70	166.90	240.80	389.10	646.30	650.70	415.70	214.50	135.50	108.30	163.40
65	115.80	134.60	151.90	178.10	255.40	415.50	688.60	683.30	440.00	225.10	142.20	113.80	179.30
60	122.00	139.30	158.10	189.10	274.00	439.60	724.40	721.80	464.10	235.80	149.30	119.00	195.60
55	125.70	144.10	166.10	199.80	294.60	463.70	754.70	761.60	486.70	248.80	157.00	123.50	215.80
50	129.50	151.50	174.40	211.70	320.70	492.50	786.70	803.40	509.40	262.10	163.30	128.10	240.60
45	134.10	160.80	183.20	226.10	345.50	522.00	834.70	846.50	538.00	275.40	169.20	132.60	275.50
40	139.10	169.40	192.50	239.90	367.80	553.10	882.40	890.00	567.00	288.70	175.40	138.40	324.30
35	145.50	177.60	202.70	253.10	392.40	585.30	930.00	944.20	598.60	307.40	182.00	144.40	378.20
30	156.40	186.20	214.90	272.30	423.70	619.10	987.40	1,003.40	630.10	326.60	188.80	150.30	442.20
25	165.60	196.40	231.40	302.50	460.00	663.70	1,054.90	1,069.10	659.40	346.60	196.40	156.90	518.80
20	175.80	207.30	254.80	340.00	501.10	711.20	1,122.70	1,141.20	688.60	371.00	204.70	164.70	604.80
15	187.50	230.70	281.70	382.40	555.70	776.60	1,210.80	1,227.00	734.90	399.90	215.20	173.60	700.90
10	198.10	271.20	347.70	430.40	622.80	897.90	1,356.20	1,362.10	806.30	436.00	229.80	184.60	841.30
5	218.20	330.70	441.90	565.00	741.60	1,215.40	1,654.90	1,572.50	933.30	503.20	258.60	201.70	1,087.70

**Table 35.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	838.92	764.49	710.45	675.25
0.50	2	1,356.70	1,180.50	1,059.50	979.83
0.20	5	2,171.50	1,757.70	1,504.70	1,342.10
0.10	10	2,765.30	2,133.90	1,774.20	1,548.10
0.05	20	3,369.20	2,486.70	2,014.00	1,723.30
0.02	50	4,198.40	2,931.80	2,300.40	1,923.10
0.01	100	4,855.20	3,257.70	2,499.60	2,056.20

**Table 36.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T7, Greater Zab River at Bekhme Dam-IMRP, Iraq, water years 1931–2004.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	113.12	113.98	115.74	118.44	125.41	133.60	170.10
0.2	5	81.71	82.55	84.02	86.41	91.40	98.03	128.53
0.1	10	65.90	66.70	67.99	70.26	74.19	79.79	107.11
0.05	20	53.82	54.58	55.71	57.87	60.98	65.71	90.36
0.02	50	41.68	42.38	43.32	45.33	47.62	51.40	73.00
0.01	100	34.56	35.22	36.04	37.93	39.74	42.92	62.49

# Tigris River Basin

## KHAZIR RIVER AT MANQUBA (IRQ\_T8)

(U.S. Geological Survey identification number:36180004333000)

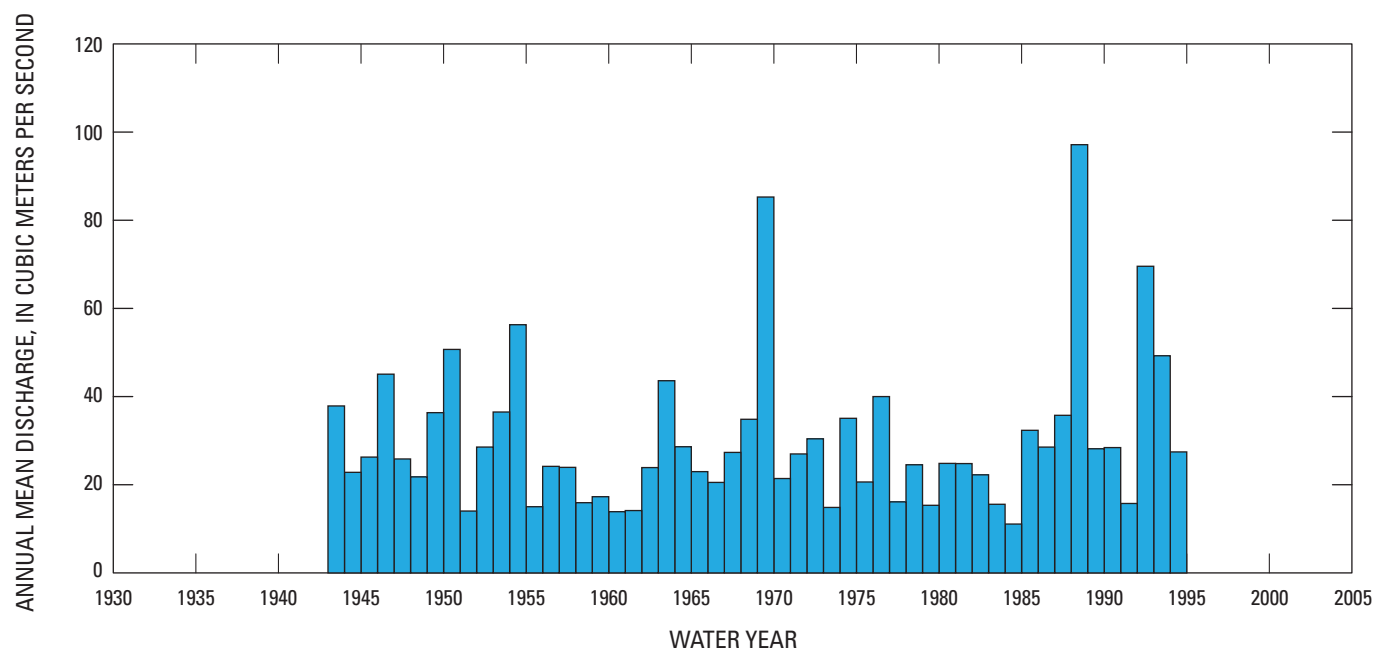
LOCATION: Latitude 36° 18' 00" N, Longitude 43° 33' 00" E.

DRAINAGE AREA: 2,900 square kilometers.

PERIOD OF RECORD: February 1943 to July 1994.

GAGE: The staff gage is fixed to the downstream side of the left pier of the former bridge, except for the lowest part of the gage, which is fixed to an upright steel beam 2 meters away. The gage is set to GTS datum.

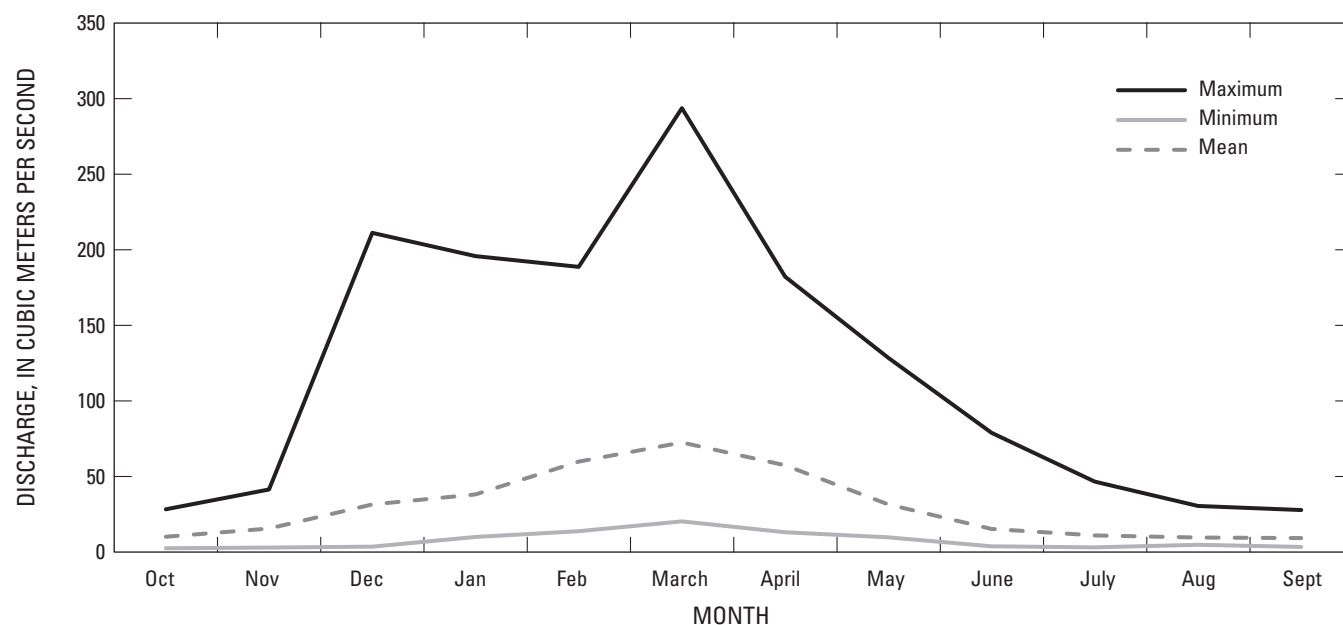
RECORDS: Discharge records are complete. Starting in 1961, discharge measurements were taken from the bridge or by wading and from a cableway.



**Figure 23.** Annual mean discharge at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

**Table 37.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	28.30	1989	2.520	1994	10.14	5.13	0.51	2.80
November	41.40	1969	2.970	1994	15.58	8.13	0.52	4.31
December	211.20	1969	3.580	1994	31.50	35.40	1.12	8.71
January	195.80	1988	9.990	1984	38.14	33.21	0.87	10.54
February	188.70	1992	13.800	1959	59.84	37.79	0.63	16.54
March	293.70	1988	20.300	1973	72.51	58.04	0.80	20.04
April	182.20	1971	13.100	1984	57.42	39.69	0.69	15.87
May	128.50	1993	9.740	1958	31.51	26.75	0.85	8.71
June	78.90	1992	3.800	1994	15.29	12.03	0.79	4.23
July	46.60	1992	3.100	1994	11.02	7.85	0.71	3.05
August	30.50	1988	4.810	1948	9.60	5.42	0.56	2.65
September	27.80	1988	3.400	1993	9.26	4.90	0.53	2.56
Annual	97.14	1988	11.08	1984	30.19	17.07	0.57	100.00

**Figure 24.** Monthly discharge at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.



**Table 38.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

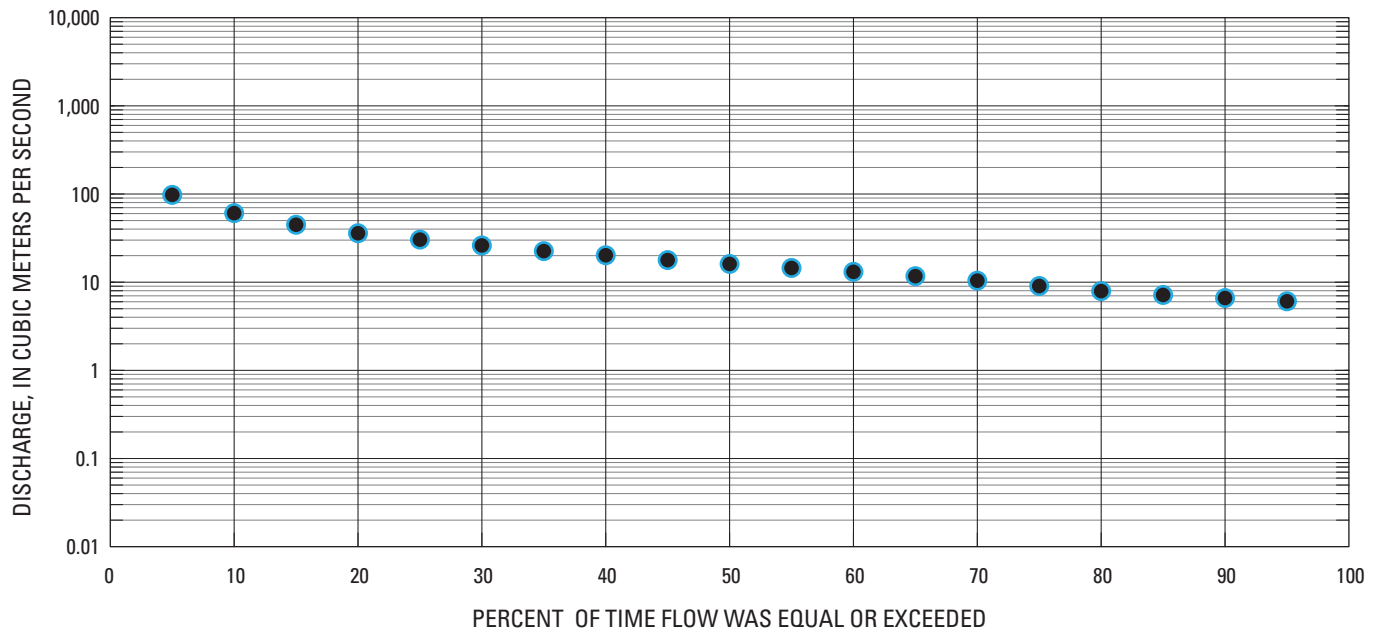
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Ja	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1943	—	—	—	—	49.10	100.70	62.80	34.60	20.90	12.90	11.00	11.00	37.88
1944	12.50	12.30	16.60	46.00	44.40	50.40	49.00	17.60	8.27	4.71	6.00	6.00	22.82
1945	6.35	21.50	11.30	75.40	41.00	45.80	49.90	25.00	14.10	11.30	7.81	5.83	26.27
1946	10.20	17.30	31.30	33.30	90.90	159.60	75.30	53.50	23.20	19.00	13.60	13.80	45.08
1947	14.70	17.00	25.40	73.90	45.00	60.40	28.10	16.80	10.20	6.35	6.00	6.33	25.85
1948	7.39	16.70	20.80	17.20	22.40	34.10	68.30	49.10	10.30	6.13	4.81	4.17	21.78
1949	5.03	7.17	10.80	20.10	47.60	141.10	116.30	41.90	15.50	11.30	10.60	8.83	36.35
1950	9.19	11.00	27.20	61.40	96.10	197.20	67.50	89.90	18.50	11.80	9.48	9.10	50.70
1951	12.10	13.00	13.10	19.90	36.60	22.50	17.90	12.00	6.63	4.68	5.00	5.00	14.03
1952	5.35	7.83	16.30	14.70	152.20	63.40	25.80	24.00	11.20	7.81	7.00	7.00	28.55
1953	7.35	8.33	11.70	25.60	73.80	139.00	98.50	26.40	15.30	12.00	10.00	10.00	36.50
1954	10.00	29.00	18.40	47.40	112.40	187.80	165.90	40.20	23.20	16.30	12.80	12.20	56.30
1955	14.20	17.70	22.20	19.20	28.60	21.30	18.90	12.90	7.17	6.00	6.00	6.00	15.01
1956	6.00	9.67	60.60	44.20	34.60	56.30	37.40	16.90	8.37	5.84	5.16	5.00	24.17
1957	5.00	6.00	11.00	13.80	45.00	82.50	32.60	48.40	17.40	9.61	8.00	8.00	23.94
1958	9.00	14.00	25.00	33.50	30.00	25.70	17.20	9.74	7.00	7.00	7.00	6.00	15.93
1959	6.94	7.93	18.20	15.50	13.80	42.60	47.80	23.50	10.10	7.16	7.00	6.87	17.28
1960	6.94	7.73	10.10	22.60	22.10	31.80	28.60	12.10	6.63	6.03	6.00	6.00	13.89
1961	6.03	19.90	11.40	18.30	28.60	22.50	25.40	13.60	6.43	5.61	5.97	6.00	14.15
1962	5.97	16.00	66.80	62.50	40.40	34.00	24.80	13.50	7.00	5.71	5.03	5.00	23.89
1963	5.03	5.90	37.20	60.80	56.40	42.40	116.40	122.00	31.90	19.10	13.60	12.40	43.59
1964	15.20	16.40	21.30	22.40	67.20	95.70	45.90	22.00	11.50	9.52	8.32	8.00	28.62
1965	9.16	11.60	12.50	26.30	57.80	31.10	69.60	24.50	10.40	8.77	7.03	6.93	22.97
1966	11.30	12.90	15.50	23.30	42.80	56.80	41.00	15.20	8.20	6.74	6.00	6.60	20.53
1967	8.61	10.90	15.10	19.40	59.60	91.60	49.30	27.20	13.90	11.80	10.60	10.00	27.33
1968	11.10	26.90	63.50	43.80	48.80	65.10	51.20	33.30	24.00	18.30	16.20	16.00	34.85
1969	18.80	41.40	211.20	152.50	99.00	215.20	132.40	62.90	31.00	23.40	18.40	17.00	85.27
1970	20.00	23.50	30.50	50.00	31.20	41.20	22.50	11.70	8.10	6.19	6.03	6.00	21.41
1971	7.32	11.00	14.50	10.90	15.60	21.80	182.20	18.60	11.60	10.40	10.00	9.93	26.99
1972	10.60	13.50	29.90	25.80	56.10	65.00	43.80	61.90	18.00	14.20	13.10	13.10	30.42
1973	13.80	15.60	15.10	16.60	26.80	20.30	19.00	13.00	9.97	9.03	9.03	10.00	14.85
1974	10.30	12.40	18.50	24.00	48.60	166.20	97.00	16.10	9.20	6.48	6.06	6.00	35.07
1975	7.77	9.67	11.20	11.70	85.70	48.40	27.90	18.40	7.77	6.35	6.00	6.67	20.63
1976	6.00	8.03	47.80	34.10	116.20	73.70	86.00	35.10	15.10	9.84	8.13	—	40.00
1977	9.61	13.50	14.20	19.10	50.90	20.50	25.20	14.30	8.10	6.00	6.00	6.00	16.12
1978	6.45	6.80	20.80	55.00	91.70	50.10	24.40	13.00	7.97	6.16	6.00	6.00	24.53
1979	7.77	10.40	17.90	27.00	31.10	24.60	19.20	12.50	9.23	8.00	8.00	8.33	15.34
1980	9.90	11.50	21.00	18.60	54.60	45.30	85.40	16.30	10.70	8.81	8.00	8.00	24.84
1981	7.03	13.00	16.90	29.70	44.70	87.30	38.20	23.10	14.20	8.23	7.26	8.00	24.80
1982	7.90	11.80	15.70	30.90	65.90	30.60	40.50	27.50	12.20	9.00	8.00	7.00	22.25
1983	11.90	20.50	14.90	19.40	31.10	33.60	17.50	13.10	7.65	6.17	5.28	5.72	15.57
1984	6.95	10.50	10.50	9.99	21.80	27.90	13.10	10.50	6.53	5.23	5.00	5.00	11.08

**Table 38.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1985	5.94	23.60	14.90	12.40	94.60	47.90	77.90	21.70	25.70	23.60	20.50	19.40	32.35
1986	19.10	21.50	25.50	42.90	80.40	45.60	24.40	25.30	17.40	12.00	14.00	14.40	28.54
1987	15.90	32.50	56.70	37.90	38.60	89.30	56.10	25.80	17.90	17.00	21.30	20.00	35.75
1988	22.00	28.60	141.10	195.80	159.90	293.70	112.10	73.00	44.30	36.90	30.50	27.80	97.14
1989	28.30	34.20	46.40	37.30	32.50	55.00	34.00	28.60	14.50	9.13	9.00	9.00	28.16
1990	3.98	22.30	45.00	23.10	110.20	48.30	39.90	20.80	10.00	6.57	5.63	5.37	28.43
1991	5.92	8.50	14.10	16.80	28.50	—	—	22.80	18.20	13.90	13.60	15.20	15.75
1992	14.40	16.10	65.70	61.70	188.70	112.80	122.40	85.90	78.90	46.60	24.00	17.50	69.56
1993	16.10	26.30	89.50	58.30	83.70	55.30	86.10	128.50	29.80	9.10	5.00	3.40	49.26
1994	2.52	2.97	3.58	63.00	36.60	77.00	69.70	12.20	3.80	3.10	—	—	27.45



**Figure 25.** Annual flow duration at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

**Table 39.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	4.75	6.16	8.17	10.50	13.50	17.90	16.50	9.34	6.39	4.91	5.14	5.05	6.07
90	5.09	6.79	10.30	12.00	16.20	20.80	19.00	11.20	6.86	5.81	5.30	5.18	6.61
85	6.15	7.35	11.10	13.50	18.80	23.50	20.80	12.20	7.11	5.95	5.78	5.40	7.16
80	6.33	7.89	12.00	14.60	21.00	26.40	22.70	13.40	7.42	6.08	6.00	5.79	7.92
75	6.51	8.77	12.60	15.60	23.50	28.70	24.90	14.60	7.85	6.22	6.10	5.90	9.05
70	6.72	10.30	13.30	16.60	26.40	30.90	27.20	15.80	9.28	6.36	6.21	6.01	10.40
65	6.95	11.40	13.90	17.80	28.70	33.00	29.60	17.30	9.95	6.70	6.32	6.12	11.70
60	7.18	11.90	14.60	19.20	31.00	36.10	32.10	18.80	10.60	7.34	7.08	6.66	13.10
55	8.22	12.40	15.40	21.00	33.30	40.00	34.90	20.30	11.30	8.34	7.37	6.88	14.50
50	8.77	13.00	16.40	23.10	35.70	45.30	37.90	21.70	12.20	8.77	7.68	7.10	16.10
45	10.00	13.70	17.40	25.60	38.20	50.20	42.50	23.60	13.10	9.13	8.01	7.96	17.80
40	10.50	14.50	18.80	28.10	41.90	55.10	46.30	25.70	14.40	10.30	9.18	8.98	20.20
35	11.10	15.30	20.60	31.10	45.70	59.80	49.70	27.80	15.60	11.20	9.90	10.10	22.50
30	12.30	16.20	22.70	35.30	51.90	66.40	54.70	30.20	17.20	12.10	10.80	10.70	26.10
25	13.70	17.50	25.30	39.00	59.40	77.60	61.90	33.10	18.80	13.40	11.90	12.00	30.40
20	14.60	19.80	29.00	43.70	69.90	92.00	71.10	38.60	20.50	14.80	13.20	13.40	35.90
15	15.80	22.30	36.20	50.30	88.30	112.20	85.00	46.50	23.30	17.50	14.70	14.60	44.80
10	17.90	25.40	51.40	62.80	126.60	140.60	109.70	60.90	26.90	19.90	18.10	17.20	60.70
5	21.60	34.00	92.80	106.50	184.40	211.90	147.80	87.90	36.90	25.50	21.60	19.60	97.80

**Table 40.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	150.79	95.52	67.36	52.26
0.50	2	283.75	175.24	118.85	88.51
0.20	5	500.73	308.74	206.25	148.46
0.10	10	657.40	408.62	273.34	193.80
0.05	20	813.00	510.95	343.76	241.04
0.02	50	1,019.20	651.49	443.34	307.46
0.01	100	1,176.00	762.27	524.17	361.18

**Table 41.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T8, Khazir River at Manquba, Iraq, water years 1943–94.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	7.43	7.52	7.63	7.68	7.88	8.13	9.62
0.2	5	4.89	4.96	5.05	5.21	5.48	5.64	6.79
0.1	10	3.94	4.00	4.09	4.30	4.62	4.76	5.82
0.05	20	3.31	3.35	3.44	3.70	4.05	4.18	5.19
0.02	50	2.72	2.76	2.83	3.14	3.53	3.65	4.63
0.01	100	2.39	2.42	2.50	2.83	3.24	3.36	4.32

## Tigris River Basin

### GREATER ZAB RIVER AT ESKI KELEK (IRQ\_T9)

(U.S. Geological Survey identification number:36160004339000)

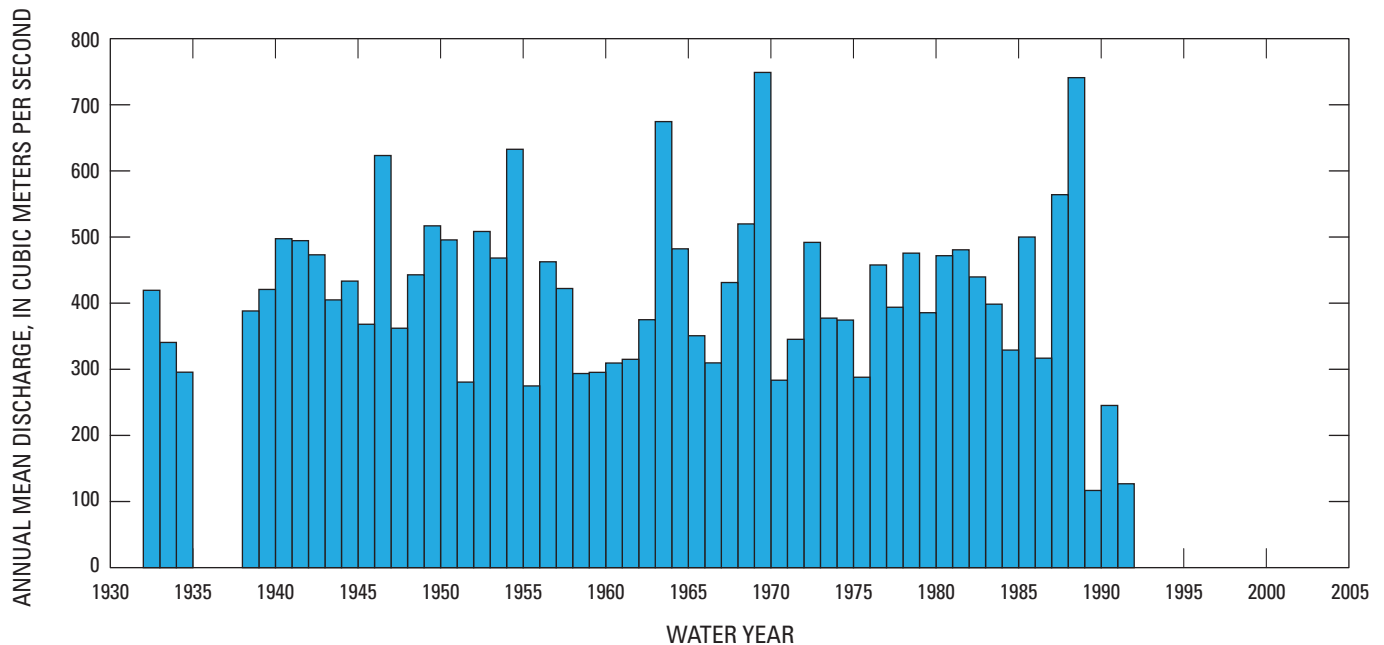
LOCATION: Latitude 36° 16' 00" N, Longitude 43° 39' 00" E.

DRAINAGE AREA: 20,500 square kilometers.

PERIOD OF RECORD: January 1932 to September 1990.

GAGE: The staff gage is attached to the downstream right side of the steel bridge, except for the lowest part of the gage, which is fixed to a concrete step. The gage is set to GTS datum.

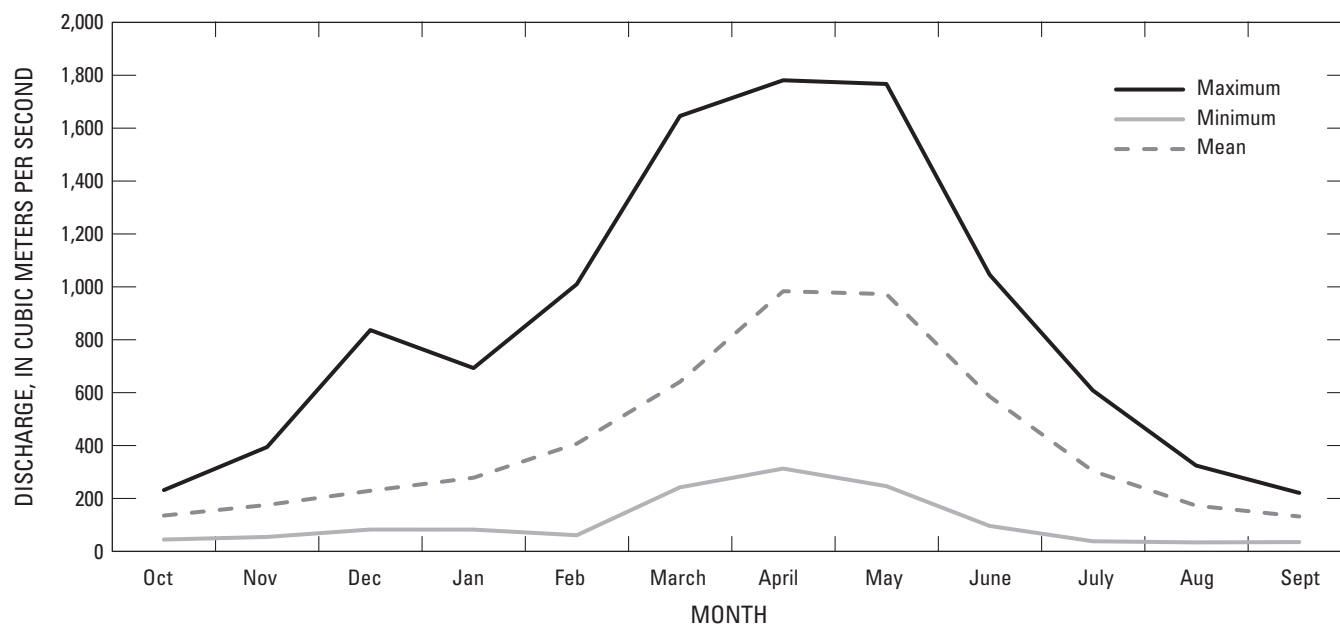
RECORDS: Discharge records are missing data from October 1935 to September 1937. Discharge measurements were made from the bridge at Eski Kelek.



**Figure 26.** Annual mean discharge at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

**Table 42.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	231.60	1964	44.60	1990	135.30	42.78	0.32	2.70
November	394.40	1943	54.50	1991	175.45	67.80	0.39	3.50
December	836.50	1969	82.40	1991	229.14	133.14	0.58	4.57
January	692.90	1988	82.20	1989	278.35	132.97	0.48	5.55
February	1,010.00	1941	60.90	1989	407.00	173.14	0.43	8.11
March	1,646.00	1969	242.10	1989	641.03	293.62	0.46	12.78
April	1,781.00	1969	312.90	1989	983.52	324.83	0.33	19.61
May	1,767.00	1946	246.50	1989	972.65	355.34	0.37	19.39
June	1,046.00	1963	96.10	1989	585.46	189.45	0.32	11.67
July	608.40	1963	38.10	1989	303.60	108.29	0.36	6.05
August	324.40	1963	33.80	1989	172.71	56.30	0.33	3.44
September	220.90	1972	35.10	1989	131.80	38.04	0.29	2.63
Annual	748.93	1968	116.74	1989	416.42	125.37	0.30	100.00

**Figure 27.** Monthly discharge at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

**Table 43.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

[Discharge measured in cubic meters per second; —, no data available]

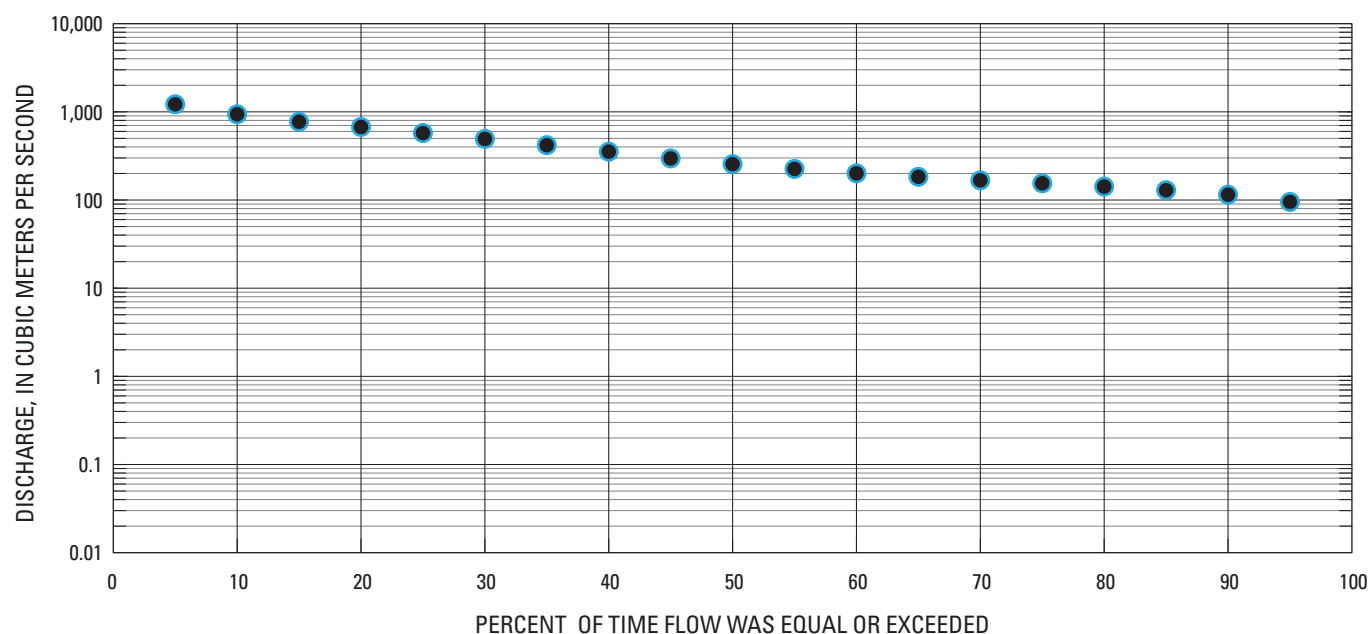
Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1932	—	—	—	140.0	372.0	615.9	764.4	851.7	565.5	239.1	133.2	93.2	419.4
1933	73.8	136.6	93.4	146.5	239.5	556.3	744.7	1,004.0	546.8	295.5	151.9	98.3	340.6
1934	81.0	73.5	273.6	149.7	277.8	371.0	768.0	681.1	483.5	195.4	108.9	83.8	295.6
1935	—	—	—	—	—	—	—	—	—	—	—	—	—
1936	—	—	—	—	—	—	—	—	—	—	—	—	—
1937	—	—	—	—	—	—	—	—	—	—	—	—	—
1938	132.6	166.8	166.3	301.3	410.9	398.0	1,064.0	911.2	546.8	287.4	154.8	118.3	388.2
1939	105.5	166.6	214.1	237.4	344.8	571.2	1,087.0	1,125.0	638.0	300.3	145.8	113.3	420.8
1940	100.3	138.0	215.3	569.0	664.0	591.5	1,502.0	956.2	612.8	323.3	173.9	123.3	497.5
1941	144.2	118.7	219.8	381.7	1,010.0	863.7	1,017.0	1,134.0	510.6	262.8	151.7	120.0	494.5
1942	114.8	105.0	131.0	415.9	394.2	865.8	1,179.0	1,306.0	613.2	273.2	158.1	121.3	473.1
1943	130.2	394.4	251.1	244.4	277.4	395.5	789.8	1,060.0	650.1	354.7	183.2	128.5	404.9
1944	120.1	117.8	132.1	285.4	321.9	723.6	1,217.0	1,086.0	535.3	323.6	192.2	145.2	433.4
1945	131.1	300.8	166.9	456.1	406.9	391.0	729.9	753.8	521.9	289.0	155.6	114.2	368.1
1946	110.4	132.5	216.8	232.2	532.9	1,018.0	1,439.0	1,767.0	1,039.0	542.3	293.6	155.5	623.3
1947	201.8	161.5	156.4	410.8	471.9	776.7	790.3	619.9	356.4	184.4	118.4	96.7	362.1
1948	102.2	205.5	205.5	180.5	264.0	416.3	1,009.0	1,304.0	910.5	397.4	189.0	130.7	442.9
1949	138.1	163.3	221.7	210.7	318.7	759.6	1,224.0	1,548.0	913.9	376.1	190.6	138.5	516.9
1950	144.2	153.0	170.0	322.1	324.1	910.5	1,082.0	1,434.0	710.3	362.3	193.2	142.3	495.7
1951	149.8	148.2	160.9	232.1	302.7	410.9	559.4	561.8	374.9	214.4	133.5	118.9	280.6
1952	196.9	195.5	242.1	218.1	724.8	842.6	1,219.0	1,207.0	621.5	329.8	174.2	129.2	508.4
1953	129.0	128.3	144.8	246.6	442.8	755.5	1,237.0	1,138.0	671.9	361.2	208.2	155.7	468.3
1954	140.6	211.9	168.1	315.8	538.9	1,245.0	1,684.0	1,421.0	909.0	479.5	268.3	210.3	632.7
1955	189.8	188.7	196.6	188.4	224.5	303.4	592.0	619.4	360.5	193.2	133.2	108.2	274.8
1956	102.1	145.7	326.3	254.7	502.8	680.9	1,184.0	893.7	727.0	390.5	199.8	143.4	462.6
1957	112.9	118.1	171.2	177.8	335.9	819.2	777.4	1,114.0	720.4	367.4	202.8	148.8	422.2
1958	142.2	174.8	192.3	238.5	293.9	450.2	647.2	600.2	354.8	189.9	132.4	106.6	293.6
1959	70.9	66.9	152.9	100.4	99.0	293.4	1,015.0	807.2	462.2	226.5	137.3	112.6	295.4
1960	107.4	112.4	115.8	214.1	343.4	451.2	760.0	847.6	386.6	163.9	115.8	95.2	309.5
1961	84.2	191.1	147.0	174.7	277.5	347.6	834.0	877.5	462.3	191.6	102.4	90.7	315.1
1962	77.5	191.3	309.3	332.3	516.6	618.7	745.9	723.3	501.0	256.0	134.6	93.3	375.0
1963	87.6	116.0	310.0	628.5	675.3	721.2	1,761.0	1,612.0	1,046.0	608.4	324.4	204.4	674.6
1964	231.6	226.1	219.9	194.0	452.3	1,236.0	1,035.0	947.4	662.7	275.6	165.1	140.6	482.2
1965	143.0	152.0	158.3	193.1	340.7	543.8	811.9	856.4	538.9	218.8	140.1	111.8	350.7
1966	208.5	152.6	155.8	218.1	349.8	527.5	673.0	610.6	374.1	184.1	136.2	125.9	309.7
1967	145.5	143.0	157.5	225.5	280.0	492.3	783.6	1,542.0	702.5	343.7	193.5	165.3	431.2
1968	167.2	244.6	361.1	295.0	325.0	761.0	1,352.0	1,176.0	787.3	375.4	218.9	174.6	519.8
1969	168.7	308.3	836.5	603.6	554.2	1,646.0	1,781.0	1,632.0	698.0	351.5	227.0	180.4	748.9
1970	175.7	172.5	237.1	295.2	298.6	378.3	594.6	475.1	306.0	183.0	151.2	134.5	283.5
1971	142.3	156.1	176.7	135.5	140.1	349.8	1,208.0	842.7	499.3	233.9	133.8	125.4	345.3
1972	132.4	153.6	188.3	168.4	299.1	574.0	1,207.0	1,380.0	841.5	447.9	289.9	220.9	491.9
1973	179.1	223.5	182.0	177.3	383.2	426.7	855.1	927.4	529.0	313.1	188.8	143.1	377.4

**Table 43.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1974	137.9	155.7	178.8	183.7	221.0	740.7	998.1	718.8	506.2	324.0	185.4	142.7	374.4
1975	133.9	147.3	151.8	154.6	367.1	377.1	562.3	527.9	386.2	269.8	213.7	164.0	288.0
1976	110.4	109.9	170.7	232.5	510.3	438.9	1,170.0	1,138.0	715.4	478.1	257.1	161.8	457.8
1977	206.1	223.9	229.7	252.6	407.9	576.7	698.2	727.7	588.7	394.5	242.0	177.9	393.8
1978	171.2	160.6	402.9	519.3	620.7	727.4	831.2	747.0	689.4	445.4	225.1	167.4	475.6
1979	156.3	155.3	289.1	362.2	534.8	524.4	765.9	678.3	565.8	299.7	164.5	130.4	385.6
1980	196.0	264.0	319.5	319.9	384.3	631.2	1,155.0	924.6	679.4	379.4	228.2	179.9	471.8
1981	136.3	257.3	204.0	390.0	563.6	837.1	899.3	899.0	725.1	448.7	228.5	179.4	480.7
1982	169.4	209.3	249.9	349.6	423.9	521.6	908.2	1,003.0	682.0	366.8	208.7	183.5	439.7
1983	216.9	230.8	196.8	228.0	321.3	613.0	861.9	931.3	612.2	235.0	172.9	161.5	398.5
1984	129.6	173.6	240.4	167.7	289.4	550.9	671.2	653.2	570.3	265.6	131.4	105.2	329.0
1985	110.2	335.6	228.8	352.4	780.6	833.3	1,251.0	1,056.0	546.3	227.5	148.8	129.6	500.0
1986	114.3	133.3	203.5	307.5	437.8	454.8	700.7	586.6	439.6	229.8	102.9	90.8	316.8
1987	130.1	289.2	366.4	336.3	579.5	757.4	1,214.0	1,726.0	669.5	357.1	199.1	144.1	564.1
1988	181.9	264.4	798.6	692.9	695.4	1,636.0	1,690.0	1,559.0	699.8	404.0	172.9	97.4	741.0
1989	67.2	83.4	102.6	82.2	60.9	242.1	312.9	246.5	96.1	38.1	33.8	35.1	116.7
1990	44.6	121.9	271.5	144.7	261.3	335.5	663.1	552.9	322.7	118.4	57.3	49.5	245.3





**Figure 28.** Annual flow duration at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

**Table 44.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	63.5	70.6	90.7	107.4	130.0	241.1	463.0	493.7	250.0	130.9	79.1	54.5	95.1
90	79.8	91.9	109.5	142.0	172.2	299.3	534.7	540.7	325.0	165.9	108.5	90.2	115.0
85	88.7	104.1	126.4	156.4	201.3	328.4	584.2	589.7	367.2	179.6	119.0	96.4	129.1
80	100.0	111.2	138.9	163.4	221.7	356.5	620.4	644.1	403.3	199.0	126.7	102.2	141.9
75	104.7	118.8	145.7	170.5	239.0	384.5	659.4	687.2	440.7	214.8	133.2	107.2	154.6
70	109.6	126.8	152.3	178.5	254.5	412.6	702.5	726.6	466.2	230.4	139.2	112.4	167.2
65	114.5	135.3	158.4	188.3	269.6	440.0	743.2	765.9	491.5	247.1	145.2	117.6	183.3
60	122.6	141.2	164.6	198.5	288.2	465.3	782.1	809.5	515.2	260.5	151.5	122.2	200.9
55	129.0	146.0	171.5	210.3	309.2	490.6	822.4	858.2	538.9	273.7	158.6	126.4	225.2
50	132.7	150.7	179.4	222.1	340.3	521.9	868.7	899.9	568.6	287.8	167.8	130.0	255.3
45	136.5	155.8	187.3	233.8	369.2	555.1	915.3	941.1	598.8	301.9	175.1	133.9	296.4
40	140.6	164.2	196.8	245.5	392.4	595.9	969.7	1,011.5	629.5	320.3	182.1	138.6	353.3
35	145.4	172.6	206.6	262.2	419.9	642.2	1,024.2	1,068.8	660.2	339.2	190.8	144.6	418.7
30	150.2	182.2	218.6	281.6	454.9	692.4	1,095.0	1,121.1	687.6	358.4	199.8	151.7	493.0
25	159.7	192.0	231.9	310.6	496.6	743.6	1,169.5	1,182.3	714.5	380.1	209.7	157.3	575.4
20	168.7	205.8	256.5	345.8	546.3	808.1	1,258.6	1,248.9	745.6	406.9	220.3	164.6	673.4
15	176.3	224.0	289.5	405.9	612.6	897.5	1,376.5	1,351.8	794.2	435.6	231.9	173.6	772.3
10	187.4	260.0	368.6	499.7	695.1	1,089.9	1,563.2	1,534.3	873.4	475.6	247.8	184.3	938.7
5	215.0	343.2	550.6	664.9	870.3	1,412.1	1,852.9	1,734.5	992.0	540.1	282.6	197.4	1,218.0

**Table 45.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,130.0	960.9	857.2	798.2
0.50	2	1,671.3	1,409.1	1,231.4	1,119.2
0.20	5	2,541.5	2,026.8	1,706.4	1,501.5
0.10	10	3,200.1	2,432.4	1,995.7	1,721.6
0.05	20	3,893.8	2,816.9	2,255.6	1,911.5
0.02	50	4,887.8	3,309.0	2,569.7	2,131.7
0.01	100	5,709.6	3,675.0	2,791.3	2,281.1

**Table 46.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T9, Greater Zab River at Eski Kelek, Iraq, water years 1932–90.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	121.1	121.6	123.2	125.6	132.5	140.2	179.3
0.2	5	88.9	89.8	91.4	93.9	98.7	104.9	138.8
0.1	10	71.7	72.8	74.3	76.9	80.6	85.7	117.5
0.05	20	58.3	59.4	61.0	63.5	66.3	70.6	100.7
0.02	50	44.6	45.8	47.3	49.7	51.7	54.9	83.0
0.01	100	36.5	37.8	39.1	41.5	42.9	45.6	72.1

## Tigris River Basin

### LESSER ZAB RIVER AT DOKAN (IRQ\_T10)

(U.S. Geological Survey identification number: 35571404457100)

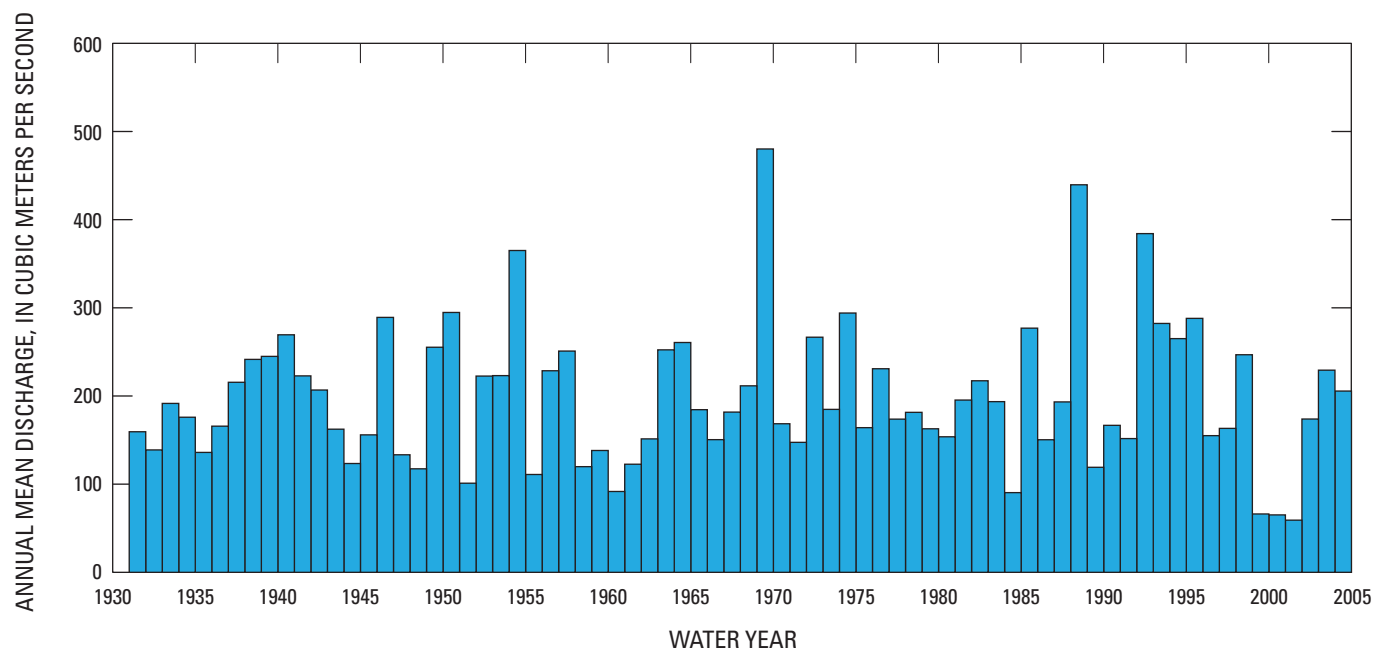
LOCATION: Latitude 35° 57' 14" N, Longitude 44° 57' 10" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: November 1931 to September 2004.

GAGE: No information available for this site.

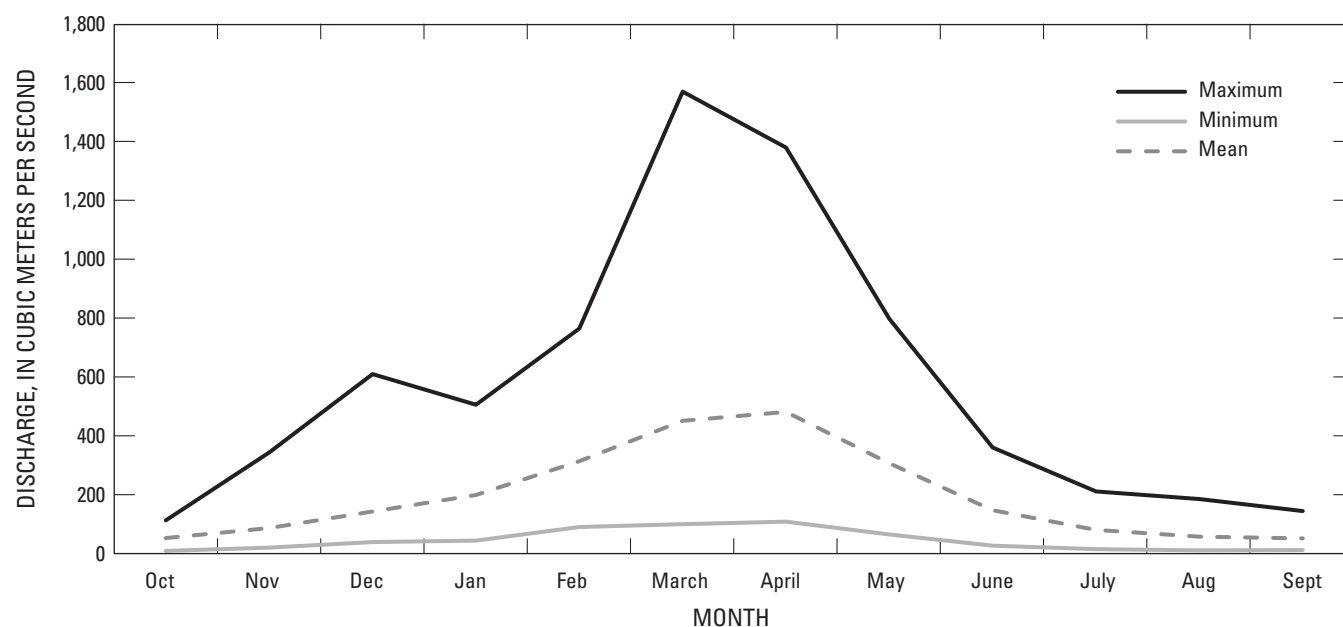
RECORDS: No information available for this site.



**Figure 29.** Annual mean discharge at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

**Table 47.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	113.00	1983	9.00	1978	52.76	23.31	0.44	2.23
November	343.50	1994	20.20	2001	86.74	55.96	0.65	3.66
December	609.60	1988	39.10	2000	143.03	99.30	0.69	6.03
January	505.50	1994	44.00	2001	198.98	106.33	0.53	8.39
February	764.20	1952	90.20	1948	313.66	156.92	0.50	13.23
March	1,569.00	1988	99.90	1999	451.02	276.13	0.61	19.03
April	1,379.00	1969	108.40	1999	481.10	238.89	0.50	20.29
May	797.30	1992	64.90	2001	306.63	149.55	0.49	12.93
June	360.10	1992	26.80	2001	147.25	64.82	0.44	6.21
July	211.00	1978	15.00	2001	80.32	36.87	0.46	3.39
August	185.20	1969	10.80	1999	57.44	27.63	0.48	2.42
September	144.40	1969	12.00	2001	51.61	25.22	0.49	2.18
Annual	479.29	1969	59.07	2001	197.67	78.946	0.40	100.00

**Figure 30.** Monthly discharge at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

**Table 48.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

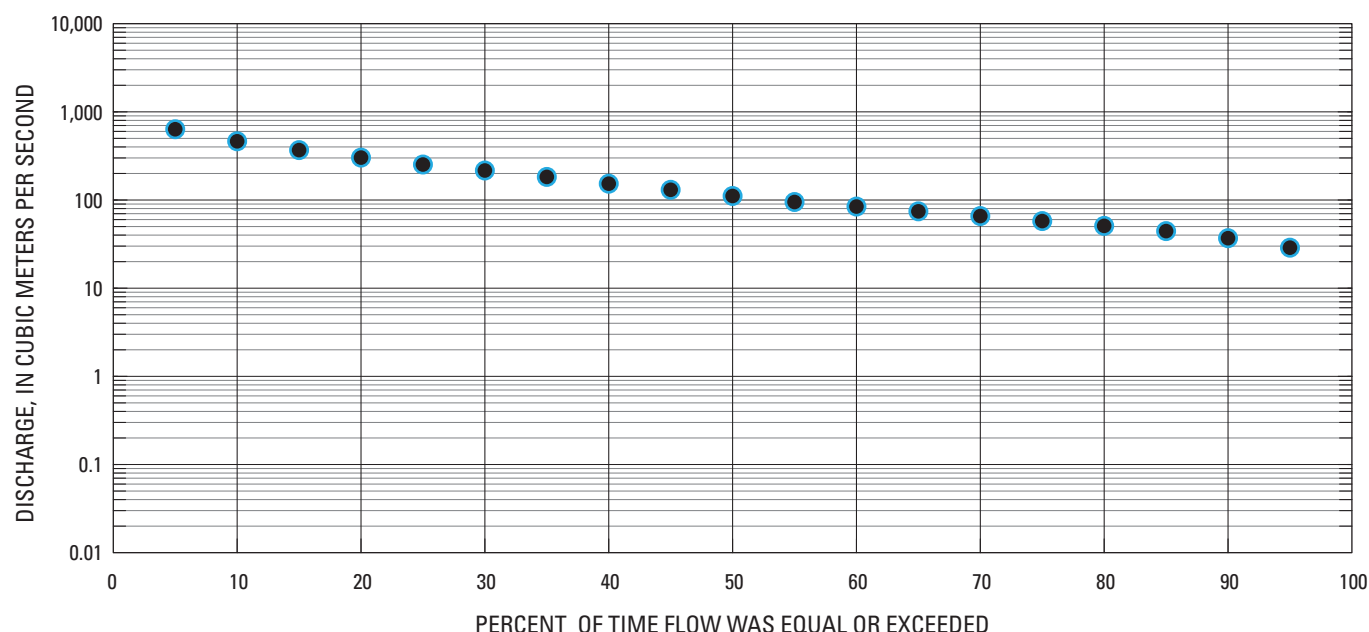
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	—	29.00	72.60	236.40	234.80	304.80	366.30	236.40	136.50	69.90	37.00	27.00	159.15
1932	25.40	46.50	107.40	132.30	288.00	382.70	245.50	193.50	128.20	54.40	32.70	26.30	138.58
1933	26.50	79.50	65.50	160.10	293.10	455.20	542.70	330.90	171.30	89.80	46.80	33.30	191.23
1934	32.50	36.90	247.20	170.00	236.50	217.50	463.30	365.40	184.30	80.10	42.70	30.70	175.59
1935	30.10	38.70	77.60	142.50	374.30	244.90	292.10	208.80	110.30	54.10	30.70	25.00	135.76
1936	26.60	51.00	109.00	64.20	389.30	292.70	452.80	288.90	143.30	84.40	46.20	37.20	165.47
1937	38.00	132.90	183.30	263.10	503.90	346.70	474.60	291.60	168.80	94.00	49.20	35.70	215.15
1938	44.80	92.70	78.80	337.30	490.20	457.50	631.60	408.10	178.30	85.40	48.50	39.70	241.08
1939	42.20	72.50	243.60	367.50	439.20	483.00	613.80	295.70	166.20	100.50	62.70	46.80	244.48
1940	46.60	80.40	131.80	422.80	760.80	522.40	557.10	311.10	179.70	108.40	59.20	46.80	268.93
1941	55.70	59.00	138.60	332.80	633.50	503.50	381.00	263.40	135.50	70.50	51.20	44.20	222.41
1942	44.40	48.00	95.50	248.10	311.90	651.30	413.80	304.40	176.70	92.80	50.50	39.30	206.39
1943	49.70	110.80	82.00	87.20	154.20	347.30	505.10	316.50	143.80	74.60	42.90	30.50	162.05
1944	33.10	42.80	60.40	182.50	171.40	258.50	332.30	201.60	98.80	45.60	28.10	23.20	123.19
1945	26.20	82.50	52.40	321.80	254.50	250.40	345.40	242.80	137.80	72.60	48.20	33.00	155.63
1946	35.90	96.80	113.60	203.20	430.50	808.80	687.70	555.40	245.80	137.90	85.30	62.50	288.62
1947	62.70	64.70	78.10	182.90	320.60	329.50	202.80	157.70	90.00	50.60	31.70	25.70	133.08
1948	27.70	44.20	78.80	81.00	90.20	203.90	308.40	306.80	144.20	64.00	32.90	24.30	117.20
1949	25.10	29.30	47.90	78.60	200.00	801.30	878.80	521.30	248.50	118.50	60.80	47.80	254.83
1950	46.10	51.70	114.90	397.00	396.40	856.40	627.40	578.60	224.50	119.00	71.60	46.80	294.20
1951	47.60	52.00	55.50	137.10	259.50	237.30	153.80	121.30	73.70	34.90	21.30	16.80	100.90
1952	26.40	39.00	92.40	90.90	764.20	634.20	370.90	321.90	152.30	83.50	49.50	41.00	222.18
1953	39.80	42.50	105.70	209.00	440.90	669.70	546.90	263.00	161.00	95.00	56.70	42.20	222.70
1954	39.80	106.50	93.50	277.20	560.40	1,098.00	1,135.00	539.90	259.70	135.20	73.90	53.00	364.34
1955	50.40	58.50	80.50	99.00	143.70	217.60	253.80	220.60	93.50	49.20	33.90	28.50	110.77
1956	29.20	85.90	218.30	164.20	380.40	471.70	696.40	304.80	188.40	109.40	53.10	36.70	228.21
1957	35.80	50.10	92.00	103.80	228.60	853.30	565.70	570.30	249.70	129.80	73.30	53.50	250.49
1958	53.50	74.60	92.30	183.50	219.50	280.40	202.70	132.90	85.30	47.90	34.00	29.00	119.63
1959	31.20	37.20	119.20	72.00	91.80	342.40	446.00	237.80	105.70	68.80	51.20	51.90	137.93
1960	39.60	79.60	64.80	99.80	118.00	134.30	194.40	157.90	66.10	38.90	56.70	48.20	91.53
1961	60.80	105.30	68.20	163.30	158.50	146.50	339.50	197.70	61.40	71.70	48.30	47.50	122.39
1962	36.50	63.80	155.40	194.30	299.90	276.00	269.20	211.30	111.10	86.80	60.90	47.80	151.08
1963	45.50	43.10	127.30	294.00	341.60	385.10	629.20	547.70	240.60	132.00	160.00	76.40	251.88
1964	60.50	124.70	172.20	184.00	379.50	746.70	573.70	380.80	203.70	121.40	76.70	98.30	260.18
1965	57.40	73.80	94.70	162.70	260.40	295.20	479.40	344.90	191.50	113.60	86.90	49.10	184.13
1966	71.40	107.70	90.40	107.70	275.00	361.90	285.70	183.80	95.60	55.30	79.60	88.40	150.21
1967	88.00	84.10	83.60	153.50	256.10	386.20	360.90	362.20	150.10	78.40	89.50	84.20	181.40
1968	87.00	114.90	219.10	135.60	200.60	364.80	606.60	391.50	165.50	78.40	89.80	80.00	211.15
1969	74.40	115.40	465.50	403.40	484.80	1,406.00	1,379.00	637.90	264.90	190.60	185.20	144.40	479.29
1970	112.10	165.70	245.30	247.60	218.20	287.00	244.40	161.20	107.40	74.20	87.70	67.80	168.22
1971	56.00	55.20	70.00	64.20	121.40	210.40	659.00	217.90	100.50	74.20	67.60	69.40	147.15
1972	64.30	82.70	137.90	136.60	222.90	522.60	766.40	734.80	238.20	98.60	73.60	115.60	266.18

**Table 48.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1973	103.70	168.90	112.00	160.00	439.60	294.10	355.20	240.50	109.80	89.50	78.10	62.30	184.48
1974	71.90	78.30	115.40	113.50	154.80	1,211.00	895.20	334.90	288.00	87.00	85.80	86.80	293.55
1975	70.20	70.40	110.90	147.50	374.60	328.90	295.80	243.30	119.10	74.50	72.30	57.90	163.78
1976	63.00	77.80	149.50	191.70	348.80	348.80	742.00	438.70	205.90	74.20	55.20	70.30	230.49
1977	88.00	99.10	116.00	127.60	274.30	337.40	440.20	250.30	108.30	43.00	81.00	116.00	173.43
1978	9.00	105.00	146.60	257.30	329.60	395.10	270.20	180.10	115.50	211.00	71.00	83.00	181.12
1979	87.00	42.00	289.50	265.00	286.00	234.00	297.20	204.30	94.20	48.00	51.00	52.00	162.52
1980	53.00	49.00	110.30	116.00	164.40	363.70	496.40	215.50	101.40	59.10	52.50	60.20	153.46
1981	59.60	103.30	55.10	215.80	277.40	511.90	430.10	306.50	158.40	86.90	71.10	64.20	195.03
1982	85.20	84.10	93.60	213.50	256.10	491.10	632.20	384.20	135.00	78.40	76.30	72.70	216.87
1983	113.00	187.50	134.90	177.90	231.80	404.40	396.80	324.80	137.80	79.00	62.20	68.80	193.24
1984	54.90	64.50	102.10	54.80	99.80	163.20	195.00	146.30	71.60	45.10	52.20	33.30	90.23
1985	50.60	149.60	177.20	306.50	677.80	588.60	665.10	321.30	165.40	91.00	50.20	73.90	276.43
1986	83.00	90.70	144.80	141.20	330.80	175.20	279.30	273.20	113.70	69.50	50.50	49.30	150.10
1987	60.10	150.40	163.10	146.50	261.60	516.30	440.40	277.90	135.10	59.70	48.40	55.70	192.93
1988	86.00	112.10	609.60	411.80	554.50	1,569.00	813.70	515.30	256.00	161.90	84.10	91.10	438.76
1989	93.50	91.00	178.30	104.40	107.20	336.80	216.10	112.00	58.30	39.40	42.20	47.70	118.91
1990	53.20	105.30	231.10	218.30	241.20	351.70	355.10	209.90	108.90	49.30	31.40	41.50	166.41
1991	58.40	66.00	66.70	56.50	169.60	525.90	472.90	173.20	77.00	47.50	40.60	62.80	151.43
1992	67.60	88.30	382.00	277.80	650.00	583.10	1,086.00	797.30	360.10	158.10	81.10	70.20	383.47
1993	74.20	172.00	322.80	288.60	336.90	426.90	686.30	579.00	243.80	115.70	72.60	62.40	281.77
1994	72.20	343.50	275.90	505.50	442.80	506.40	455.80	274.90	113.50	70.10	60.50	53.90	264.58
1995	65.20	326.00	314.40	388.80	459.60	370.50	742.40	402.10	192.00	84.00	55.60	49.50	287.51
1996	53.30	79.00	79.70	131.20	237.70	354.70	483.60	216.80	95.60	52.70	44.20	28.40	154.74
1997	37.30	46.30	80.70	117.00	146.60	431.30	519.90	291.30	143.10	65.80	41.70	34.60	162.97
1998	55.40	131.40	168.30	229.30	438.30	749.90	672.90	285.90	113.60	45.60	33.50	32.00	246.34
1999	40.60	60.10	65.30	84.60	193.90	99.90	108.40	68.10	31.40	16.50	10.80	13.30	66.08
2000	16.50	23.10	39.10	108.10	124.90	146.20	161.60	88.40	31.30	16.10	12.20	12.70	65.02
2001	14.70	20.20	56.20	44.00	110.10	203.00	129.90	64.90	26.80	15.00	12.00	12.00	59.07
2002	14.00	26.00	136.90	350.20	273.10	302.90	489.90	230.10	150.20	52.40	27.00	30.00	173.56
2003	29.00	62.50	272.90	278.00	383.00	594.80	569.00	290.10	136.10	63.00	35.00	33.00	228.87
2004	42.00	93.00	160.80	401.10	435.00	413.00	325.80	328.80	121.10	60.00	40.00	42.00	205.22



**Figure 31.** Annual flow duration at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

**Table 49.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	18.10	27.00	41.30	52.70	82.30	129.30	156.20	101.40	46.00	25.40	18.10	17.40	28.80
90	25.40	33.40	48.60	64.60	102.30	163.70	197.60	132.20	63.70	38.40	28.20	24.80	36.90
85	28.50	37.90	54.90	74.90	121.90	193.80	229.30	152.20	74.70	43.40	31.50	27.60	44.40
80	30.80	41.10	60.50	85.40	140.00	216.00	254.80	169.70	84.50	47.90	34.80	30.00	50.90
75	33.60	44.70	65.70	95.40	154.40	235.70	276.20	189.10	93.40	52.30	38.10	32.50	57.70
70	36.70	49.10	70.70	106.50	170.30	256.60	302.40	207.20	101.00	56.70	40.60	35.70	65.80
65	39.40	52.20	75.40	118.40	187.50	278.60	327.80	223.10	108.60	61.10	43.80	38.50	74.40
60	42.10	55.50	80.30	128.40	206.10	301.60	353.20	237.90	116.30	65.40	47.50	41.00	84.30
55	45.00	60.70	87.30	139.30	224.40	325.30	378.90	252.60	124.00	69.40	50.00	43.60	94.90
50	47.90	65.20	94.30	150.40	243.10	350.40	408.20	268.20	132.50	73.40	52.30	46.00	111.10
45	51.00	69.20	103.80	161.80	262.80	379.60	440.30	284.60	141.00	77.30	54.80	48.40	130.60
40	54.10	73.90	113.70	175.90	285.50	413.50	475.70	302.30	150.50	82.10	58.20	51.00	153.20
35	57.50	80.30	127.90	191.80	311.80	447.00	513.00	321.50	160.50	87.00	61.70	54.10	182.80
30	61.00	87.70	143.10	209.90	344.00	482.40	551.60	344.10	171.10	92.00	67.10	57.20	216.10
25	65.90	96.00	159.10	236.20	381.80	527.80	592.00	373.30	184.60	100.30	72.50	63.00	252.70
20	71.80	106.40	186.40	273.50	427.30	586.10	646.00	414.40	198.60	109.50	77.50	70.40	302.80
15	79.80	122.80	224.70	323.80	483.90	667.60	722.40	466.70	219.00	120.60	83.90	79.40	368.20
10	89.20	154.90	266.40	383.50	576.90	793.10	851.60	536.00	246.90	132.40	91.50	88.90	463.50
5	103.70	220.80	382.90	514.30	779.90	1,129.90	1,096.20	664.80	294.30	168.60	108.60	106.80	634.80

**Table 50.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	664.6	514.89	417.61	357.3
0.50	2	1,047.10	792.76	638.36	537.97
0.20	5	1,639.80	1,229.40	983.72	817.38
0.10	10	2,068.20	1,550.80	1,237.20	1,020.90
0.05	20	2,502.10	1,881.50	1,497.60	1,228.90
0.02	50	3,096.10	2,342.50	1,860.20	1,517.20
0.01	100	3,565.90	2,713.60	2,151.80	1,748.30

**Table 51.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T10, Lesser Zab River at Dokan, Iraq, water years 1931–2004.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	29.53	35.91	38.89	41.61	45.80	48.91	68.28
0.2	5	18.54	23.50	25.49	27.06	30.40	32.43	46.53
0.1	10	13.86	17.78	19.50	20.66	23.63	25.26	36.62
0.05	20	10.61	13.68	15.24	16.12	18.82	20.17	29.41
0.02	50	7.63	9.84	11.22	11.87	14.23	15.33	22.44
0.01	100	6.02	7.73	9.00	9.52	11.66	12.61	18.48



## Tigris River Basin

### LESSER ZAB RIVER AT DOKAN VILLAGE (IRQ\_T11)

(U.S. Geological Survey identification number: 35530004458000)

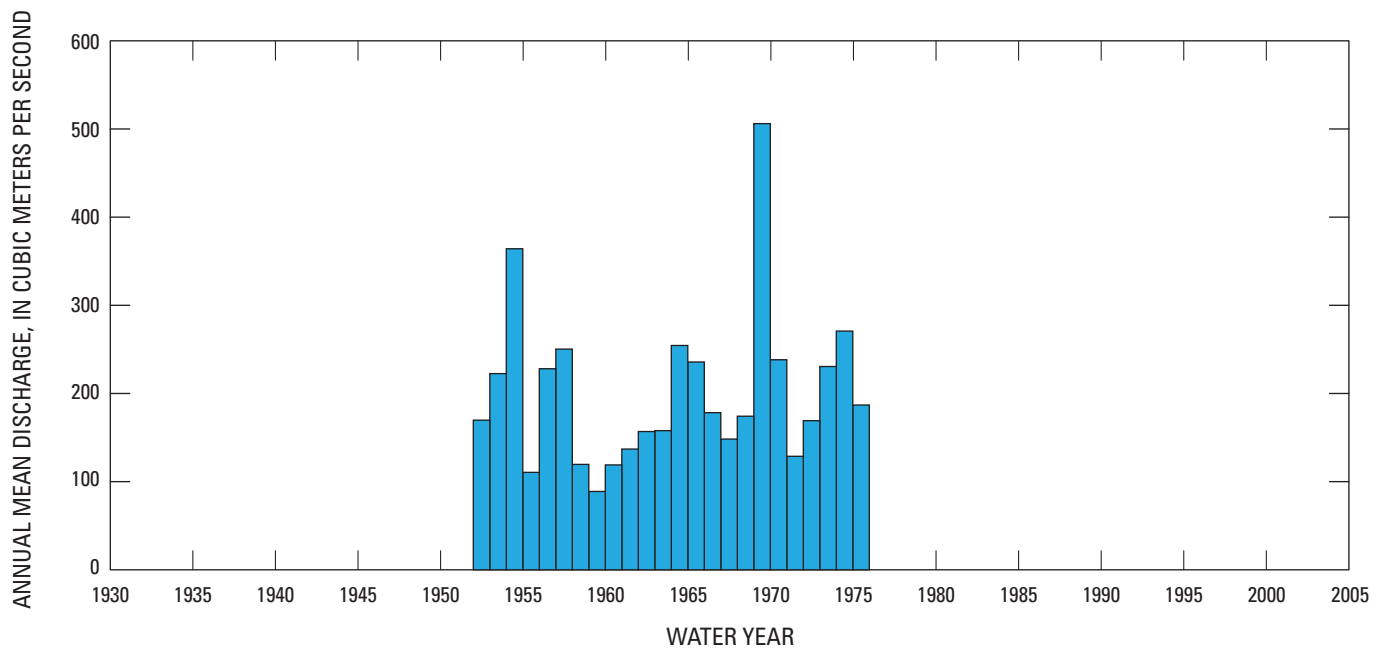
LOCATION: Latitude 35° 53' 00" N, Longitude 44° 58' 00" E.

DRAINAGE AREA: 11,700 square kilometers.

PERIOD OF RECORD: April 1952 to September 1975.

GAGE: The staff gage is located on the left bank of the Lesser Zab River 5 kilometers downstream of Dokan Dam. The automatic water-stage recorder is located on the left bank of the river 1 kilometer downstream of the staff gage. The gage is set to GTS datum.

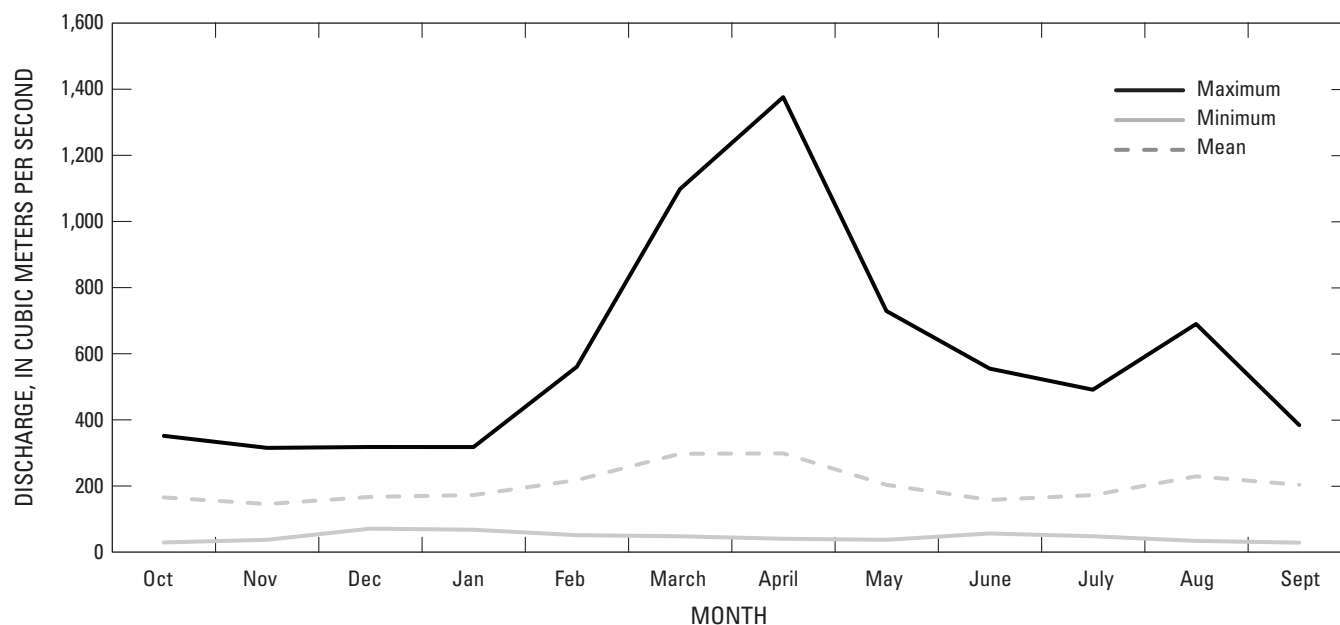
RECORDS: Regular discharge measurements were made until 1962 from a cableway near the gage site. Starting on June 1, 1971, direct daily discharge measurements were taken directly from the outflow of Dokan Dam.



**Figure 32.** Annual mean discharge at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

**Table 52.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.[m<sup>3</sup>/s, cubic meters per second]

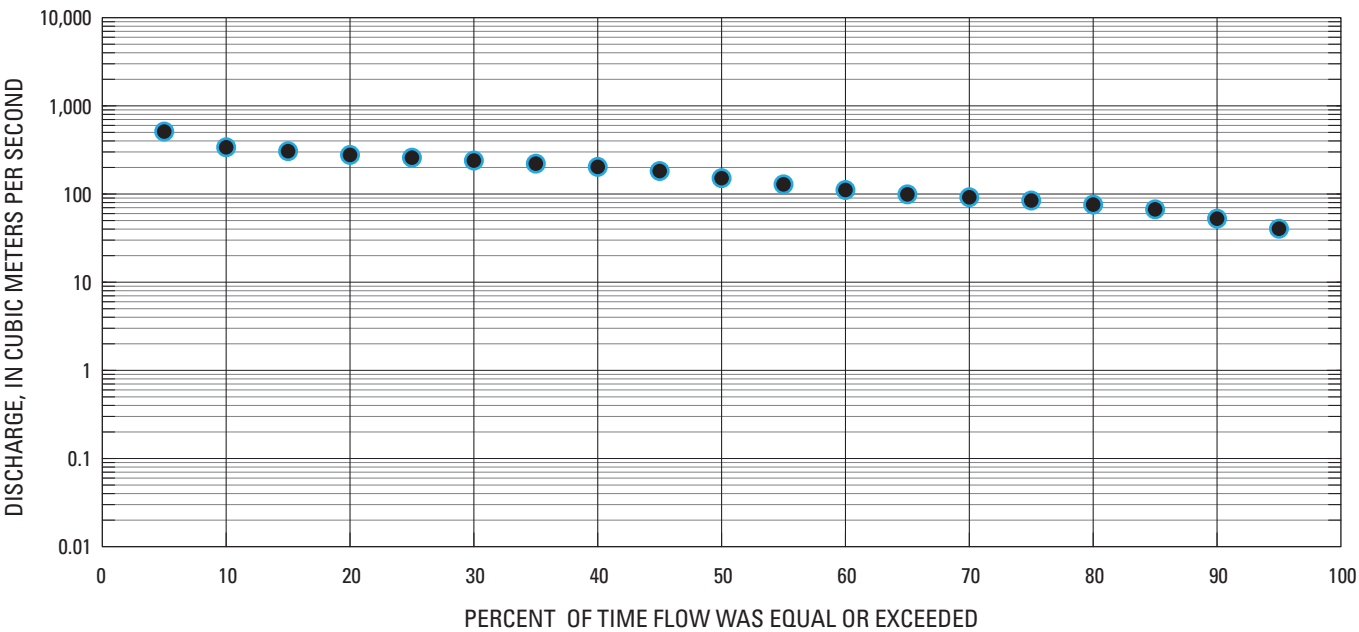
Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	351.6	1973	29.2	1956	165.34	104.27	0.63	6.80
November	315.2	1970	37.2	1959	145.28	82.37	0.57	5.98
December	317.9	1964	71	1963	166.99	77.78	0.47	6.87
January	317.7	1964	67.6	1959	172.53	75.01	0.43	7.10
February	560.4	1954	51.2	1959	217.77	137.21	0.63	8.96
March	1,098	1954	47.9	1959	297.34	297.55	1.00	12.24
April	1,376	1969	40.3	1959	298.55	351.63	1.18	12.29
May	729.2	1969	37.1	1961	203.35	183.72	0.90	8.37
June	555	1974	56.3	1961	157.92	111.67	0.71	6.50
July	491.1	1969	47.9	1958	172.18	97.77	0.57	7.09
August	689.9	1969	33.9	1955	229.20	1,55.67	0.68	9.43
September	383.9	1964	28.5	1955	203.57	1,18.84	0.58	8.38
Annual	506.43	1969	88.94	1959	202.04	90.45	0.45	100.00

**Figure 33.** Monthly discharge at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

**Table 53.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1952	—	—	—	—	—	—	370.90	321.90	152.30	83.50	49.50	41.00	169.85
1953	39.80	42.50	105.70	209.00	440.90	669.70	546.90	263.00	161.00	95.00	56.70	42.20	222.70
1954	39.80	106.50	93.50	277.20	560.40	1,098.00	1,135.00	539.90	259.70	135.20	73.90	53.00	364.34
1955	50.40	58.50	80.50	99.00	141.90	217.60	253.80	220.60	93.50	49.20	33.90	28.50	110.62
1956	29.20	85.90	218.30	164.20	380.40	471.70	696.40	304.80	188.40	109.40	53.10	36.70	228.21
1957	35.80	50.10	92.00	103.80	228.60	853.30	565.70	570.30	249.70	129.80	73.30	53.50	250.49
1958	53.50	74.60	92.30	183.50	219.50	280.40	202.70	132.90	85.30	47.90	34.00	29.00	119.63
1959	31.20	37.20	119.20	67.60	51.20	47.90	40.30	185.90	101.90	117.70	143.10	124.10	88.94
1960	87.50	150.30	265.80	126.60	72.80	76.50	74.50	75.40	75.00	88.20	148.90	187.30	119.07
1961	225.60	169.20	113.60	123.10	160.80	102.50	60.50	37.10	56.30	155.70	194.20	246.10	137.06
1962	186.70	84.00	135.20	202.10	223.30	117.40	101.70	101.60	102.10	175.10	230.50	223.60	156.94
1963	159.50	88.20	71.00	107.30	118.60	121.30	130.40	129.70	129.00	132.20	449.10	259.00	157.94
1964	103.00	262.30	317.90	317.70	317.90	317.40	177.60	89.90	231.30	244.90	291.50	383.90	254.61
1965	162.10	115.80	235.90	251.90	254.60	258.80	257.50	259.00	259.00	259.00	253.50	263.20	235.86
1966	270.80	197.70	195.40	185.70	203.90	105.20	102.30	102.40	102.20	137.20	254.60	282.50	178.33
1967	200.60	158.00	162.90	96.50	98.10	94.90	100.20	101.00	99.30	132.20	285.50	251.80	148.42
1968	286.00	113.30	97.40	98.20	151.10	159.90	173.40	127.40	96.00	140.00	336.40	312.80	174.33
1969	218.20	195.00	197.30	207.80	485.70	829.20	1,376.00	729.20	280.50	491.10	689.90	377.20	506.43
1970	321.80	315.20	302.50	292.80	204.20	117.00	117.00	117.00	225.90	276.20	294.40	276.70	238.39
1971	195.50	114.20	114.30	84.30	77.40	74.20	66.20	52.20	66.70	197.10	253.70	250.20	128.83
1972	211.00	142.30	107.30	100.00	189.70	242.70	151.70	55.80	60.00	141.90	303.90	325.00	169.28
1973	351.60	299.00	277.10	270.00	233.90	200.00	86.00	80.00	80.00	257.10	350.00	284.30	230.75
1974	265.00	235.00	235.60	169.20	80.00	—	—	—	555.00	266.40	349.00	283.30	270.94
1975	278.30	246.70	210.00	230.60	113.90	85.80	80.00	80.00	80.00	270.30	298.20	270.70	187.04



**Figure 34.** Annual flow duration at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

**Table 54.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	31.10	38.00	56.60	74.20	66.50	51.20	45.30	48.40	62.10	50.40	34.80	29.80	40.40
90	35.70	42.80	66.00	81.20	73.10	71.70	66.20	53.60	68.40	64.10	45.60	36.00	52.50
85	38.80	48.20	73.00	87.00	81.30	77.50	78.10	68.00	72.50	78.00	52.80	41.00	67.00
80	40.60	55.40	82.90	95.20	90.30	89.50	85.30	79.60	75.90	92.70	62.00	45.40	75.90
75	49.40	63.70	92.10	99.50	97.40	99.00	92.50	87.20	79.30	97.30	72.00	53.90	84.40
70	55.90	74.60	98.40	102.60	105.00	107.50	97.60	94.60	84.50	101.10	141.30	118.70	91.80
65	78.70	91.50	104.00	105.80	117.00	115.80	102.60	100.40	97.10	107.70	150.80	166.80	99.10
60	117.80	101.50	110.20	110.90	143.00	123.80	107.50	106.10	102.50	116.00	192.50	214.80	111.10
55	156.90	107.90	121.50	124.90	155.70	149.00	113.30	111.80	107.90	127.00	204.60	235.00	128.70
50	175.50	121.00	162.20	159.00	170.90	166.90	126.60	121.30	113.30	133.80	243.70	246.70	151.30
45	193.10	154.30	182.80	182.20	193.50	209.10	168.20	130.80	122.90	145.50	260.70	255.40	182.20
40	207.80	162.30	190.70	192.50	211.40	233.10	188.50	152.60	133.10	187.80	275.90	264.10	203.10
35	229.30	187.60	200.30	205.20	228.00	252.90	226.30	196.80	168.10	200.90	283.70	271.50	221.10
30	242.80	195.50	216.70	219.40	240.60	280.60	264.90	225.50	194.30	215.70	290.90	278.30	239.50
25	259.90	203.50	238.60	234.60	253.20	311.60	319.90	247.40	206.80	244.10	298.00	285.00	258.40
20	273.90	238.00	250.50	251.50	272.60	456.70	447.60	269.00	219.30	257.40	307.50	291.80	277.40
15	286.80	251.70	265.30	269.60	315.50	528.30	544.80	331.50	247.10	268.20	348.00	311.40	306.10
10	299.70	283.00	286.30	289.60	356.90	655.70	775.10	439.30	278.70	295.10	367.20	334.60	338.90
5	320.20	308.40	312.90	309.70	537.00	925.60	1,233.00	670.00	318.20	353.20	540.00	385.70	511.00

**Table 55.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	267.81	262.39	252.7	241.66
0.50	2	450.7	404.91	379.5	348.53
0.20	5	915.1	754.29	684.35	595.82
0.10	10	1,437.70	1,134.50	1,009.80	850.28
0.05	20	2,182.70	1,663.30	1,455.60	1,188.80
0.02	50	3,669.90	2,692.10	2,308.80	1,815.70
0.01	100	5,346.70	3,827.10	3,235.80	2,476.60

**Table 56.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T11, Lesser Zab River at Dokan Village, Iraq, water years 1952–75.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	49.30	49.53	51.67	58.13	65.93	72.68	115.63
0.2	5	27.23	32.98	35.31	39.44	43.04	46.25	72.49
0.1	10	18.52	26.68	29.04	32.04	34.57	36.71	55.83
0.05	20	12.93	22.40	24.76	26.92	28.91	30.43	44.61
0.02	50	8.24	18.41	20.74	22.06	23.69	24.71	34.31
0.01	100	5.93	16.15	18.45	19.29	20.77	21.54	28.63

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## Tigris River Basin

### LESSER ZAB RIVER AT ALTUN KUPRI-GOMA ZERDELA (IRQ\_T12)

(U.S. Geological Survey identification number: 35454104408520)

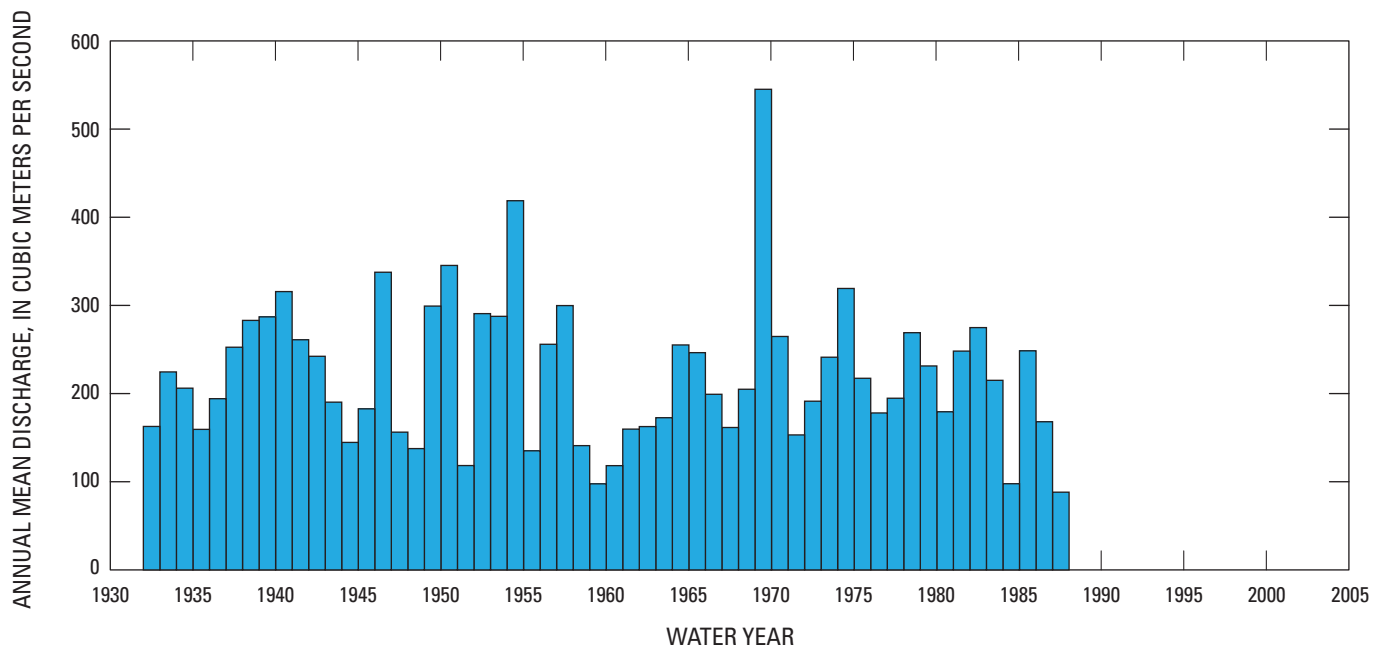
LOCATION: Latitude 35° 45' 41" N, Longitude 44° 08' 52" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: October 1932 to May 1987.

GAGE: The staff gage is set to masonry steps immediately downstream of the left bank abutment of the highway bridge at the south branch of the river by the town of Altun Kupri. The gage is set to GTS datum.

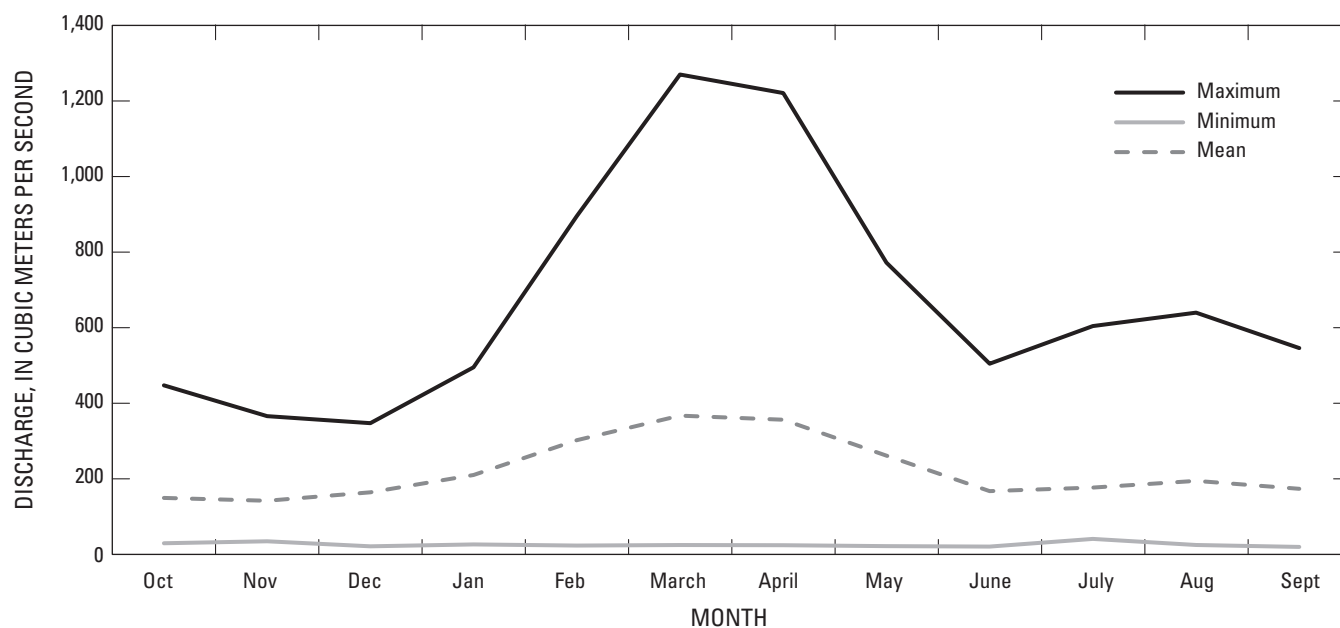
RECORDS: Discharge measurements were made regularly from a cableway at Goma Zerdela.



**Figure 35.** Annual mean discharge at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

**Table 57.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	447.4	1979	29.5	1949	149.47	123.07	0.82	5.61
November	365.9	1979	34.7	1949	141.96	94.80	0.67	5.33
December	347.3	1970	21.4	1984	164.30	83.64	0.51	6.16
January	495.2	1940	26.4	1984	210.17	114.38	0.54	7.88
February	895.2	1952	23.4	1984	302.24	203.77	0.67	11.34
March	1,270	1954	24.8	1984	367.24	300.72	0.82	13.78
April	1,221	1954	24.3	1984	356.42	296.67	0.83	13.37
May	772.2	1969	21.9	1984	261.37	197.80	0.76	9.81
June	504.7	1974	20.7	1984	167.46	91.97	0.55	6.28
July	604.3	1978	41	1951	176.85	128.59	0.73	6.63
August	639.8	1969	24.9	1951	194.58	164.53	0.85	7.30
September	546	1981	19.8	1951	173.59	150.14	0.86	6.51
Annual	543.95	1969	87.98	1987	221.53	82.25	0.37	100.00

**Figure 36.** Monthly discharge at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.



**Table 58.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

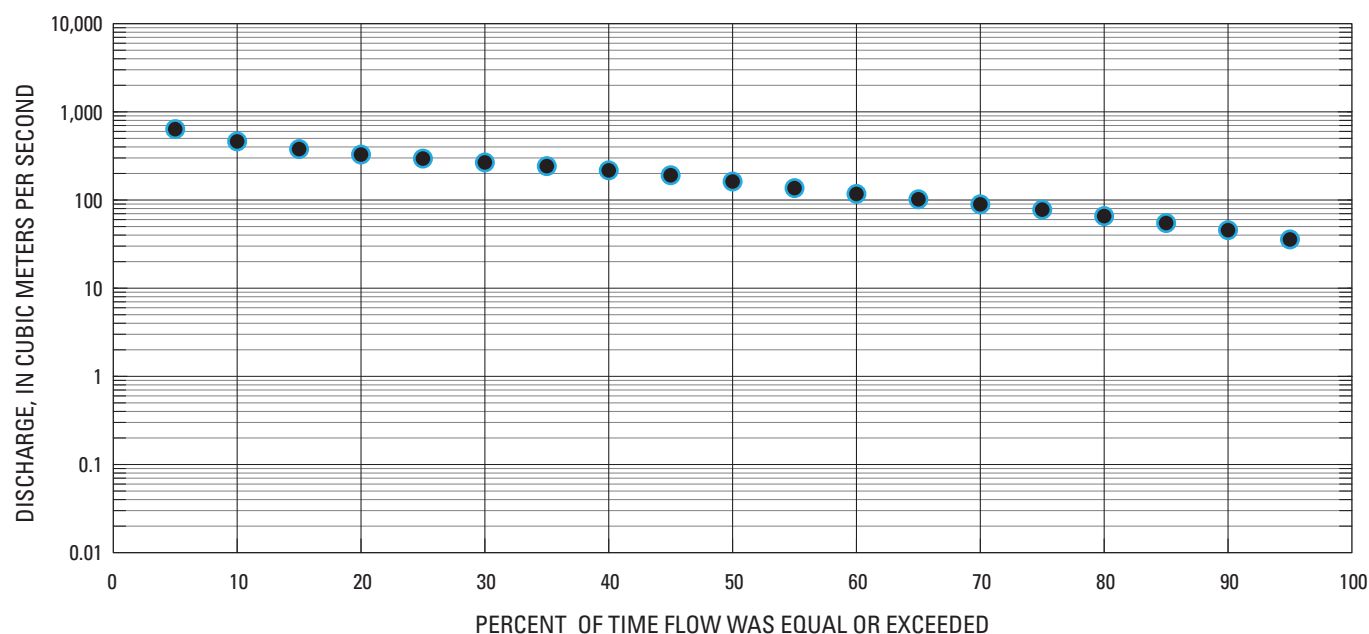
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1932	30.00	54.70	125.80	155.00	337.60	448.30	287.70	226.60	150.20	63.30	38.20	31.00	162.37
1933	31.40	93.30	76.80	187.60	343.30	533.20	635.80	387.50	200.80	105.20	54.90	39.20	224.08
1934	38.50	43.10	289.20	199.10	277.00	254.80	542.70	428.10	216.00	93.80	49.90	36.00	205.68
1935	35.50	45.20	90.70	166.90	438.80	287.00	342.30	244.60	129.00	63.20	36.00	29.50	159.06
1936	31.10	59.80	127.60	75.10	456.00	342.80	530.40	338.50	167.80	98.90	54.20	43.20	193.78
1937	44.80	155.90	214.80	308.20	589.90	406.20	555.50	341.60	197.90	110.10	57.50	42.00	252.03
1938	52.80	108.50	92.40	395.10	573.90	535.80	739.80	478.00	209.00	100.00	56.70	46.70	282.39
1939	49.00	85.00	285.50	430.40	514.70	566.00	719.00	346.40	194.70	117.80	73.50	54.80	286.40
1940	54.50	94.20	154.30	495.20	891.50	612.00	652.70	364.40	210.30	126.90	69.20	54.80	315.00
1941	65.20	69.20	162.30	389.90	742.40	589.80	446.20	308.40	158.70	82.40	59.60	51.70	260.48
1942	52.10	56.20	111.70	290.60	365.30	763.20	484.70	356.50	207.20	108.80	58.90	46.00	241.77
1943	58.10	129.80	96.10	102.10	180.80	406.90	591.70	370.70	168.50	87.50	50.40	35.70	189.86
1944	38.60	50.00	70.80	213.80	200.90	302.70	389.20	236.10	116.00	53.40	32.90	27.20	144.30
1945	30.90	96.70	61.40	377.00	297.90	293.30	404.50	284.30	161.30	85.00	56.50	38.80	182.30
1946	41.90	113.50	133.10	237.90	504.40	947.70	805.60	636.00	288.30	161.50	99.80	73.20	336.91
1947	73.40	75.80	91.50	214.40	375.50	386.00	237.50	184.70	105.70	59.20	37.00	30.20	155.91
1948	32.60	51.80	92.40	95.00	105.60	238.90	361.30	359.40	168.80	74.90	38.70	28.30	137.31
1949	29.50	34.70	56.10	92.10	234.20	938.90	1,030.00	610.60	291.20	138.70	71.20	56.00	298.60
1950	54.20	60.70	134.60	464.70	464.30	1,003.00	734.90	677.70	263.20	139.20	83.90	54.70	344.59
1951	55.60	60.50	64.70	160.60	304.00	277.90	180.10	142.00	86.20	41.00	24.90	19.80	118.11
1952	30.90	45.50	108.20	106.60	895.20	827.00	557.30	480.80	227.70	106.60	51.60	43.30	290.06
1953	42.40	45.30	148.60	327.50	609.00	924.60	664.90	305.50	175.20	98.60	58.50	43.70	286.98
1954	42.50	141.70	102.90	351.00	658.40	1,270.00	1,221.00	577.10	307.70	178.10	95.20	68.30	417.83
1955	63.60	85.50	107.30	132.00	171.90	247.10	298.40	256.60	112.50	61.10	43.50	38.20	134.81
1956	35.90	98.30	284.40	209.10	438.20	498.40	721.70	342.10	206.70	123.30	63.00	43.20	255.36
1957	33.80	47.70	98.50	113.10	265.90	1,037.00	699.60	683.00	331.70	147.40	78.70	53.50	299.16
1958	55.20	98.50	121.90	258.90	288.20	296.20	220.90	141.60	94.40	48.50	34.10	29.50	140.66
1959	32.00	38.70	151.70	78.90	61.80	87.10	81.20	190.90	96.00	106.10	131.20	113.50	97.43
1960	86.90	128.90	257.40	144.80	81.00	86.10	80.40	71.10	68.10	75.10	148.70	187.50	118.00
1961	229.30	242.80	118.50	154.60	175.70	116.60	106.50	74.70	82.60	167.60	204.30	239.00	159.35
1962	183.20	81.70	162.70	241.80	245.50	138.80	120.20	103.60	96.70	154.50	213.30	204.70	162.23
1963	153.90	85.30	68.40	112.70	196.40	160.10	194.30	227.80	143.70	120.50	342.10	261.70	172.24
1964	100.10	255.60	328.20	317.20	347.00	346.50	199.70	74.20	214.30	227.60	279.00	365.90	254.61
1965	180.70	111.20	245.20	291.80	277.50	272.00	307.10	267.20	251.00	247.50	246.10	253.30	245.88
1966	271.20	202.00	196.60	186.10	258.60	249.30	143.50	106.00	92.90	136.90	261.40	280.70	198.77
1967	231.70	164.40	175.20	119.60	143.80	140.10	112.30	103.30	94.80	126.80	277.50	244.60	161.18
1968	277.30	137.10	182.30	111.50	167.80	174.20	260.00	184.40	120.90	153.20	340.10	344.80	204.47
1969	263.10	232.40	292.00	359.00	572.20	819.80	1,106.00	772.20	420.60	572.60	639.80	477.70	543.95
1970	351.10	349.90	347.30	367.80	251.60	166.60	147.80	140.30	216.10	275.60	287.60	268.70	264.20
1971	202.70	123.10	125.20	90.80	90.10	109.70	182.60	75.50	79.40	211.00	273.40	269.90	152.78

**Table 58.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1972	220.30	165.70	125.20	124.30	251.70	325.20	217.20	110.80	68.70	121.50	269.40	291.30	190.94
1973	324.50	304.90	288.30	291.60	291.50	230.10	110.30	85.10	78.80	239.70	349.10	294.80	240.73
1974	267.80	242.70	243.90	201.60	117.30	330.40	250.20	706.80	504.70	282.20	357.80	317.00	318.53
1975	315.20	276.70	235.70	251.80	218.20	139.70	106.50	96.90	92.30	254.40	326.50	288.70	216.88
1976	273.70	256.10	239.70	136.30	138.30	120.40	127.70	98.10	92.30	111.50	250.20	287.40	177.64
1977	306.40	337.30	262.20	258.80	164.20	93.00	106.50	91.10	80.30	181.80	227.60	222.40	194.30
1978	189.50	256.10	237.00	133.60	149.50	171.30	—	102.10	104.10	604.30	585.90	419.80	268.47
1979	447.40	365.90	306.20	292.70	231.20	67.30	32.30	36.30	82.60	260.00	351.10	297.00	230.83
1980	220.00	88.60	101.30	73.70	74.70	102.00	80.30	54.10	110.60	424.40	427.40	390.60	178.98
1981	385.70	217.80	207.20	130.60	109.20	184.90	105.60	86.20	151.10	342.50	504.90	546.00	247.64
1982	400.80	262.20	124.60	163.10	140.90	102.00	123.10	289.80	293.90	392.10	486.50	511.90	274.24
1983	280.10	286.30	268.50	296.30	115.20	37.40	28.50	33.80	150.40	399.00	464.70	—	214.56
1984	328.70	69.60	21.40	26.40	23.40	24.80	24.30	21.90	20.70	158.60	213.60	237.10	97.54
1985	151.40	99.00	75.20	53.50	322.10	399.10	96.40	234.20	160.80	482.10	494.60	407.20	247.97
1986	315.90	335.00	247.00	136.80	112.80	46.80	41.60	45.90	95.10	223.50	219.70	192.20	167.69
1987	175.60	131.90	63.20	72.90	71.60	89.60	55.40	43.60	—	—	—	—	87.98



**Figure 37.** Annual flow duration at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

**Table 59.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	31.20	37.80	48.30	55.70	60.80	46.70	33.90	34.80	51.90	50.00	33.80	28.20	35.70
90	33.50	42.10	56.20	70.60	79.50	73.80	55.80	52.40	69.80	61.10	39.30	31.20	45.50
85	35.30	45.60	63.30	80.90	94.50	88.80	75.90	72.40	77.30	71.60	45.70	35.60	54.80
80	38.40	49.60	72.10	92.30	110.80	108.20	93.70	85.10	83.90	79.00	50.20	39.50	65.70
75	42.00	55.10	79.60	103.00	126.50	132.20	106.20	96.20	91.90	88.00	55.00	42.10	77.80
70	45.70	60.60	85.60	112.30	144.10	150.50	124.70	104.80	98.80	94.80	60.20	44.90	89.30
65	50.90	68.50	93.20	119.90	164.80	171.30	143.70	124.90	107.50	100.20	65.10	48.50	101.90
60	54.60	74.40	101.90	130.50	187.50	204.30	165.20	147.00	120.50	107.70	73.60	54.30	117.20
55	64.40	82.50	112.20	147.60	209.10	237.90	198.40	182.50	132.70	115.40	88.00	59.40	136.40
50	74.90	93.20	124.20	168.60	229.60	264.80	259.60	215.80	147.00	122.60	131.30	82.00	162.10
45	128.00	108.50	139.30	190.70	249.10	290.80	299.50	245.20	160.80	134.90	194.40	188.00	190.90
40	166.00	130.40	168.60	210.20	271.00	321.10	349.10	268.40	176.20	151.40	222.10	223.40	216.80
35	206.30	162.80	194.50	231.80	294.40	355.90	411.40	292.60	193.10	174.20	242.80	249.40	242.20
30	235.90	193.50	213.00	253.80	320.90	411.80	473.60	322.60	210.30	203.20	278.10	272.90	266.80
25	262.60	222.30	237.00	273.50	348.10	479.10	539.60	359.00	223.60	228.20	300.10	291.10	295.10
20	284.40	248.40	255.90	296.90	393.90	564.40	605.50	404.00	237.10	254.10	331.70	305.20	327.70
15	303.90	269.90	272.50	326.80	466.40	666.10	674.10	462.70	256.00	285.00	384.80	330.10	378.30
10	347.30	313.70	300.80	377.00	588.60	792.90	775.80	552.50	286.20	366.20	441.30	399.30	461.90
5	390.90	346.40	344.60	473.30	846.80	1,030.00	1,021.00	706.00	345.90	461.90	514.70	466.60	636.20

**Table 60.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	458.96	385.65	347.69	320.56
0.50	2	769.36	618.84	536.82	478.54
0.20	5	1,362.80	1,051.30	880.97	756.21
0.10	10	1,879.60	1,419.70	1,170.50	983.45
0.05	20	2,480.80	1,842.30	1,500.10	1,237.20
0.02	50	3,435	2,504.10	2,012.90	1,624.10
0.01	100	4,300.90	3,097.80	2,470.50	1,963.30

**Table 61.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T12, Lesser Zab River at Altun Kupri-Goma Zerdela, Iraq, water years 1932–87.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	46.78	45.82	47.45	50.64	56.69	63.90	103.89
0.2	5	29.86	31.47	32.69	34.30	37.05	40.38	65.63
0.1	10	22.95	26.22	27.43	28.48	30.15	32.30	51.81
0.05	20	18.19	22.71	23.97	24.65	25.64	27.08	42.70
0.02	50	13.77	19.46	20.80	21.14	21.55	22.41	34.42
0.01	100	11.33	17.63	19.03	19.19	19.28	19.85	29.85

## Tigris River Basin

### TIGRIS RIVER AT FATHA (IRQ\_T13)

(U.S. Geological Survey identification number: 35030004333000)

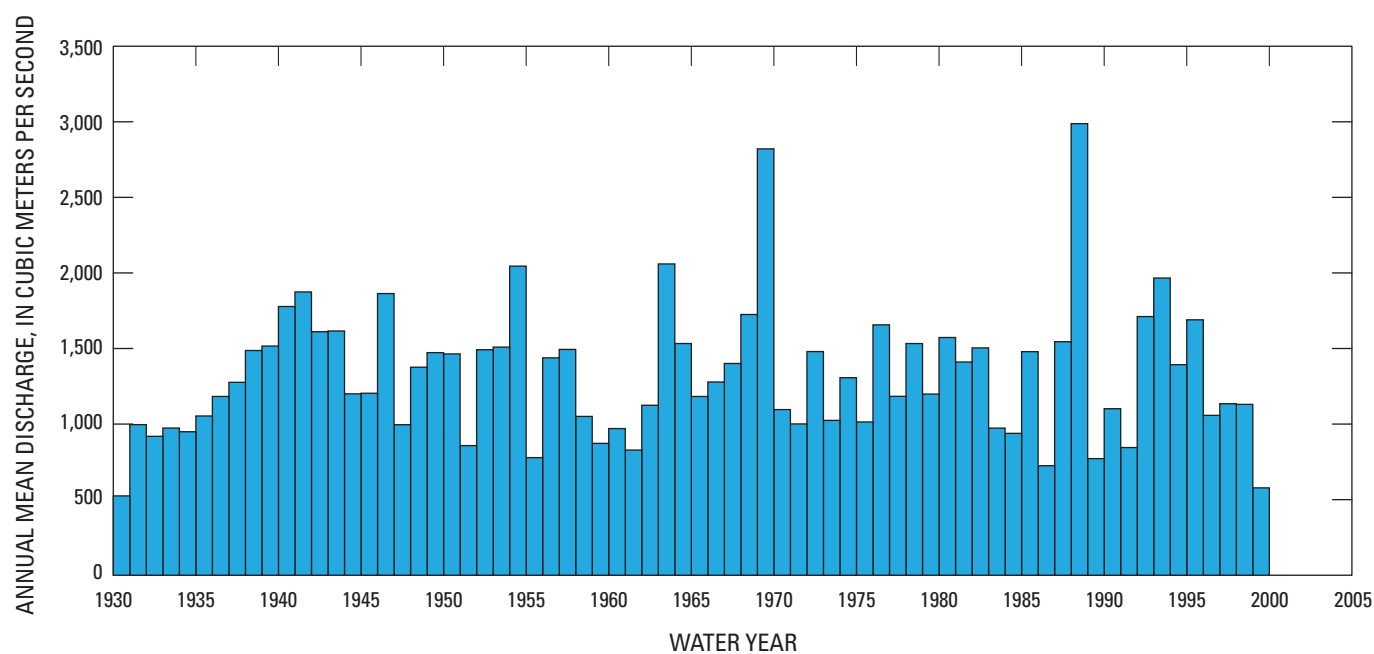
LOCATION: Latitude 35° 03' 00" N, Longitude 43° 33' 00" E.

DRAINAGE AREA: 107,600 square kilometers.

PERIOD OF RECORD: March 1930 to September 1999.

GAGE: The staff gage is attached to the bank. The gage is set to an arbitrary datum.

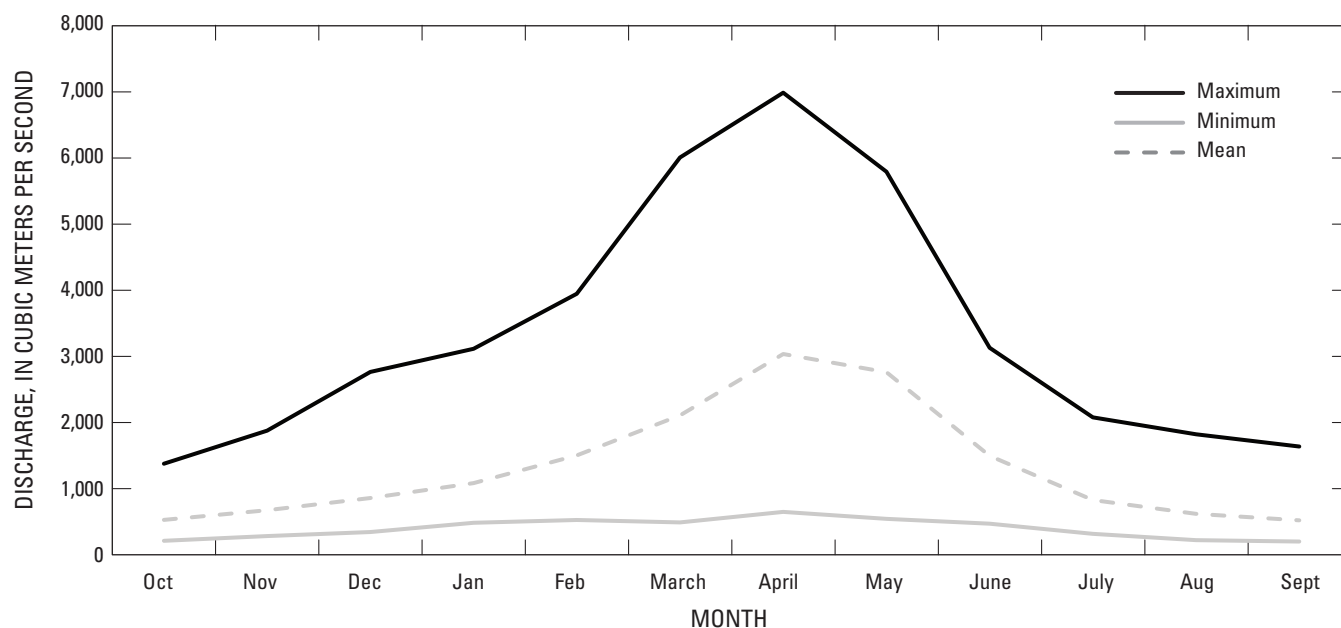
RECORDS: Discharge measurements were being taken from a cableway until 1969. After 1969, the cableway was damaged and discharge measurements were made from the staff gage.



**Figure 38.** Annual mean discharge at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

**Table 62.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,377.00	1989	211.30	1931	527.47	242.86	0.46	3.29
November	1,877.00	1943	282.80	1935	673.71	290.21	0.43	4.21
December	2,765.00	1969	343.80	1935	858.04	427.39	0.50	5.36
January	3,115.00	1988	483.60	1936	1,083.50	522.29	0.48	6.77
February	3,947.00	1941	526.00	1959	1,502.83	667.95	0.44	9.39
March	6,008.00	1969	489.30	1999	2,107.75	1,082.20	0.51	13.16
April	6,988.00	1988	648.40	1999	3,036.00	1,288.84	0.42	18.96
May	5,793.00	1969	543.20	1999	2,761.46	1,207.93	0.44	17.25
June	3,130.00	1963	470.00	1999	1,495.63	560.88	0.38	9.34
July	2,078.00	1988	316.50	1930	827.83	309.24	0.37	5.17
August	1,822.00	1990	221.00	1930	618.94	308.18	0.50	3.87
September	1,637.00	1988	200.00	1930	520.85	252.11	0.48	3.25
Annual	2,987.69	1988	524.81	1930	1,325.72	441.36	0.33	100.00

**Figure 39.** Monthly discharge at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

**Table 63.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

[Discharge measured in cubic meters per second; —, no data available]

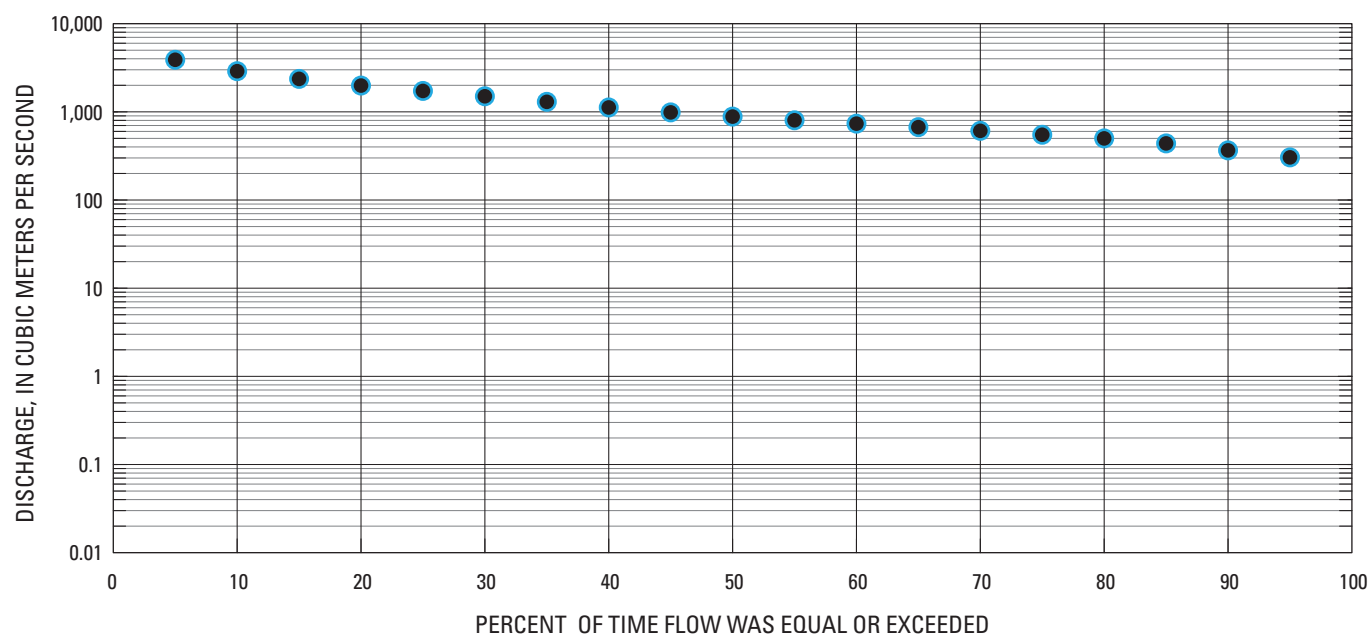
Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1930	—	—	—	—	—	686.00	876.70	863.30	510.20	316.50	221.00	200.00	524.81
1931	211.30	341.70	558.30	1,221.00	926.40	1,415.00	2,705.00	1,999.00	1,342.00	636.30	345.20	254.70	996.33
1932	249.70	328.10	512.60	508.80	1,171.00	1,907.00	1,898.00	2,040.00	1,274.00	545.90	324.80	267.00	918.91
1933	246.70	391.60	345.30	604.40	894.90	1,697.00	2,122.00	2,635.00	1,412.00	679.80	376.00	278.30	973.58
1934	278.00	298.20	916.20	588.10	988.00	1,226.00	2,511.00	2,048.00	1,371.00	575.10	326.40	263.40	949.12
1935	258.70	282.80	343.80	942.00	2,285.00	1,766.00	2,547.00	2,100.00	1,082.00	498.10	301.50	235.80	1,053.56
1936	253.20	568.50	1,170.00	483.60	1,833.00	1,482.00	3,153.00	2,653.00	1,308.00	663.90	362.90	261.70	1,182.73
1937	303.40	801.80	1,009.00	843.90	1,865.00	1,853.00	3,596.00	2,304.00	1,312.00	727.20	422.40	276.30	1,276.17
1938	239.80	630.70	714.00	1,451.00	2,076.00	1,740.00	4,220.00	3,504.00	1,633.00	830.70	449.70	351.70	1,486.72
1939	330.00	769.00	779.40	1,379.00	1,644.00	2,721.00	4,051.00	3,422.00	1,570.00	764.30	420.00	345.00	1,516.23
1940	330.00	488.50	851.10	2,445.00	3,217.00	2,577.00	4,420.00	3,296.00	1,859.00	930.10	520.20	400.00	1,777.83
1941	573.50	551.00	1,015.00	1,950.00	3,947.00	4,181.00	3,762.00	3,441.00	1,650.00	705.20	388.40	326.70	1,874.23
1942	332.30	350.00	512.00	1,558.00	1,946.00	3,747.00	3,806.00	3,740.00	1,619.00	869.10	472.00	377.70	1,610.76
1943	413.10	1,877.00	1,477.00	1,473.00	1,554.00	2,284.00	3,374.00	3,683.00	1,623.00	830.60	452.60	349.50	1,615.90
1944	355.30	420.80	556.50	1,020.00	1,103.00	1,840.00	3,341.00	3,151.00	1,270.00	612.50	404.40	328.20	1,200.23
1945	337.60	890.50	515.50	1,908.00	1,456.00	1,461.00	2,617.00	2,420.00	1,414.00	716.00	383.80	328.20	1,203.97
1946	272.20	530.80	808.70	1,234.00	2,007.00	3,674.00	4,363.00	5,030.00	2,270.00	1,120.00	622.70	429.20	1,863.47
1947	596.80	465.80	464.80	1,378.00	1,447.00	2,215.00	2,021.00	1,425.00	881.90	469.60	317.80	265.80	995.71
1948	235.00	590.00	559.00	655.00	1,380.00	1,480.00	3,510.00	4,090.00	2,300.00	933.00	460.00	324.00	1,376.33
1949	293.90	295.00	419.40	498.40	1,138.00	2,643.00	4,635.00	4,022.00	2,137.00	858.10	412.90	320.00	1,472.73
1950	356.00	384.00	539.00	1,170.00	1,220.00	3,040.00	3,300.00	4,100.00	1,770.00	853.00	486.00	353.00	1,464.25
1951	382.30	363.30	417.10	1,109.00	1,148.00	1,518.00	1,789.00	1,703.00	966.70	431.30	255.50	208.30	857.63
1952	411.30	415.00	602.70	580.60	3,399.00	2,875.00	3,431.00	3,212.00	1,580.00	699.00	389.70	305.00	1,491.69
1953	283.50	306.70	433.50	864.70	2,019.00	3,346.00	4,275.00	3,150.00	1,768.00	856.40	454.40	353.30	1,509.21
1954	298.10	600.60	524.80	1,199.00	2,162.00	4,796.00	6,445.00	4,140.00	2,315.00	1,108.00	576.50	373.30	2,044.86
1955	360.00	431.80	550.50	794.60	842.20	1,166.00	1,634.00	1,674.00	857.90	463.50	317.10	246.30	778.16
1956	247.10	442.80	1,335.00	1,087.00	1,836.00	2,500.00	3,627.00	2,680.00	1,783.00	851.50	468.80	400.00	1,438.18
1957	410.20	403.20	576.50	570.70	1,080.00	3,920.00	2,728.00	4,247.00	2,171.00	982.60	497.40	340.90	1,493.96
1958	344.70	530.90	668.30	1,120.00	1,309.00	2,018.00	2,470.00	1,953.00	1,139.00	490.50	300.70	263.70	1,050.65
1959	257.30	314.40	670.80	676.70	526.00	1,209.00	2,450.00	2,103.00	1,062.00	499.50	378.70	321.80	872.43
1960	325.50	399.20	533.80	861.30	893.70	1,416.00	2,530.00	2,460.00	937.00	473.50	407.10	407.20	970.36
1961	434.30	721.30	472.00	652.90	781.40	854.90	1,802.00	2,027.00	905.90	471.30	416.60	396.10	827.98
1962	405.10	624.00	1,264.00	1,160.00	1,585.00	1,949.00	2,083.00	1,945.00	1,053.00	576.60	448.50	400.30	1,124.46
1963	361.60	347.20	993.10	1,670.00	2,023.00	2,013.00	5,463.00	5,666.00	3,130.00	1,427.00	953.00	667.10	2,059.50
1964	716.20	903.90	957.00	815.40	1,508.00	3,739.00	3,213.00	2,688.00	1,776.00	849.60	632.40	597.20	1,532.98
1965	416.20	478.90	660.70	821.20	1,386.00	1,831.00	2,711.00	2,629.00	1,538.00	732.00	517.60	470.10	1,182.64
1966	818.50	720.80	983.00	1,635.00	2,019.00	1,759.00	2,512.00	2,186.00	1,135.00	577.10	513.60	482.20	1,278.43
1967	504.00	441.10	647.40	872.70	1,070.00	2,079.00	3,032.00	4,426.00	1,861.00	807.00	584.40	487.40	1,401.00
1968	547.40	1,018.00	1,656.00	1,510.00	1,396.00	3,029.00	4,166.00	3,419.00	1,895.00	828.20	656.00	579.80	1,725.03
1969	515.80	757.80	2,765.00	2,797.00	2,443.00	6,008.00	6,582.00	5,793.00	2,640.00	1,553.00	1,156.00	840.00	2,820.88
1970	837.50	862.00	997.30	1,175.00	1,502.00	1,680.00	2,037.00	1,434.00	894.80	650.10	559.50	521.70	1,095.91
1971	501.90	499.30	658.50	484.30	549.40	1,175.00	3,338.00	2,077.00	1,055.00	639.80	540.10	494.90	1,001.10

**Table 63.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1972	521.90	559.80	898.90	661.70	1,048.00	1,827.00	3,260.00	4,472.00	2,119.00	994.70	742.90	651.10	1,479.75
1973	688.90	849.60	730.60	708.50	1,215.00	1,295.00	1,835.00	1,984.00	1,114.00	702.90	622.60	546.90	1,024.42
1974	538.20	627.30	715.90	723.00	715.10	3,066.00	3,586.00	2,210.00	1,558.00	719.20	639.20	580.80	1,306.56
1975	557.80	613.30	672.40	699.70	1,317.00	1,444.00	2,138.00	1,969.00	1,031.00	648.30	562.90	514.10	1,013.96
1976	510.50	564.10	800.30	1,197.00	1,740.00	1,690.00	4,788.00	3,986.00	2,232.00	999.60	711.60	659.70	1,656.57
1977	832.80	1,022.00	1,111.00	920.90	1,234.00	1,692.00	2,405.00	2,175.00	1,141.00	653.10	530.90	484.50	1,183.52
1978	546.50	603.30	1,085.00	1,335.00	2,722.00	2,515.00	2,719.00	2,499.00	1,492.00	1,224.00	943.70	709.70	1,532.85
1979	798.70	735.10	1,061.00	1,580.00	1,543.00	1,476.00	2,174.00	1,811.00	1,231.00	741.90	654.20	577.20	1,198.59
1980	723.80	937.70	1,061.00	1,007.00	1,329.00	2,296.00	4,639.00	2,934.00	1,447.00	999.80	792.20	706.80	1,572.78
1981	808.90	841.80	909.00	1,176.00	1,600.00	2,492.00	2,427.00	2,251.00	1,553.00	1,058.00	917.70	894.60	1,410.75
1982	847.20	890.20	923.50	1,201.00	1,445.00	1,442.00	3,219.00	3,502.00	1,613.00	1,058.00	965.60	941.80	1,504.03
1983	903.60	920.20	877.10	942.50	927.90	1,493.00	—	—	—	984.40	873.40	837.70	973.31
1984	672.50	1,086.00	875.30	554.00	840.70	1,444.00	1,708.00	1,438.00	1,002.00	613.10	527.40	502.30	938.61
1985	455.70	1,000.00	615.60	752.60	1,979.00	2,557.00	4,180.00	2,596.00	1,303.00	877.20	740.20	692.80	1,479.09
1986	528.00	547.80	509.60	502.80	639.50	788.30	1,216.00	1,122.00	933.80	675.50	621.40	606.20	724.24
1987	637.30	815.10	794.40	826.60	1,591.00	2,581.00	3,371.00	3,499.00	1,940.00	924.70	764.10	793.20	1,544.78
1988	831.30	1,075.00	2,204.00	3,115.00	2,203.00	5,519.00	6,988.00	5,528.00	2,875.00	2,078.00	1,799.00	1,637.00	2,987.69
1989	1,377.00	1,129.00	878.30	829.30	632.30	744.30	793.80	700.00	599.80	530.10	515.40	529.00	771.53
1990	707.40	787.00	1,070.00	742.80	1,124.00	1,328.00	1,294.00	1,760.00	1,155.00	796.60	1,822.00	630.20	1,101.42
1991	558.30	635.30	520.10	586.00	1,180.00	1,451.00	1,210.00	902.40	698.20	803.80	791.00	801.30	844.78
1992	610.40	746.30	853.80	1,002.00	2,362.00	1,986.00	3,459.00	4,234.00	1,956.00	1,440.00	1,025.00	861.20	1,711.31
1993	695.40	889.20	1,690.00	1,595.00	1,600.00	1,745.00	3,737.00	4,701.00	2,912.00	1,679.00	1,288.00	1,063.00	1,966.22
1994	1,107	1,229	1,083	1,287	1,391	1,698	2,755	2,043	1,278	997.4	943.8	902.5	1,392.89
1995	858.3	1,219	1,871	1,684	2,144	1,748	3,069	3,009	1,776	1,186	873.9	841.6	1,689.98
1996	974.8	913	609.9	805.3	875.3	1,045	2,286	1,745	1,088	842.7	781.4	725.2	1,057.63
1997	745.8	738.1	746.6	902.8	816.9	1,067	2,003	2,203	1,550	1,152	922.7	764.8	1,134.39
1998	808.3	989.9	989.5	1,071	1,292	—	2,429	1,146	1,059	972	929.3	748.6	1,130.41
1999	703.9	684	614.5	584.6	612.8	489.3	648.4	543.2	470	493.3	529.7	562.6	578.0





**Figure 40.** Annual flow duration at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

**Table 64.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	245.30	280.10	358.00	452.40	553.60	744.10	1,048.50	899.70	626.30	425.60	283.50	239.00	304.50
90	261.30	305.60	405.20	503.60	629.00	910.60	1,400.00	1,310.80	766.00	477.50	327.50	260.60	365.50
85	277.70	331.00	452.90	555.30	702.40	1,046.20	1,604.00	1,561.50	855.20	525.40	358.30	276.90	438.60
80	305.10	359.50	484.60	601.60	775.00	1,149.70	1,789.00	1,697.30	935.80	555.80	379.20	312.60	499.70
75	329.40	396.60	520.00	641.80	855.50	1,257.90	1,971.80	1,817.00	1,017.60	586.80	403.10	330.80	549.70
70	346.00	440.70	555.30	680.50	928.60	1,376.70	2,111.90	1,927.10	1,087.00	621.70	430.30	349.50	609.20
65	368.80	471.10	589.40	722.70	1,003.00	1,465.10	2,241.00	2,020.60	1,143.00	656.30	464.30	377.20	670.70
60	399.40	521.90	621.90	766.60	1,069.60	1,553.80	2,356.10	2,132.90	1,209.00	690.10	492.90	401.70	734.80
55	442.40	559.00	660.70	811.80	1,147.10	1,642.80	2,477.20	2,278.10	1,292.30	718.20	519.00	441.10	802.10
50	485.10	594.10	704.20	861.50	1,236.10	1,741.80	2,625.20	2,426.40	1,375.60	752.30	542.30	487.40	883.40
45	519.50	631.90	754.20	916.50	1,337.40	1,846.10	2,787.10	2,577.10	1,447.80	799.50	571.90	515.10	986.00
40	547.20	682.70	801.10	983.30	1,434.20	1,963.00	2,997.30	2,730.00	1,510.60	833.80	614.10	540.30	1,121.50
35	576.00	730.50	849.90	1,058.60	1,558.10	2,091.30	3,236.20	2,925.80	1,592.90	889.80	652.70	586.40	1,298.70
30	653.80	770.80	901.50	1,147.50	1,693.40	2,241.50	3,507.30	3,147.50	1,690.50	938.50	703.30	633.40	1,502.30
25	709.60	818.20	967.20	1,254.70	1,817.80	2,462.50	3,842.90	3,408.20	1,818.90	985.10	764.60	679.30	1,726.50
20	757.40	872.40	1,069.10	1,390.10	1,985.70	2,776.50	4,131.90	3,718.70	1,953.00	1,038.10	829.10	726.40	1,986.80
15	810.60	953.80	1,209.30	1,593.70	2,235.60	3,213.00	4,498.70	4,100.60	2,118.20	1,123.60	903.10	791.80	2,364.30
10	860.40	1,070.00	1,444.00	1,969.40	2,613.50	3,832.50	5,038.10	4,622.50	2,352.00	1,264.90	960.80	857.70	2,890.90
5	999.70	1,293.40	1,892.20	2,589.20	3,439.10	4,870.50	5,961.40	5,284.10	2,803.20	1,521.00	1,137.70	922.40	3,896.70

**Table 65.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	3,353.30	2,911.00	2,524.40	2,252.50
0.50	2	5,193.80	4,423.60	3,814.00	3,365.60
0.20	5	7,644.10	6,347.30	5,409.30	4,735.60
0.10	10	9,174.70	7,501.10	6,340.80	5,534.50
0.05	20	10,564.00	8,518.30	7,145.90	6,225.10
0.02	50	12,255.00	9,719.40	8,076.40	7,024.40
0.01	100	13,451.00	10,545.00	8,703.20	7,563.70

**Table 66.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T13, Tigris River at Fatha, Iraq, water years 1930–99.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	395.42	403.27	413.44	427.21	450.51	475.03	604.21
0.2	5	288.67	291.02	296.10	304.01	319.11	338.37	458.52
0.1	10	246.02	246.50	249.53	255.06	266.68	283.29	396.20
0.05	20	216.10	215.40	217.02	220.90	230.03	244.59	350.84
0.02	50	187.22	185.53	185.82	188.12	194.86	207.28	305.64
0.01	100	170.39	168.20	167.73	169.15	174.49	185.61	278.62

## Tigris River Basin

### TIGRIS RIVER AT BEIJI (IRQ\_T14)

(U.S. Geological Survey identification number: 34554504329350)

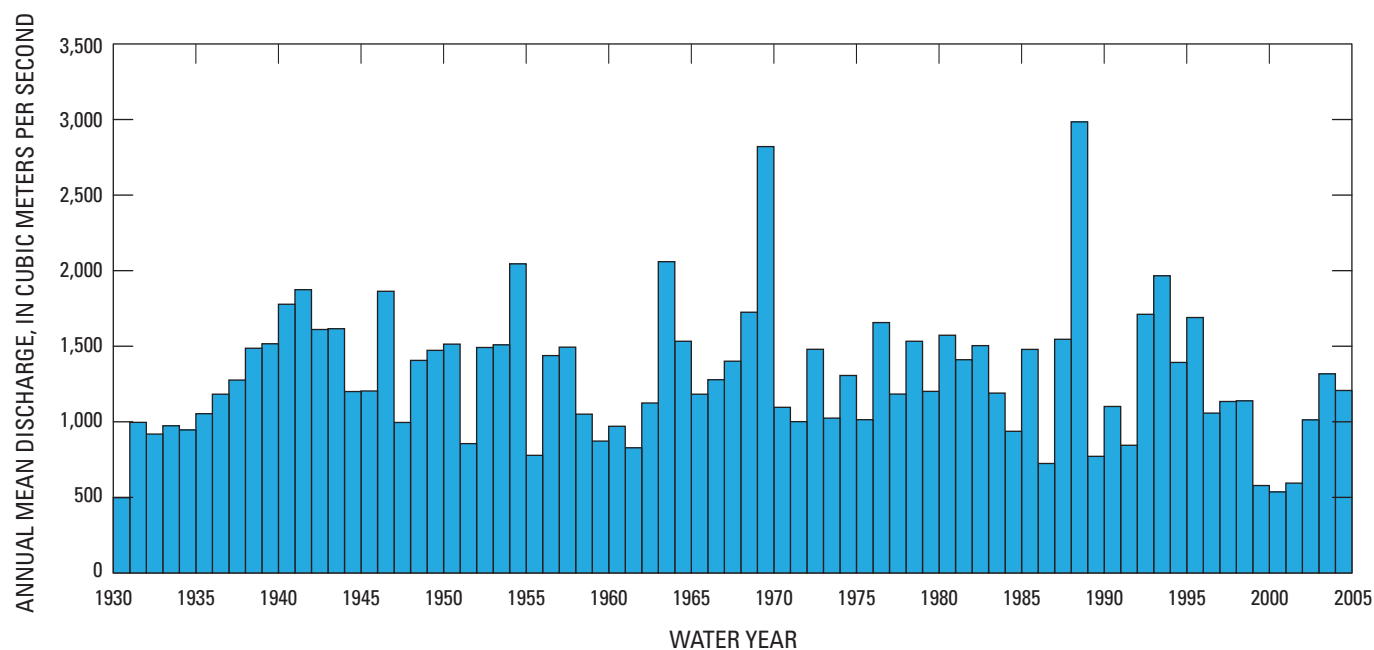
LOCATION: Latitude 34° 55' 45" N, Longitude 43° 29' 35" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: April 1930 to March 2005.

GAGE: No information available for this site.

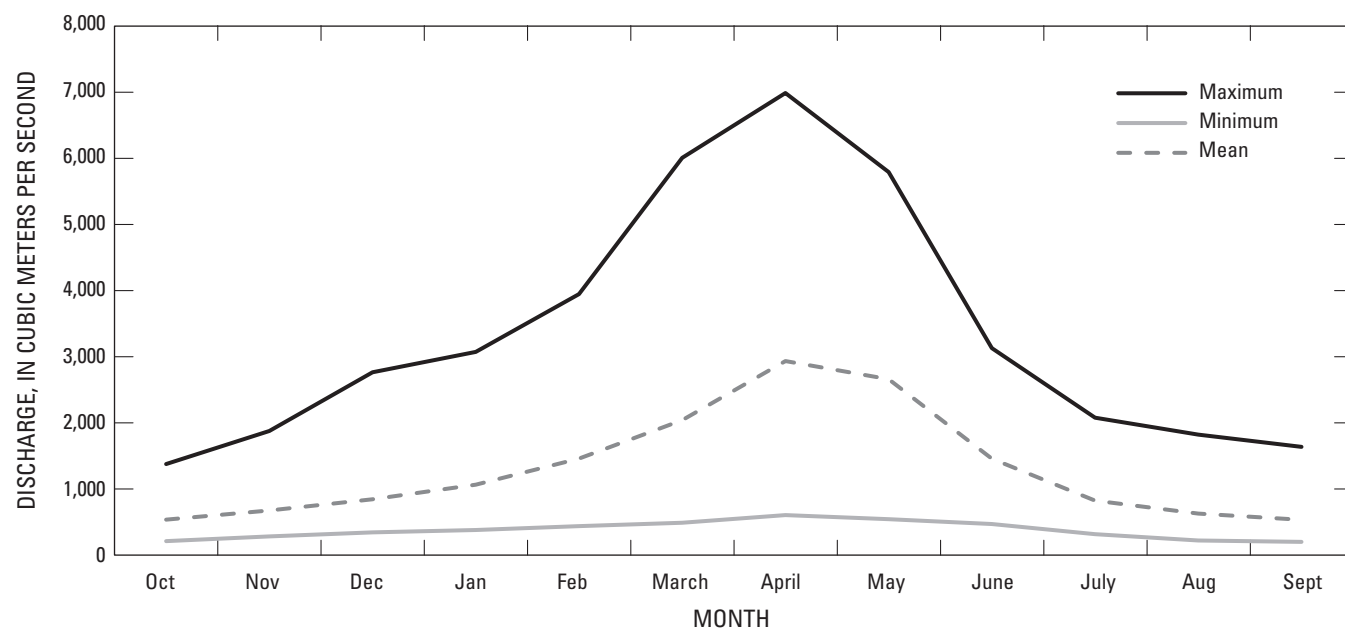
RECORDS: No information available for this site.



**Figure 41.** Annual mean discharge at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

**Table 67.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,377.00	1989	211.30	1931	536.28	234.05	0.44	3.42
November	1,877.00	1943	282.80	1935	674.90	277.61	0.41	4.31
December	2,765.00	1969	343.80	1935	844.29	415.03	0.49	5.39
January	3,073.00	1988	379.50	2001	1,064.95	513.49	0.48	6.80
February	3,947.00	1941	438.20	2000	1,459.39	671.93	0.46	9.32
March	6,008.00	1969	489.30	1999	2,040.88	1,070.70	0.52	13.03
April	6,988.00	1988	605.10	2001	2,934.35	1,308.32	0.45	18.74
May	5,793.00	1969	543.20	1999	2,660.41	1,224.51	0.46	16.99
June	3,130.00	1963	470.00	1999	1,457.84	559.70	0.38	9.31
July	2,078.00	1988	316.50	1930	823.89	299.48	0.36	5.26
August	1,822.00	1990	221.00	1930	627.82	298.94	0.48	4.01
September	1,637.00	1988	200.00	1930	533.76	247.35	0.46	3.41
Annual	2,984.19	1988	497.95	1930	1,295.94	446.06	0.34	100.00

**Figure 42.** Monthly discharge at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

**Table 68.** Monthly and mean discharge at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

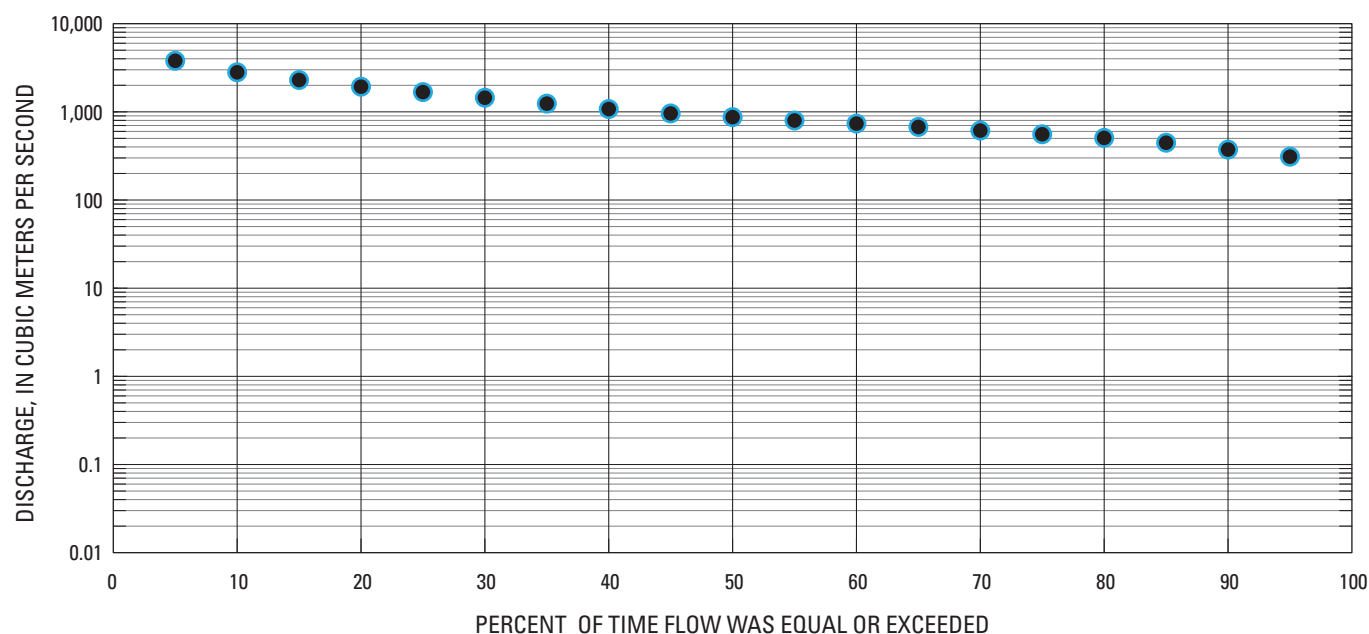
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1930	—	—	—	—	—	—	876.70	863.30	510.20	316.50	221.00	200.00	497.95
1931	211.3	341.70	558.30	1,221.00	926.40	1,415.00	2,705.00	1,999.00	1,342.00	636.30	345.20	254.70	996.33
1932	249.7	328.10	512.60	508.80	1,171.00	1,907.00	1,898.00	2,040.00	1,274.00	545.90	324.80	267.00	918.91
1933	246.7	391.60	345.30	604.40	894.90	1,697.00	2,122.00	2,635.00	1,412.00	679.80	376.00	278.30	973.58
1934	278	298.20	916.20	588.10	988.00	1,226.00	2,477.00	2,048.00	1,371.00	575.10	326.40	263.40	946.28
1935	258.7	282.80	343.80	942.00	2,285.00	1,766.00	2,547.00	2,100.00	1,082.00	498.10	301.50	235.80	1,053.56
1936	253.2	568.50	1,170.00	483.60	1,833.00	1,482.00	3,153.00	2,653.00	1,308.00	663.90	362.90	261.70	1,182.73
1937	303.4	801.80	1,009.00	843.90	1,865.00	1,853.00	3,596.00	2,304.00	1,312.00	727.20	422.40	276.30	1,276.17
1938	239.8	630.70	714.00	1,451.00	2,076.00	1,740.00	4,220.00	3,504.00	1,633.00	830.70	449.70	351.70	1,486.72
1939	330	769.00	779.40	1,379.00	1,644.00	2,721.00	4,051.00	3,422.00	1,570.00	764.30	420.00	345.00	1,516.23
1940	330	488.50	851.10	2,445.00	3,217.00	2,577.00	4,420.00	3,296.00	1,859.00	930.10	520.20	400.00	1,777.83
1941	573.5	551.00	1,015.00	1,950.00	3,947.00	4,181.00	3,762.00	3,441.00	1,650.00	705.20	388.40	326.70	1,874.23
1942	332.3	350.00	512.00	1,558.00	1,946.00	3,747.00	3,806.00	3,740.00	1,619.00	869.10	472.00	377.70	1,610.76
1943	413.1	1,877.00	1,477.00	1,473.00	1,554.00	2,284.00	3,374.00	3,683.00	1,623.00	830.60	452.60	349.50	1,615.90
1944	355.3	420.80	556.50	1,020.00	1,103.00	1,840.00	3,341.00	3,151.00	1,270.00	612.50	404.40	328.20	1,200.23
1945	337.6	890.50	515.50	1,908.00	1,456.00	1,461.00	2,617.00	2,420.00	1,414.00	716.00	383.80	328.20	1,203.97
1946	272.2	530.80	808.70	1,234.00	2,007.00	3,674.00	4,363.00	5,030.00	2,270.00	1,120.00	622.70	429.20	1,863.47
1947	596.8	465.80	464.80	1,378.00	1,447.00	2,215.00	2,021.00	1,425.00	881.90	469.60	317.80	265.80	995.71
1948	240.7	605.90	690.60	672.40	1,399.00	1,510.00	3,585.00	4,141.00	2,314.00	936.20	459.50	321.80	1,406.34
1949	293.9	295.00	419.40	498.40	1,138.00	2,643.00	4,635.00	4,022.00	2,137.00	858.10	412.90	320.00	1,472.73
1950	364.6	394.60	566.50	1,228.00	1,331.00	3,240.00	3,380.00	4,182.00	1,771.00	857.70	492.90	359.00	1,513.94
1951	382.3	363.30	417.10	1,109.00	1,148.00	1,495.00	1,789.00	1,703.00	966.70	431.30	255.50	208.30	855.71
1952	411.3	415.00	602.70	580.60	3,399.00	2,875.00	3,431.00	3,212.00	1,580.00	699.00	389.70	305.00	1,491.69
1953	283.5	306.70	433.50	864.70	2,019.00	3,346.00	4,275.00	3,150.00	1,768.00	856.40	454.40	353.30	1,509.21
1954	298.1	600.60	524.80	1,199.00	2,162.00	4,796.00	6,445.00	4,140.00	2,315.00	1,110.00	576.50	373.30	2,045.03
1955	360	431.80	550.50	794.60	842.20	1,166.00	1,634.00	1,674.00	857.90	463.50	317.10	246.30	778.16
1956	247.1	442.80	1,335.00	1,087.00	1,836.00	2,500.00	3,627.00	2,680.00	1,783.00	851.50	468.80	400.00	1,438.18
1957	410.2	403.20	576.50	570.70	1,080.00	3,920.00	2,728.00	4,247.00	2,171.00	982.60	497.40	340.90	1,493.96
1958	344.7	530.90	668.30	1,120.00	1,309.00	2,018.00	2,470.00	1,953.00	1,139.00	490.50	300.70	263.70	1,050.65
1959	257.3	314.40	670.80	676.70	526.00	1,209.00	2,450.00	2,103.00	1,062.00	499.50	378.70	321.80	872.43
1960	325.5	399.20	533.80	861.30	893.70	1,416.00	2,530.00	2,460.00	937.00	473.50	407.10	407.20	970.36
1961	434.3	721.30	472.00	652.90	781.40	854.90	1,802.00	2,027.00	905.90	471.30	416.60	396.10	827.98
1962	405.1	624.00	1,264.00	1,160.00	1,585.00	1,949.00	2,083.00	1,945.00	1,053.00	576.60	448.50	400.30	1,124.46
1963	361.6	347.20	993.10	1,670.00	2,023.00	2,013.00	5,463.00	5,666.00	3,130.00	1,427.00	953.00	667.10	2,059.50
1964	716.2	903.90	957.00	815.40	1,508.00	3,739.00	3,213.00	2,688.00	1,776.00	849.60	632.40	597.20	1,532.98
1965	416.2	478.90	660.70	821.20	1,386.00	1,831.00	2,711.00	2,629.00	1,538.00	732.00	517.60	470.10	1,182.64
1966	818.5	720.80	983.00	1,635.00	2,019.00	1,759.00	2,512.00	2,186.00	1,135.00	577.10	513.60	482.20	1,278.43
1967	504	441.10	647.40	872.70	1,070.00	2,079.00	3,032.00	4,426.00	1,861.00	807.00	584.40	487.40	1,401.00
1968	547.4	1,018.00	1,656.00	1,510.00	1,396.00	3,029.00	4,166.00	3,419.00	1,895.00	828.20	656.00	579.80	1,725.03
1969	515.8	757.80	2,765.00	2,797.00	2,443.00	6,008.00	6,582.00	5,793.00	2,640.00	1,553.00	1,156.00	840.00	2,820.88
1970	837.5	862.00	997.30	1,175.00	1,502.00	1,680.00	2,037.00	1,434.00	894.80	650.10	559.50	521.70	1,095.91
1971	501.9	499.30	658.50	484.30	549.40	1,175.00	3,338.00	2,077.00	1,055.00	639.80	540.10	494.90	1,001.10

**Table 68.** Monthly and mean discharge at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Annual
1972	521.9	559.80	898.90	661.70	1,048.00	1,827.00	3,260.00	4,472.00	2,119.00	994.70	742.90	651.10	1,479.75
1973	688.9	849.60	730.60	708.50	1,215.00	1,295.00	1,835.00	1,984.00	1,114.00	702.90	622.60	546.90	1,024.42
1974	538.2	627.30	715.90	723.00	715.10	3,066.00	3,586.00	2,210.00	1,558.00	719.20	639.20	580.80	1,306.56
1975	558	613.30	672.40	699.70	1,317.00	1,444.00	2,138.00	1,969.00	1,031.00	648.30	562.90	514.10	1,013.98
1976	510.5	564.10	800.30	1,197.00	1,740.00	1,690.00	4,788.00	3,986.00	2,232.00	999.60	711.60	659.70	1,656.57
1977	832.8	1,022.00	1,111.00	920.90	1,234.00	1,692.00	2,405.00	2,175.00	1,141.00	653.10	530.90	484.50	1,183.52
1978	546.5	603.30	1,085.00	1,335.00	2,722.00	2,515.00	2,719.00	2,499.00	1,492.00	1,224.00	943.70	709.70	1,532.85
1979	798.7	735.10	1,061.00	1,580.00	1,543.00	1,476.00	2,207.00	1,811.00	1,231.00	741.90	654.20	577.20	1,201.34
1980	723.8	937.70	1,061.00	1,007.00	1,329.00	2,296.00	4,639.00	2,934.00	1,447.00	999.80	792.20	706.80	1,572.78
1981	808.9	841.80	909.00	1,176.00	1,600.00	2,492.00	2,427.00	2,251.00	1,553.00	1,058.00	917.70	894.60	1,410.75
1982	847.2	890.20	923.50	1,201.00	1,445.00	1,442.00	3,219.00	3,502.00	1,613.00	1,058.00	965.60	941.80	1,504.03
1983	903.6	920.20	877.10	980.40	927.90	1,493.00	1,926.00	2,235.00	1,321.00	984.40	873.40	837.70	1,189.98
1984	672.5	1,086.00	858.60	554.00	840.70	1,444.00	1,708.00	1,438.00	1,002.00	613.10	527.40	502.30	937.22
1985	455.7	1,000.00	615.60	752.60	1,979.00	2,557.00	4,180.00	2,596.00	1,303.00	877.20	740.20	692.80	1,479.09
1986	528	547.80	509.60	502.80	639.50	788.30	1,216.00	1,122.00	933.80	675.50	621.40	606.20	724.24
1987	637.3	815.10	794.40	826.60	1,606.00	2,581.00	3,371.00	3,499.00	1,940.00	924.70	764.10	793.20	1,546.03
1988	831.3	1,075.00	2,204.00	3,073.00	2,203.00	5,519.00	6,988.00	5,528.00	2,875.00	2,078.00	1,799.00	1,637.00	2,984.19
1989	1,377	1,129.00	878.30	829.30	632.30	744.30	793.80	700.00	599.80	530.10	515.40	529.00	771.53
1990	707.4	787.00	1,070.00	742.80	1,124.00	1,328.00	1,294.00	1,760.00	1,155.00	796.60	1,822.00	630.20	1,101.42
1991	558.3	635.30	520.10	586.00	1,180.00	1,451.00	1,210.00	902.40	698.20	803.80	791.00	801.30	844.78
1992	610.4	746.30	853.80	1,002.00	2,362.00	1,986.00	3,459.00	4,234.00	1,956.00	1,440.00	1,025.00	861.20	1,711.31
1993	695.4	889.20	1,690.00	1,595.00	1,600.00	1,745.00	3,737.00	4,701.00	2,912.00	1,679.00	1,288.00	1,063.00	1,966.22
1994	1,107	1,229.00	1,083.00	1,287.00	1,391.00	1,698.00	2,755.00	2,043.00	1,278.00	997.40	943.80	902.50	1,392.89
1995	858.3	1,219.00	1,871.00	1,684.00	2,144.00	1,748.00	3,069.00	3,009.00	1,776.00	1,186.00	873.90	841.60	1,689.98
1996	974.8	913.00	609.90	805.30	875.30	1,045.00	2,286.00	1,745.00	1,088.00	842.70	781.40	725.20	1,057.63
1997	745.8	738.10	746.60	902.80	816.90	1,067.00	2,003.00	2,203.00	1,550.00	1,152.00	922.70	764.80	1,134.39
1998	808.3	989.90	989.50	1,071.00	1,292.00	1,158.00	2,429.00	1,205.00	1,059.00	984.90	929.30	748.60	1,138.71
1999	703.9	684.00	614.50	591.40	596.00	489.30	662.40	543.20	470.00	493.30	529.70	562.60	578.36
2000	561.1	560.10	418.10	420.40	438.20	544.10	756.50	574.20	500.50	531.60	555.90	571.80	536.04
2001	576.8	637.40	532.40	379.50	455.00	653.30	605.10	545.40	616.60	698.00	712.40	720.20	594.34
2002	571.6	602.30	440.20	1,321.00	807.90	1,007.00	2,152.00	1,828.00	1,178.00	766.20	761.50	717.20	1,012.74
2003	676.3	736.10	873.00	755.40	890.60	1,664.00	3,599.00	2,570.00	1,551.00	928.20	813.00	750.10	1,317.23
2004	794	868.30	1,096.00	1,489.00	2,066.00	2,167.00	1,386.00	1,045.00	957.70	897.10	911.90	809.40	1,207.28
2005	631.8	700.70	615.10	666.40	973.10	916.60	—	—	—	—	—	—	750.62



**Figure 43.** Annual flow flow duration at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

**Table 69.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	244.30	282.10	354.50	429.20	518.40	658.80	825.90	694.40	602.20	431.80	287.80	241.50	310.10
90	260.70	310.20	394.40	494.40	596.40	817.10	1,220.20	1,121.70	723.80	487.10	335.20	264.00	373.40
85	278.60	339.40	438.50	541.70	672.50	951.60	1,500.40	1,427.10	833.90	532.90	364.30	290.00	446.50
80	309.80	372.40	467.90	588.20	730.00	1,076.10	1,705.10	1,624.80	915.00	559.90	386.80	318.00	506.50
75	334.00	411.40	502.30	635.80	804.30	1,176.00	1,876.60	1,764.60	990.30	594.80	411.90	334.80	556.70
70	352.90	450.50	539.80	674.90	879.60	1,290.90	2,027.20	1,887.50	1,065.70	632.90	443.40	354.40	613.40
65	376.70	485.80	577.40	714.20	949.40	1,400.40	2,163.10	1,989.10	1,124.20	667.50	476.50	383.80	674.20
60	414.60	537.00	611.20	753.70	1,013.00	1,501.70	2,303.80	2,103.40	1,188.60	698.50	506.20	406.50	736.00
55	462.10	570.20	644.50	800.30	1,100.50	1,598.50	2,438.80	2,230.40	1,266.10	724.40	529.20	461.90	797.30
50	506.30	603.70	686.20	852.50	1,197.10	1,693.90	2,564.90	2,388.70	1,357.40	759.80	551.70	500.10	870.90
45	536.90	637.20	732.10	904.70	1,294.30	1,788.60	2,728.40	2,549.30	1,438.50	801.80	586.80	528.80	959.30
40	558.50	680.70	783.90	963.30	1,395.50	1,904.50	2,954.60	2,711.20	1,506.70	835.40	627.60	563.10	1,076.20
35	586.70	723.30	834.50	1,034.20	1,520.70	2,038.60	3,218.80	2,896.60	1,581.50	884.80	669.90	608.60	1,239.70
30	643.40	761.10	888.00	1,128.30	1,660.40	2,216.20	3,448.00	3,110.90	1,669.40	931.40	720.90	658.10	1,446.00
25	699.70	804.70	945.50	1,226.60	1,793.80	2,394.40	3,730.70	3,360.80	1,790.30	976.80	772.10	700.70	1,675.60
20	745.90	855.30	1,040.50	1,382.10	1,971.80	2,673.70	4,063.90	3,660.00	1,935.80	1,026.40	827.80	737.40	1,929.10
15	799.10	933.50	1,175.80	1,589.60	2,171.20	3,057.10	4,415.40	4,033.70	2,096.00	1,106.00	895.50	785.80	2,296.80
10	852.50	1,044.70	1,401.20	1,905.20	2,529.60	3,719.00	4,939.20	4,541.50	2,336.80	1,237.90	953.00	849.30	2,808.70
5	978.70	1,253.00	1,863.80	2,476.00	3,340.50	4,721.20	5,847.30	5,374.30	2,782.90	1,486.80	1,110.60	917.30	3,795.60

**Table 70.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	3,134.50	2,710.50	2,356.70	2,107.20
0.50	2	5,026.00	4,330.20	3,743.60	3,298.90
0.20	5	7,500.40	6,290.20	5,370.90	4,689.20
0.10	10	8,999.80	7,383.60	6,250.60	5,440.70
0.05	20	10,323.00	8,288.60	6,961.20	6,049.20
0.02	50	11,883.00	9,282.10	7,720.90	6,701.90
0.01	100	12,949.00	9,916.60	8,193.70	7,109.90

**Table 71.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T14, Tigris River at Beiji, Iraq, water years 1930–2005.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	391.12	398.52	409.49	424.69	450.17	474.18	598.19
0.2	5	286.36	289.75	295.55	304.83	321.14	339.80	457.33
0.1	10	244.97	246.81	250.44	257.14	269.35	285.42	397.18
0.05	20	216.10	216.87	218.96	223.80	233.03	247.12	353.40
0.02	50	188.36	188.14	188.73	191.75	198.04	210.10	309.76
0.01	100	172.24	171.47	171.20	173.15	177.73	188.54	283.64



## Tigris River Basin

### ADHAIM RIVER INJANA (IRQ\_T15)

(U.S. Geological Survey identification number: 34300004431000)

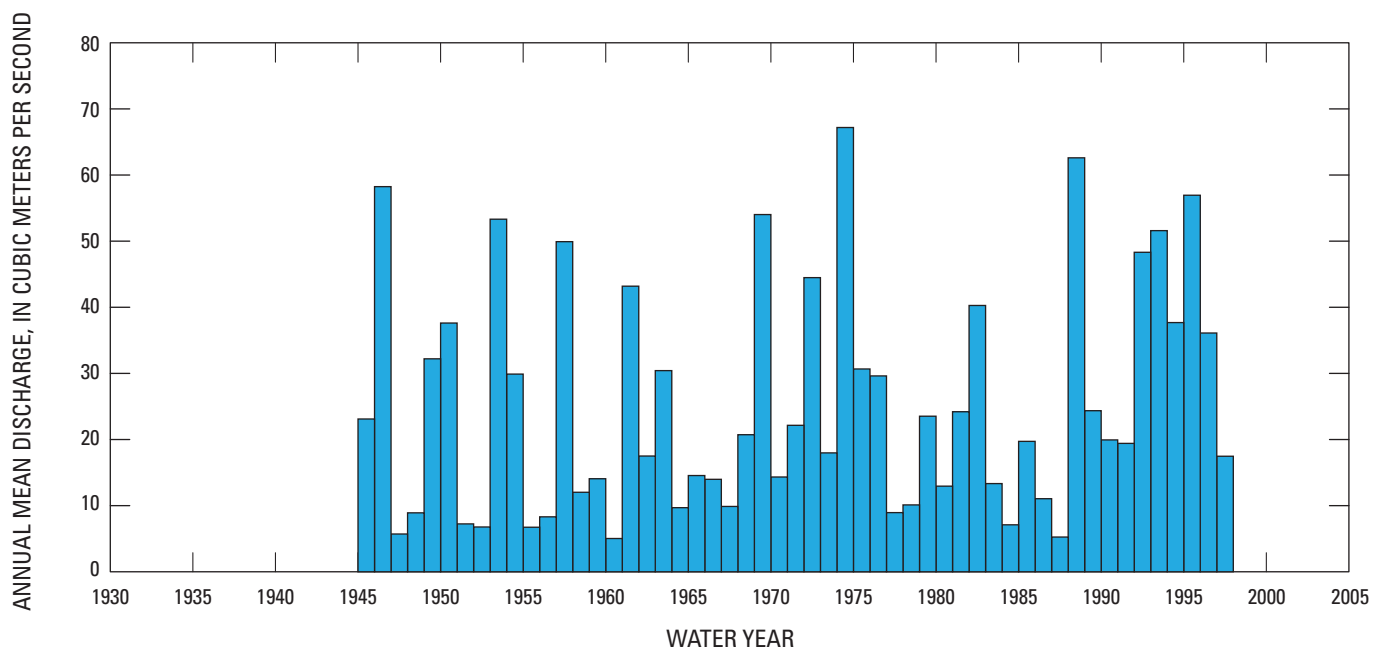
LOCATION: Latitude 34° 30' 00" N, Longitude 44° 31' 00" E.

DRAINAGE AREA: 9,840 square kilometers.

PERIOD OF RECORD: October 1945 to September 1997.

GAGE: The automatic water-stage recorder and external staff gage are located on the left bank of the Adhaim River about 4 kilometers upstream of Injana. Gage heights were referred to an arbitrary datum until October 15, 1964, and after October 15, 1965, gage heights were referred to the GTS datum.

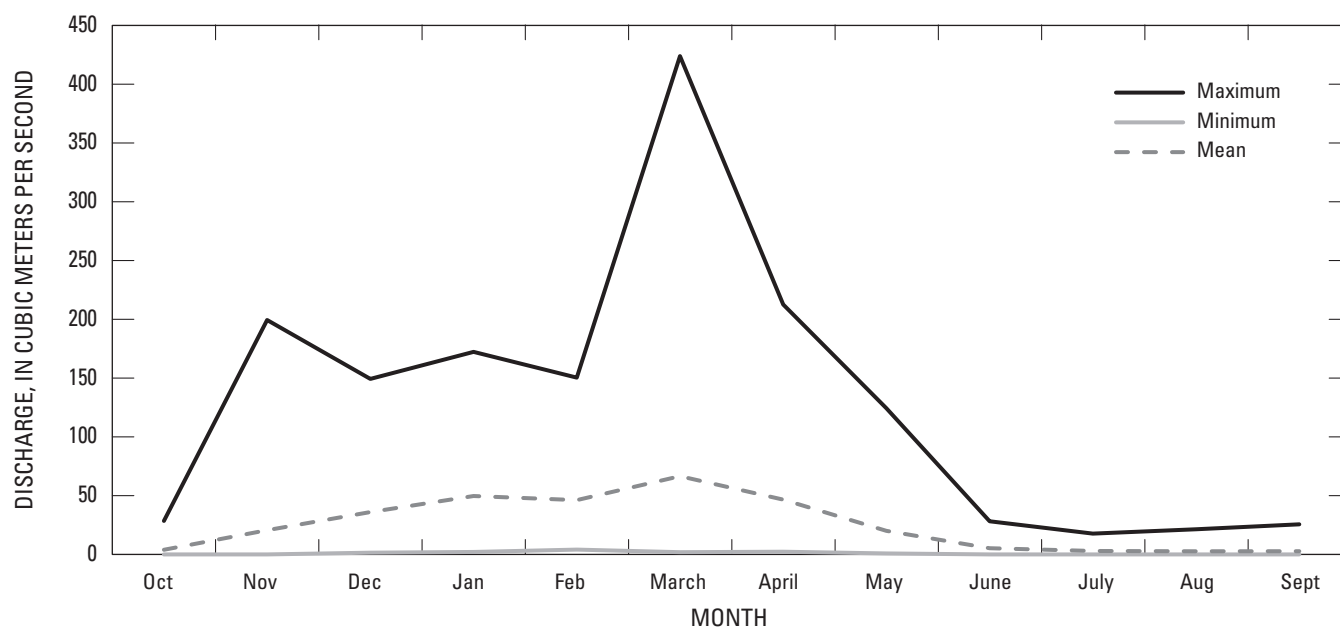
RECORDS: Discharge measurements were made regularly from a cableway or by wading except for the years 1967, 1968, 1971, and 1973. Discharge records are good.



**Figure 44.** Annual mean discharge at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

**Table 72.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	28.50	1996	0.00	1947	3.95	5.96	1.51	1.30
November	199.40	1961	0.00	1950	20.61	37.54	1.82	6.80
December	149.30	1953	1.48	1966	36.03	39.60	1.10	11.88
January	172.30	1961	2.10	1987	49.68	49.65	1.00	16.38
February	150.40	1953	4.10	1984	46.19	36.52	0.79	15.23
March	423.90	1974	1.90	1955	66.53	81.91	1.23	21.94
April	212.60	1974	2.30	1958	46.61	51.27	1.10	15.37
May	124.30	1963	0.84	1947	20.04	27.55	1.37	6.61
June	28.20	1957	0.00	1947	5.28	5.88	1.11	1.74
July	17.70	1995	0.00	1947	2.94	3.57	1.21	0.97
August	21.40	1995	0.00	1947	2.68	3.95	1.48	0.88
September	25.60	1995	0.00	1946	2.73	4.33	1.58	0.90
Annual	67.19	1974	5.03	1987	25.48	17.38	0.68	100.00

**Figure 45.** Monthly discharge at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

**Table 73.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

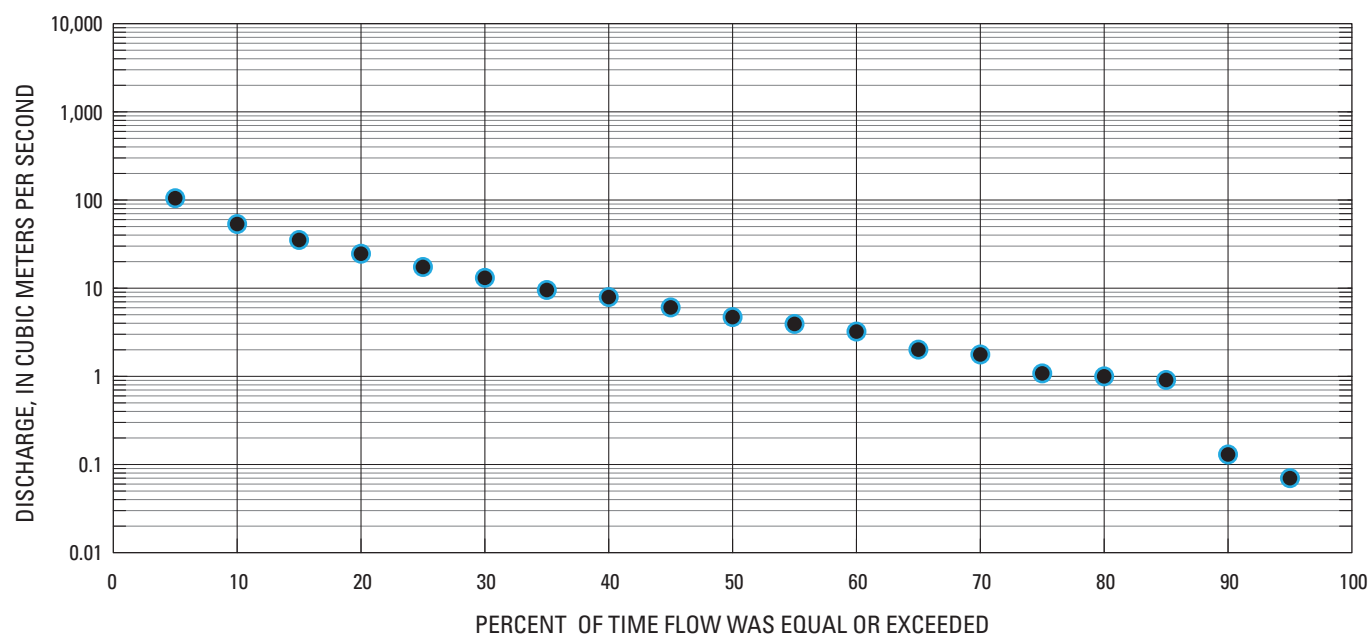
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1945	2.00	18.20	4.94	161.80	31.90	17.90	14.20	8.00	6.30	4.03	4.00	4.00	23.11
1946	4.48	47.50	20.90	154.40	105.10	228.00	99.80	33.10	4.43	1.19	0.03	0.00	58.24
1947	0.00	0.43	12.00	12.90	14.20	24.80	3.37	0.84	0.00	0.00	0.00	0.00	5.71
1948	3.55	5.77	17.50	7.48	8.28	8.10	34.20	10.70	3.57	2.84	2.52	2.47	8.92
1949	3.00	3.13	13.30	17.80	25.10	222.20	86.40	13.40	2.13	0.03	0.00	0.00	32.21
1950	0.00	0.00	102.40	114.60	93.90	97.70	15.70	24.30	2.50	0.00	0.00	0.30	37.62
1951	1.16	1.97	2.03	13.50	49.20	8.81	7.53	2.03	0.37	0.00	0.00	0.30	7.24
1952	0.84	2.70	4.58	5.03	21.60	30.60	7.93	5.90	1.40	0.03	0.48	0.20	6.77
1953	0.48	0.83	149.30	96.50	150.40	173.10	52.30	8.68	3.90	2.35	0.87	1.13	53.32
1954	1.97	28.90	9.94	14.50	52.70	125.10	117.20	7.87	0.57	0.00	0.00	0.00	29.90
1955	0.00	1.60	8.39	23.50	7.71	1.90	6.93	21.20	2.83	2.13	1.84	2.80	6.74
1956	2.65	8.87	23.10	6.94	14.60	10.90	25.40	5.29	0.87	0.42	0.19	0.50	8.31
1957	0.92	1.12	7.39	14.00	54.00	190.90	163.30	124.00	28.20	9.35	3.90	2.00	49.92
1958	1.48	10.60	24.00	63.00	29.00	10.00	2.30	1.23	1.03	0.65	0.50	0.50	12.02
1959	1.53	5.53	14.80	3.68	9.36	78.40	31.00	19.10	2.33	1.03	1.03	1.03	14.07
1960	1.61	1.37	2.00	26.60	6.03	8.35	9.87	1.48	1.27	0.84	0.16	0.80	5.03
1961	1.29	199.40	42.50	172.30	14.70	10.80	38.00	35.20	1.10	1.00	1.00	1.00	43.19
1962	1.00	22.70	80.60	60.90	17.00	6.32	13.40	4.23	1.00	0.90	1.00	1.00	17.50
1963	1.00	10.80	8.81	25.00	76.10	31.20	73.80	124.30	10.40	1.71	0.97	0.97	30.42
1964	4.71	2.80	15.90	22.30	41.20	15.20	7.93	2.32	1.10	0.94	0.94	1.00	9.69
1965	1.00	1.27	4.39	63.80	15.80	10.40	68.40	8.58	1.00	0.00	0.00	0.00	14.55
1966	0.77	1.87	1.48	9.68	87.30	54.70	9.97	1.81	0.20	0.00	0.00	0.00	13.98
1967	10.40	1.27	2.65	3.77	54.80	34.00	7.40	3.97	0.30	0.00	0.00	0.00	9.88
1968	0.00	47.50	58.90	3.71	18.20	4.10	111.40	4.74	0.17	0.00	0.00	0.00	20.73
1969	0.00	18.20	57.40	155.30	81.40	108.10	170.40	45.60	5.97	2.81	1.29	1.80	54.02
1970	2.00	18.20	21.20	67.00	13.40	36.40	4.57	4.32	1.90	1.00	1.00	1.00	14.33
1971	1.00	1.07	9.77	3.13	5.64	30.80	189.60	10.10	5.13	3.55	3.00	3.00	22.15
1972	3.00	10.30	24.00	46.00	73.90	149.80	103.70	91.00	16.40	7.58	4.13	4.00	44.48
1973	4.48	32.40	33.10	18.70	48.20	42.20	18.00	11.60	3.30	1.55	1.00	1.23	17.98
1974	1.03	5.47	8.26	49.20	84.50	423.90	212.60	12.90	2.40	2.00	2.00	1.97	67.19
1975	2.42	12.70	90.00	30.80	75.40	67.70	47.10	30.30	7.33	2.00	1.29	1.00	30.67
1976	0.03	0.63	15.60	64.20	77.30	71.40	83.10	27.60	9.37	3.16	2.68	0.37	29.62
1977	1.55	2.57	3.77	26.50	30.40	9.81	23.00	6.84	2.87	0.07	0.00	0.00	8.95
1978	0.00	7.40	24.10	27.20	15.40	35.10	3.37	2.26	1.93	1.58	1.32	1.70	10.11
1979	3.94	4.97	141.20	81.00	19.50	11.00	6.10	5.10	4.73	2.35	1.10	1.33	23.53
1980	5.68	5.00	30.50	18.40	26.00	43.00	18.40	4.23	0.47	1.81	1.06	0.83	12.95
1981	0.87	4.60	14.20	124.30	21.40	75.20	31.10	9.71	2.17	3.68	1.19	2.00	24.20
1982	3.13	2.57	48.00	151.50	64.10	66.80	70.20	60.30	7.97	3.94	2.77	2.00	40.27
1983	20.30	34.50	14.60	19.80	23.10	18.40	15.90	8.10	2.07	1.46	0.92	0.90	13.34
1984	1.62	2.29	4.16	4.34	4.10	16.90	19.70	3.72	—	—	—	—	7.10
1985	1.73	84.30	30.50	12.70	69.60	12.10	17.80	3.23	1.67	1.03	1.00	1.00	19.72
1986	1.00	3.27	16.50	5.03	61.10	7.26	21.50	11.50	1.63	1.00	1.23	1.57	11.05

**Table 73.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1987	2.13	11.40	8.68	2.10	5.54	12.30	4.60	1.94	1.87	1.97	—	—	5.25
1988	—	7.30	125.10	71.90	89.40	288.80	47.40	40.20	7.37	3.84	3.23	4.10	62.60
1989	9.87	8.63	89.90	23.70	21.40	66.70	30.50	10.00	6.37	8.58	9.32	7.33	24.36
1990	5.42	25.10	46.90	19.70	53.70	42.60	10.90	4.35	6.43	6.65	8.50	9.06	19.94
1991	8.36	5.57	5.46	9.79	28.90	130.00	14.00	9.60	9.03	3.23	4.13	4.93	19.42
1992	8.82	21.10	103.10	48.90	148.80	132.80	47.60	27.60	13.80	5.76	9.92	11.60	48.32
1993	12.50	44.90	138.00	104.70	50.20	38.70	116.50	64.50	16.40	10.70	11.10	10.90	51.59
1994	24.40	72.70	50.10	125.40	52.00	44.30	20.20	24.90	12.50	10.40	7.94	7.40	37.69
1995	—	170.10	48.60	59.50	125.30	45.50	58.30	36.10	18.30	17.70	21.40	25.60	56.95
1996	28.50	33.90	42.10	121.50	64.70	58.10	26.50	16.70	16.90	9.25	8.74	6.41	36.11
1997	1.81	15.30	33.00	43.00	15.60	37.10	30.10	5.68	11.10	4.71	5.94	6.33	17.47



**Figure 46.** Annual flow duration at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

**Table 74.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

[Flow duration measured in cubic meters per second]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	14.60	76.80	146.80	225.90	175.90	263.80	185.40	73.80	19.20	11.40	10.80	11.50	104.80
90	8.28	42.60	70.10	112.80	102.00	155.40	104.90	42.60	14.00	8.16	8.67	7.81	53.40
85	5.64	26.80	45.90	70.50	75.60	103.00	75.50	30.80	11.90	5.88	5.09	5.40	35.20
80	4.56	16.30	36.90	55.30	59.00	79.90	57.00	25.00	8.25	4.33	4.05	3.82	24.60
75	3.29	11.50	28.90	44.10	49.10	63.40	46.30	20.40	6.74	3.51	3.12	3.26	17.40
70	2.97	7.97	22.50	35.60	42.20	50.90	38.50	15.90	5.74	2.86	2.89	2.15	13.10
65	2.24	5.59	18.00	29.60	36.30	41.50	31.60	12.70	5.07	2.53	2.23	2.05	9.54
60	2.10	4.76	14.70	24.40	30.40	33.90	25.90	10.40	4.18	1.98	1.10	1.95	7.93
55	1.97	4.33	11.80	21.10	25.40	28.00	21.30	8.32	3.36	1.85	1.07	1.09	6.05
50	1.09	3.89	9.11	17.30	21.30	22.50	17.20	7.41	3.04	1.72	1.04	1.07	4.70
45	1.06	3.34	6.89	14.10	17.60	18.40	14.00	6.42	2.04	1.18	1.01	1.04	3.93
40	1.02	2.25	5.67	11.10	15.10	15.30	11.40	5.40	1.94	1.13	0.98	1.02	3.22
35	0.98	2.08	4.87	8.25	12.60	12.50	9.37	4.58	1.84	1.08	0.95	1.00	2.01
30	0.95	1.91	4.14	6.67	10.10	9.67	7.40	4.10	1.09	1.03	0.91	0.97	1.77
25	0.91	1.74	2.95	5.04	8.53	7.84	5.54	3.11	1.06	0.98	0.13	0.14	1.08
20	0.37	1.22	2.55	4.08	6.79	6.65	4.33	2.67	1.03	0.12	0.11	0.11	1.00
15	0.22	1.12	2.35	3.40	5.24	4.79	3.53	2.06	1.00	0.09	0.08	0.08	0.91
10	0.14	1.02	2.18	2.92	3.91	3.26	2.92	1.89	0.83	0.06	0.05	0.06	0.13
5	0.07	0.12	2.00	2.06	2.99	2.61	1.95	1.14	0.41	0.03	0.03	0.03	0.07

**Table 75.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	178.50	113.02	73.63	50.14
0.50	2	338.16	209.53	135.25	94.41
0.20	5	665.23	394.70	250.93	176.57
0.10	10	962.04	553.11	348.02	244.26
0.05	20	1,315.20	733.28	456.88	318.88
0.02	50	1,886.30	1,010.80	622.05	429.82
0.01	100	2,411.40	1,254.70	765.15	524.02

**Table 76.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T15, Adhaim River Injana, Iraq, water years 1945–97.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	0.77	0.73	0.77	0.89	1.02	1.17	1.89
0.2	5	0.28	0.00	0.00	0.00	0.00	0.01	0.75
0.1	10	0.28	0.00	0.00	0.00	0.00	0.01	0.48
0.05	20	0.28	0.00	0.00	0.00	0.00	0.01	0.33
0.02	50	0.28	0.00	0.00	0.00	0.00	0.01	0.22
0.01	100	0.28	0.00	0.00	0.00	0.00	0.01	0.17

# Tigris River Basin

## DIYALA RIVER AT DERBENDI-KHAN (IRQ\_T16 )

(U.S. Geological Survey identification number: 35080004545000)

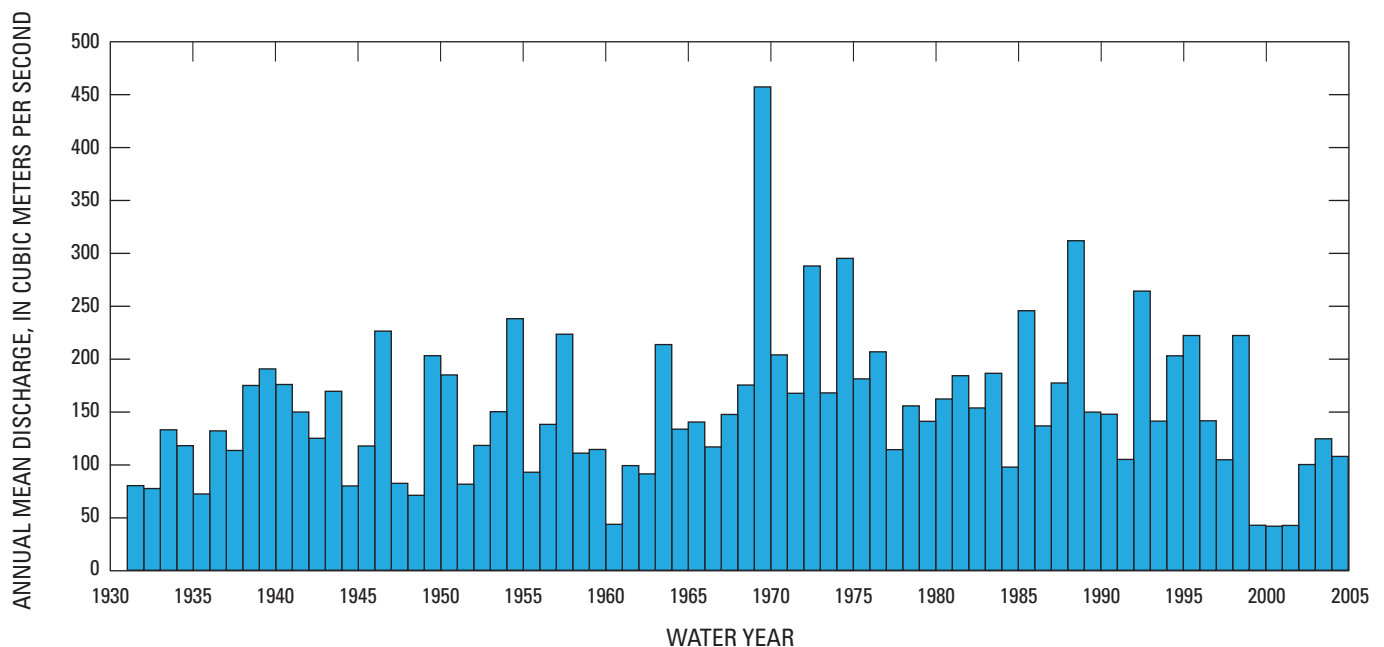
LOCATION: Latitude 35° 08' 00" N, Longitude 45° 45' 00" E.

DRAINAGE AREA: 17,800 square kilometers.

PERIOD OF RECORD: November 1931 to September 2004.

GAGE: The staff gage known as "D" gage was located on the right bank of the Diyala River 900 meters downstream of the Derbendi-Khan Dam. The gage was damaged in October 1961 and a temporary gage, gage "E," was installed 1 kilometer downstream of gage "D." In May 1975, a permanent gage was installed upstream of gage "E."

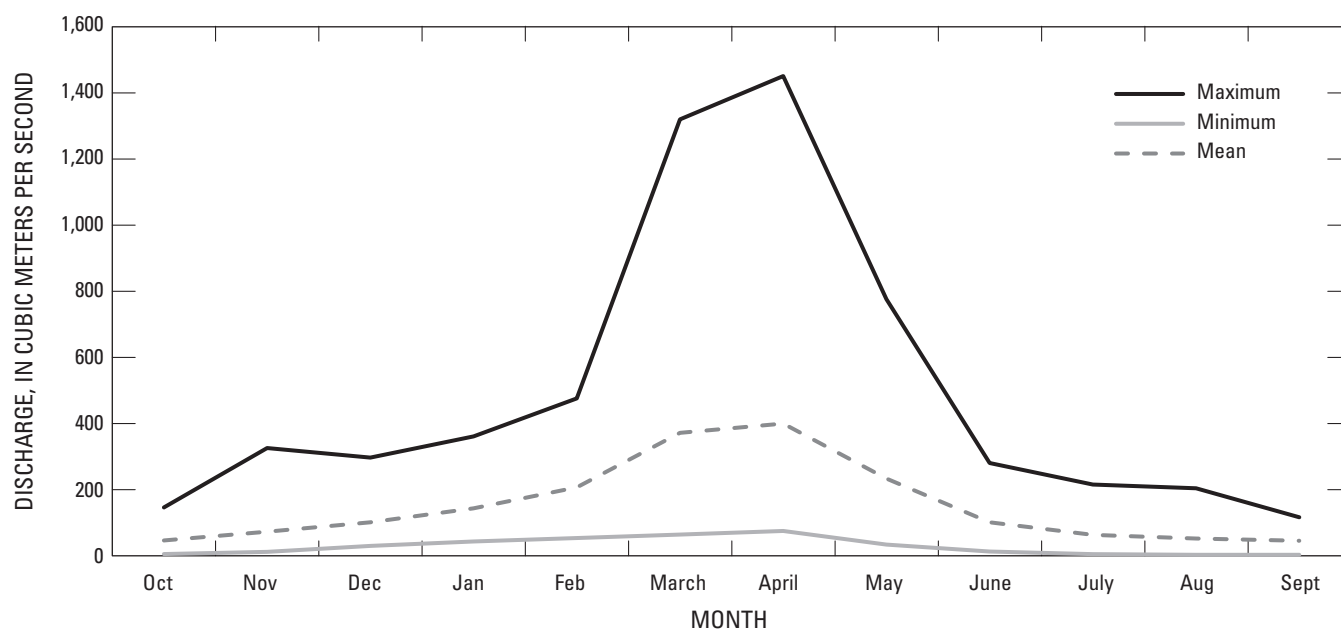
RECORDS: From gage "D" until 1961, the discharge measurements were made regularly until April 1961 and the records for that time period are considered complete. As of December 1961, the values have been taken directly from the outflow of the Derbendi-Khan Dam.



**Figure 47.** Annual mean discharge at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

**Table 77.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	146.20	1988	5.28	2002	46.39	26.50	0.57	2.52
November	325.90	1995	11.90	2002	72.89	51.59	0.71	3.96
December	297.00	1988	29.90	1999	101.31	58.57	0.58	5.51
January	361.10	1994	43.30	2001	143.54	76.10	0.53	7.81
February	476.00	1969	53.70	1960	206.95	96.52	0.47	11.26
March	1,320.00	1974	64.20	1960	371.86	241.32	0.65	20.22
April	1,451.00	1969	75.10	1999	399.92	229.12	0.57	21.75
May	776.10	1972	33.90	1999	233.55	143.55	0.61	12.70
June	280.60	1969	12.90	2000	101.31	54.23	0.54	5.51
July	215.50	1969	5.00	2000	63.31	36.09	0.57	3.44
August	204.20	1969	3.00	2000	52.20	33.81	0.65	2.84
September	116.50	1969	3.00	2000	45.47	25.25	0.56	2.47
Annual	459.27	1969	41.86	2000	153.26	69.88	0.46	100.00

**Figure 48.** Monthly discharge at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.



**Table 78.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

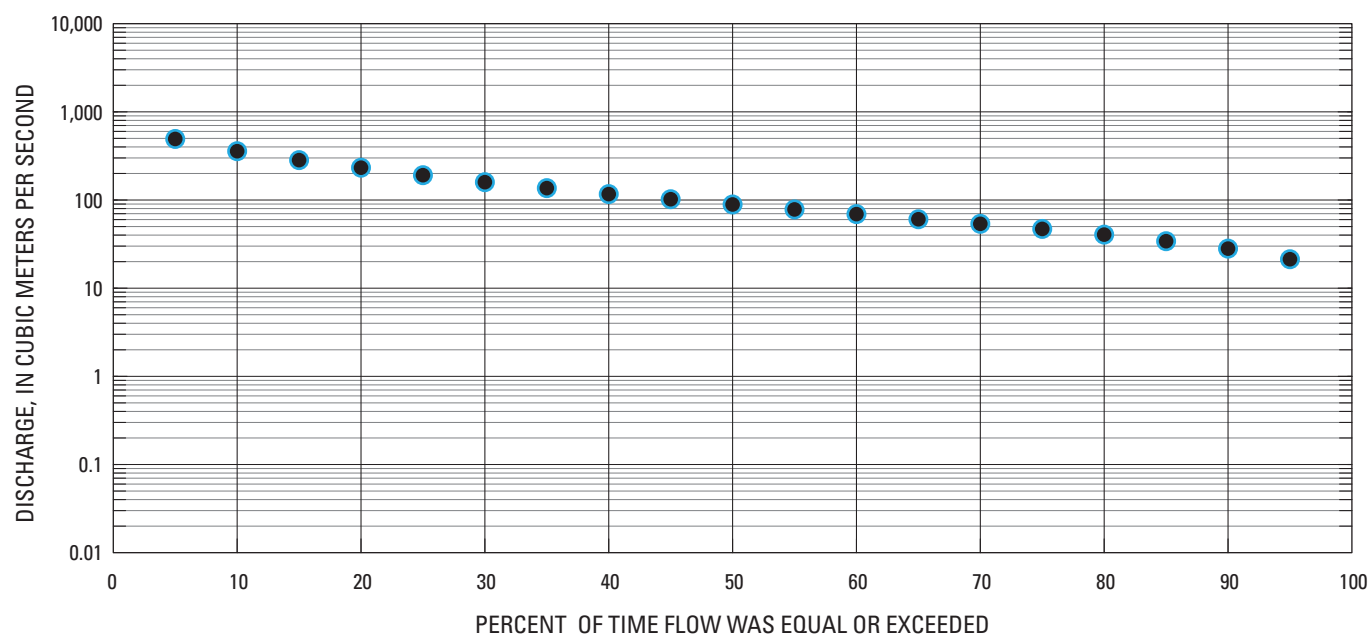
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	—	27.70	51.20	106.40	115.40	177.70	171.00	115.40	44.50	27.00	24.00	24.00	80.39
1932	20.80	30.80	51.90	79.40	137.20	282.00	140.20	79.80	39.50	26.20	22.10	21.70	77.63
1933	19.20	31.50	32.90	84.40	147.40	380.10	473.50	238.80	89.20	44.00	31.70	28.80	133.46
1934	23.90	26.80	95.50	92.70	127.10	162.50	346.90	306.80	126.30	47.20	33.40	31.00	118.34
1935	24.10	28.70	41.50	76.10	187.50	155.70	160.60	94.70	31.80	25.90	21.80	21.30	72.48
1936	18.40	47.20	129.10	50.00	200.60	261.70	482.40	208.30	75.30	45.70	35.90	34.70	132.44
1937	27.80	48.20	106.80	95.90	196.50	171.70	305.60	213.00	82.80	48.10	37.60	31.80	113.82
1938	27.60	69.70	67.10	235.80	280.40	335.60	507.60	324.60	109.20	59.90	46.40	43.00	175.58
1939	45.50	45.60	156.00	210.70	264.80	426.10	612.50	240.00	124.20	75.10	50.30	45.00	191.32
1940	35.40	55.00	88.80	220.20	418.80	470.80	400.40	185.00	95.80	61.50	45.00	41.30	176.50
1941	47.10	64.50	97.40	188.10	328.30	348.50	324.80	197.80	81.20	48.60	39.60	38.30	150.35
1942	33.30	38.70	67.10	133.10	170.80	454.30	295.50	143.40	65.50	39.20	32.10	31.80	125.40
1943	40.20	88.90	80.00	107.60	166.30	490.50	528.30	293.90	109.50	60.40	40.60	34.30	170.04
1944	32.30	38.80	46.20	102.70	113.90	227.40	184.10	92.50	40.70	31.20	26.40	25.30	80.13
1945	25.10	88.20	49.70	209.30	153.10	206.40	283.00	203.10	88.00	44.50	35.80	30.70	118.08
1946	24.40	59.10	86.60	172.00	231.70	793.40	664.50	364.10	141.80	77.70	58.70	52.70	227.23
1947	51.80	48.50	49.60	119.20	148.00	211.90	141.60	98.10	40.30	29.30	26.20	26.30	82.57
1948	21.90	43.30	51.70	53.30	60.80	134.10	206.50	157.50	50.50	29.00	23.40	22.50	71.21
1949	20.50	23.80	45.20	58.70	112.20	675.80	796.60	396.40	160.00	72.10	45.30	39.50	203.84
1950	33.70	38.00	83.00	157.50	157.60	547.50	436.70	426.90	169.70	79.90	53.10	43.30	185.58
1951	36.50	37.80	49.70	117.30	137.90	211.70	170.10	100.30	41.00	29.70	25.10	24.30	81.78
1952	28.90	40.80	71.20	63.20	290.30	345.90	233.40	191.10	63.70	37.80	28.90	28.00	118.60
1953	23.70	27.70	55.50	99.00	206.00	543.80	460.90	191.60	87.80	46.00	34.60	31.20	150.65
1954	26.50	79.50	61.70	138.80	285.60	745.40	857.50	346.60	150.00	78.30	52.90	45.70	239.04
1955	36.80	59.10	74.80	83.30	99.40	139.90	247.80	222.50	65.00	34.30	28.10	26.70	93.14
1956	19.80	41.10	118.30	88.10	160.00	298.20	532.40	194.70	83.90	55.50	42.20	29.00	138.60
1957	38.10	45.60	55.80	70.60	104.80	572.50	691.10	678.00	234.60	92.90	58.40	49.20	224.30
1958	58.00	107.20	108.50	182.90	192.10	296.40	186.40	79.20	46.70	30.80	25.10	22.10	111.28
1959	22.60	29.90	100.50	53.60	82.20	293.00	439.50	169.40	73.80	47.00	36.60	29.10	114.77
1960	20.90	32.40	39.20	54.30	53.70	64.20	102.80	74.10	30.60	20.50	16.00	15.00	43.64
1961	15.30	69.50	46.50	147.30	109.80	129.30	319.60	215.50	62.00	32.90	24.80	20.50	99.42
1962	18.40	30.00	54.60	131.00	152.60	185.20	196.50	136.20	63.30	46.20	45.30	39.60	91.58
1963	36.50	55.30	90.50	184.50	313.90	281.90	448.40	581.10	213.00	139.30	139.00	89.80	214.43
1964	45.00	34.10	68.70	74.80	212.70	435.90	368.20	177.90	85.40	50.20	36.80	19.10	134.07
1965	46.90	60.10	66.50	106.20	142.20	230.00	392.60	262.20	117.00	103.10	106.40	56.80	140.83
1966	66.50	80.00	53.50	73.00	173.10	309.80	263.70	155.30	84.20	56.10	49.50	41.60	117.19
1967	60.00	61.70	69.30	103.90	178.30	332.70	319.30	279.60	141.40	101.70	75.10	53.10	148.01
1968	52.00	119.40	129.10	131.40	207.80	310.80	364.60	335.20	171.80	117.30	100.50	72.00	175.99
1969	63.80	126.60	257.00	338.40	476.00	1,261.00	1,451.00	720.60	280.60	215.50	204.20	116.50	459.27
1970	100.70	176.80	147.30	319.30	307.80	497.50	318.80	228.70	126.90	101.50	76.50	54.10	204.66
1971	51.70	74.10	86.10	89.70	144.30	225.60	629.30	242.80	123.90	127.90	116.90	105.60	168.16
1972	61.30	106.80	141.20	170.00	220.60	617.40	742.00	776.10	244.40	144.50	131.30	113.60	289.10

**Table 78.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1973	102.40	118.30	128.40	136.50	370.10	377.50	289.40	185.10	111.30	90.30	61.20	51.90	168.53
1974	43.30	47.50	82.50	114.60	202.10	1320.00	981.50	293.90	163.30	130.80	98.90	77.70	296.34
1975	85.00	83.00	122.60	131.40	284.70	389.40	333.50	293.40	159.00	106.00	101.10	93.30	181.87
1976	95.00	115.00	145.80	262.30	301.10	366.00	383.00	347.00	191.20	105.00	90.10	89.20	207.56
1977	102.00	118.00	112.00	105.10	96.00	222.90	237.90	138.00	76.10	65.10	58.00	44.10	114.60
1978	52.10	88.00	134.00	204.90	288.00	283.90	312.10	164.00	118.80	83.20	68.20	77.00	156.18
1979	68.10	65.00	201.00	227.00	261.00	229.10	219.90	129.80	81.20	72.00	75.00	69.10	141.52
1980	56.20	46.80	92.20	121.00	153.20	431.10	579.20	196.00	101.90	83.00	43.20	49.10	162.74
1981	73.00	125.90	105.00	217.00	285.00	381.00	412.90	254.00	127.90	58.30	98.00	80.10	184.84
1982	76.70	81.90	86.00	153.10	219.00	372.10	426.00	216.00	73.90	39.00	53.90	53.00	154.22
1983	79.80	153.90	126.80	195.00	259.90	432.90	432.00	260.00	108.20	56.90	64.00	76.20	187.13
1984	68.10	67.90	95.00	71.00	99.10	206.00	228.90	146.20	60.10	46.80	48.10	39.00	98.02
1985	54.00	210.20	263.00	356.00	469.90	553.10	507.00	222.00	122.00	68.00	60.10	73.70	246.58
1986	68.00	92.00	133.10	112.10	268.00	188.10	256.90	277.00	89.20	55.90	58.10	47.70	137.18
1987	67.20	141.90	143.10	136.00	191.00	504.90	416.00	200.90	100.80	75.10	72.20	86.10	177.93
1988	146.20	143.00	297.00	262.00	419.00	1,120.00	629.00	310.00	165.90	113.90	83.20	67.90	313.09
1989	76.00	96.00	157.90	132.00	134.90	473.90	314.10	147.00	88.20	67.10	58.00	58.10	150.27
1990	66.80	84.90	155.10	159.00	207.00	387.90	310.00	165.90	87.90	50.00	49.10	55.10	148.23
1991	43.80	41.90	37.80	48.00	149.10	198.00	314.90	144.00	87.90	78.20	55.00	65.00	105.30
1992	75.90	55.80	208.00	176.00	374.90	472.00	860.00	503.00	203.00	103.00	80.10	71.10	265.23
1993	56.90	104.90	159.10	223.90	197.80	249.00	285.10	231.00	90.00	46.10	30.60	26.00	141.70
1994	42.90	188.90	213.00	361.10	285.00	506.90	371.10	225.10	87.90	69.00	46.20	48.10	203.77
1995	74.80	325.90	248.00	291.80	314.00	275.00	483.10	348.00	148.90	72.80	50.10	44.10	223.04
1996	48.20	58.00	46.00	86.00	177.90	355.00	537.10	188.90	79.10	52.00	36.10	40.00	142.03
1997	31.90	38.00	52.10	81.00	68.00	241.20	420.10	172.00	71.00	36.20	27.10	21.30	104.99
1998	27.00	102.90	129.90	195.00	319.90	759.90	660.10	244.80	109.90	55.00	39.90	32.20	223.04
1999	33.00	33.80	29.90	64.00	123.10	82.10	75.10	33.90	15.20	9.88	5.00	7.98	42.75
2000	8.22	16.10	39.00	65.10	76.00	124.00	110.00	40.00	12.90	5.00	3.00	3.00	41.86
2001	11.00	22.20	50.20	43.30	80.00	135.00	96.00	39.80	16.50	7.01	4.88	5.00	42.57
2002	5.28	11.90	70.00	165.00	165.10	176.90	337.90	150.00	55.00	28.40	21.00	18.80	100.44
2003	21.90	36.10	130.00	146.90	260.00	259.90	368.00	109.00	73.20	39.10	28.00	26.90	124.92
2004	23.20	39.80	80.80	205.10	245.00	201.00	208.00	167.90	63.00	35.00	12.00	17.10	108.16



**Figure 49.** Annual flow duration at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

**Table 79.** Monthly flow duration at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	14.40	20.20	27.90	42.60	59.70	93.60	118.60	62.90	28.00	20.10	13.20	13.90	21.30
90	18.40	24.40	34.40	53.30	78.00	129.00	150.60	85.90	37.20	26.20	21.90	20.60	28.10
85	20.40	27.50	41.30	60.80	89.50	153.70	173.30	101.10	46.80	30.10	24.60	22.50	34.10
80	22.60	30.20	45.40	66.90	99.40	174.80	200.30	116.90	55.40	33.60	27.20	24.50	40.50
75	24.70	33.80	49.40	73.60	108.50	193.50	227.00	130.60	62.30	37.20	29.70	26.70	47.00
70	27.40	38.70	54.10	80.40	117.90	209.50	250.80	142.30	68.30	40.90	32.50	29.40	53.70
65	30.60	41.70	59.10	88.70	128.60	227.10	272.00	154.70	74.10	44.60	35.50	31.60	60.50
60	33.70	44.80	64.10	97.30	142.40	245.90	294.30	167.80	79.50	48.00	38.30	33.70	69.20
55	36.60	48.70	70.20	105.60	155.50	271.90	316.80	180.10	85.00	51.40	41.10	36.90	78.20
50	39.50	53.10	76.40	113.80	168.70	293.50	339.50	192.20	91.00	54.80	44.20	40.20	89.00
45	43.30	57.70	83.80	122.30	182.20	313.70	363.10	206.60	97.00	59.30	47.70	43.20	102.10
40	48.00	62.40	92.80	130.90	197.10	335.30	387.10	222.10	103.70	63.90	51.40	46.20	116.70
35	52.80	67.10	102.00	142.00	215.90	357.10	416.10	240.60	110.40	68.70	55.30	49.30	136.40
30	57.80	75.30	111.80	155.40	237.10	388.70	447.50	260.10	118.70	75.20	59.50	53.60	159.30
25	62.90	84.80	121.70	173.00	258.00	426.80	488.50	286.20	128.20	81.70	66.40	59.30	191.20
20	69.20	97.70	136.90	195.30	284.10	472.70	540.00	319.70	140.90	90.50	74.40	66.70	232.60
15	75.50	112.20	154.90	229.10	320.70	532.60	618.00	362.60	156.50	101.60	84.10	74.80	283.40
10	84.60	133.10	192.80	269.20	376.00	668.60	717.50	427.00	177.50	116.60	96.80	84.50	357.70
5	97.40	189.80	270.40	356.90	486.20	985.10	922.00	567.10	214.80	138.40	121.00	97.30	492.60

**Table 80.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	460.49	375.53	314.55	274.27
0.50	2	738.25	592.02	495.30	430.41
0.20	5	1,207.80	963.09	798.52	680.81
0.10	10	1,575.10	1,258.00	1,034.80	867.97
0.05	20	1,969.70	1,579.00	1,288.10	1,062.50
0.02	50	2,545.10	2,054.30	1,657.20	1,336.40
0.01	100	3,027.50	2,458.90	1,966.70	1,558.90

**Table 81.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T16, Diyala River at Derbendi-Khan, Iraq, water years 1931–2004.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	28.29	31.06	33.64	36.88	40.35	42.75	54.28
0.2	5	14.44	16.51	17.71	20.38	22.39	23.78	32.43
0.1	10	9.05	10.79	11.58	13.77	15.11	16.21	23.55
0.05	20	5.78	7.21	7.76	9.53	10.42	11.33	17.59
0.02	50	3.24	4.32	4.68	5.98	6.51	7.22	12.28
0.01	100	2.11	2.96	3.23	4.26	4.61	5.20	9.49

## Tigris River Basin

### DIYALA RIVER AT DISCHARGE SITE (IRQ\_T17 )

(U.S. Geological Survey identification number: 35060104542020)

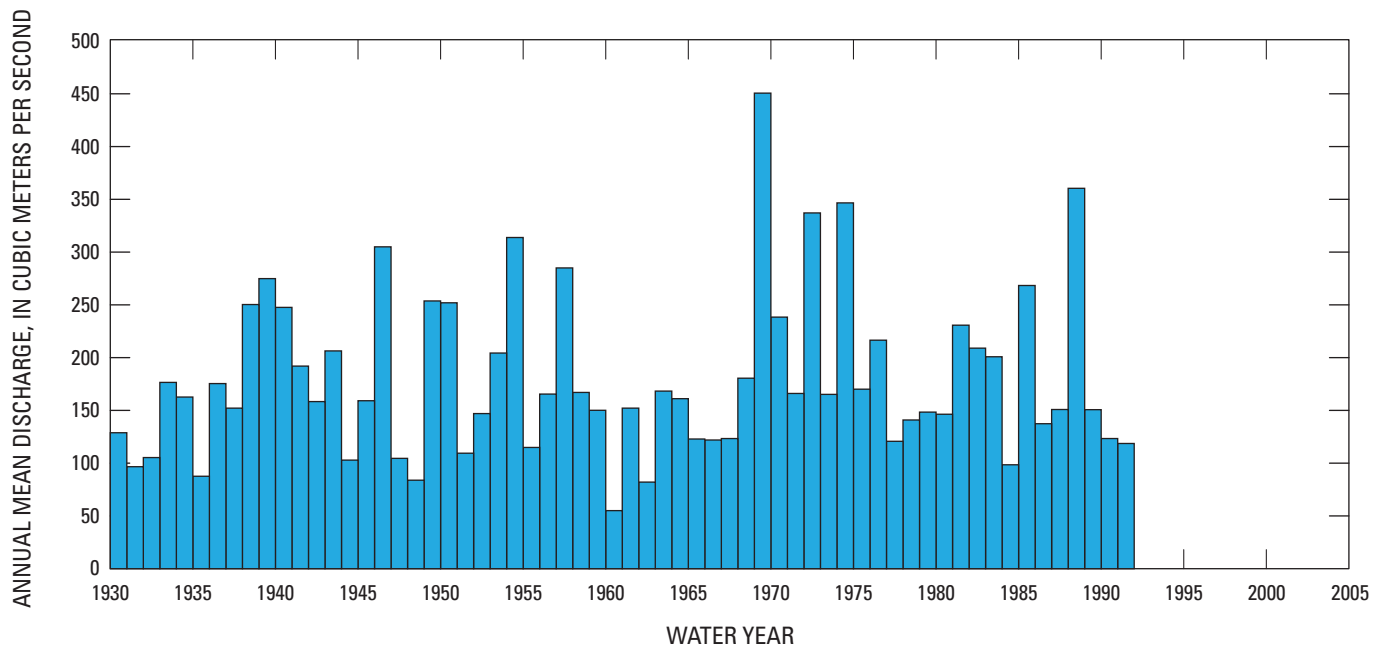
LOCATION: Latitude 35° 06' 01" N, Longitude 45° 42' 02" E.

DRAINAGE AREA: 29,700 square kilometers.

PERIOD OF RECORD: January 1930 to September 1991.

GAGE: The staff gage at the discharge site is located on the left bank of the Diyala River 8 kilometers upstream of the Diyala Weir. The gage is set to the GTS datum. A second staff is located at the Flying Bridge 7 kilometers downstream of the discharge site.

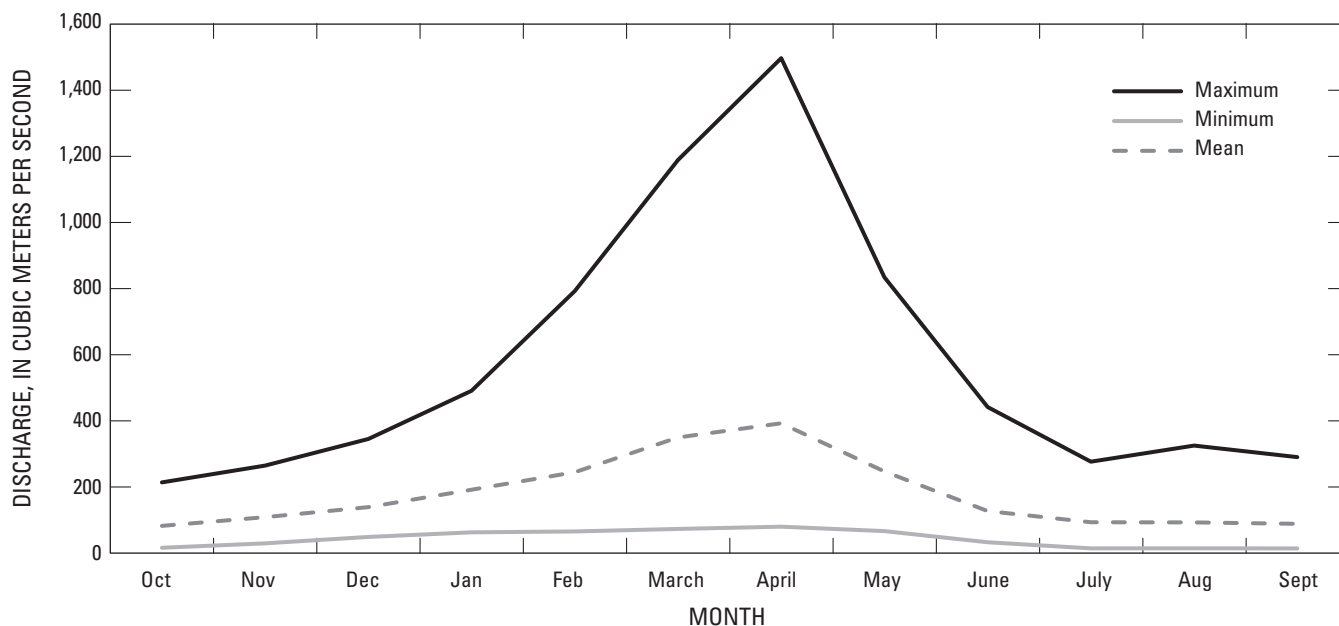
RECORDS: Discharge measurements are considered to be good for low and medium flows and fair for high flows.



**Figure 50.** Annual mean discharge at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

**Table 82.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	213.90	1970	16.10	1961	82.36	54.99	0.67	3.82
November	264.70	1970	29.50	1949	108.74	58.90	0.54	5.04
December	345.20	1939	48.90	1933	139.05	62.23	0.45	6.44
January	491.00	1938	62.80	1948	191.71	99.05	0.52	8.88
February	792.60	1940	65.50	1991	244.70	137.94	0.56	11.34
March	1,189.00	1974	73.10	1960	349.81	250.42	0.72	16.21
April	1,497.00	1969	79.90	1979	392.67	302.34	0.77	18.20
May	834.20	1969	66.50	1962	246.89	175.12	0.71	11.44
June	441.80	1988	32.80	1960	127.14	72.26	0.57	5.89
July	276.50	1969	14.30	1960	93.37	56.67	0.61	4.33
August	325.20	1985	14.50	1960	92.84	71.57	0.77	4.30
September	290.30	1985	14.10	1960	88.53	68.27	0.77	4.10
Annual	449.50	1969	54.89	1960	180.12	77.59	0.43	100.00

**Figure 51.** Monthly discharge at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

**Table 83.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

[Discharge measured in cubic meters per second; —, no data available]

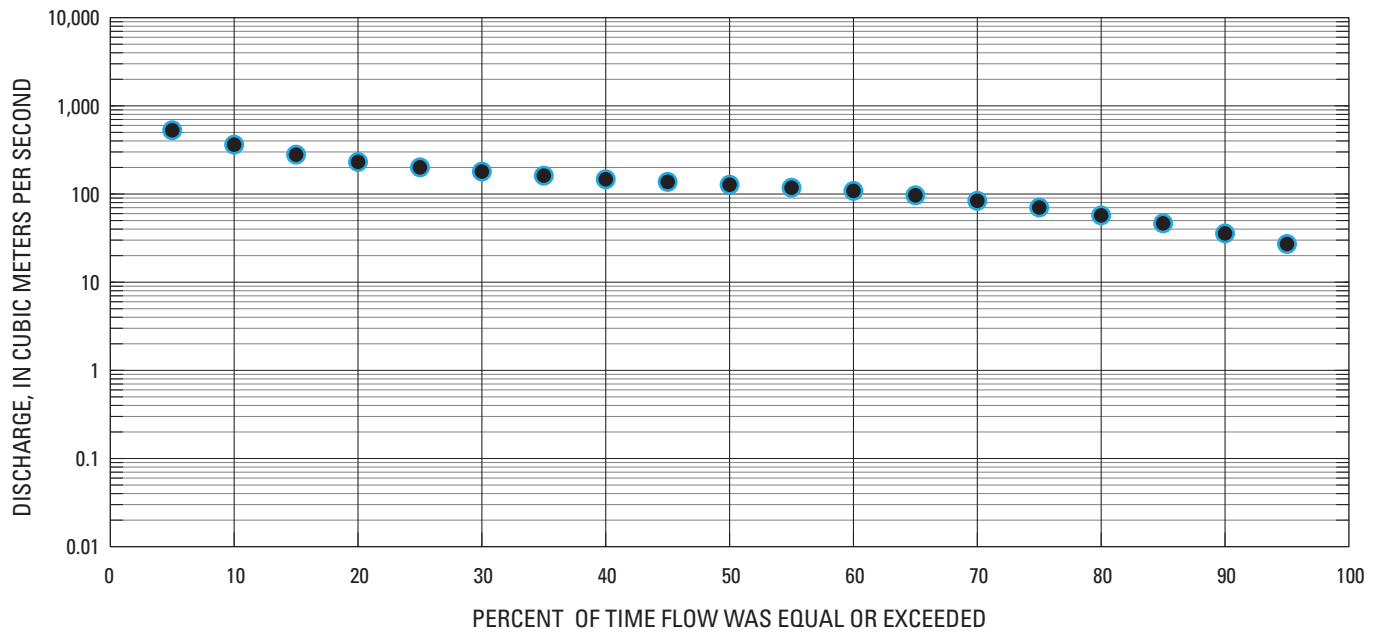
Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1930	—	—	—	135.00	256.90	189.10	246.00	188.20	68.20	29.20	22.50	21.50	128.51
1931	27.10	33.70	71.10	138.30	205.30	215.50	207.40	139.90	53.80	24.80	20.00	20.00	96.41
1932	26.30	44.50	79.80	159.70	234.10	342.40	170.30	96.90	48.00	23.40	17.80	17.30	105.04
1933	22.20	37.70	48.90	160.80	301.70	461.00	574.20	289.80	108.20	49.00	31.70	27.80	176.08
1934	31.30	36.00	148.40	199.60	270.10	197.10	420.80	372.40	153.50	53.30	34.40	30.00	162.24
1935	33.60	42.00	70.60	89.80	218.40	188.90	194.70	115.00	38.70	22.90	17.60	16.30	87.38
1936	18.40	60.20	198.00	73.20	378.50	317.50	585.20	252.80	91.50	51.30	37.40	35.70	174.98
1937	36.80	60.50	182.80	172.70	304.00	208.40	370.80	258.30	100.70	54.50	39.80	31.80	151.76
1938	46.40	120.10	92.70	491.00	525.10	407.10	615.70	393.70	132.30	71.50	52.60	48.00	249.68
1939	50.50	51.40	345.20	415.30	525.40	516.70	742.90	291.20	150.50	93.10	58.00	50.00	274.18
1940	54.10	87.50	140.40	322.20	792.60	570.90	485.70	224.40	116.50	73.90	50.30	45.30	246.98
1941	56.10	112.30	138.50	267.20	430.10	422.70	394.10	239.90	98.70	55.40	42.60	40.30	191.49
1942	48.40	60.20	118.80	174.60	224.50	551.00	358.50	174.00	79.30	42.30	32.10	31.80	157.96
1943	55.80	107.90	97.20	130.60	201.90	595.20	640.80	356.50	132.80	72.10	44.10	35.30	205.85
1944	43.70	52.80	61.20	162.20	173.80	275.90	223.30	112.30	49.50	30.70	23.90	22.30	102.63
1945	27.70	130.00	70.90	378.80	234.30	250.30	343.50	246.50	106.80	49.60	37.00	29.70	158.76
1946	34.30	110.40	141.70	354.90	400.60	962.40	806.00	441.70	171.80	96.50	69.40	61.00	304.23
1947	64.20	71.00	78.50	150.10	215.50	257.20	171.70	119.10	49.00	28.30	23.30	23.50	104.28
1948	31.30	45.00	59.20	62.80	73.50	162.80	250.40	191.00	61.50	27.90	19.90	18.50	83.65
1949	21.50	29.50	73.90	100.00	168.40	820.30	966.40	480.90	194.00	88.60	50.90	42.50	253.08
1950	45.90	52.30	191.00	306.30	294.50	663.80	529.60	517.80	205.80	99.60	61.90	47.50	251.33
1951	50.30	56.70	80.50	176.50	239.00	256.70	206.50	121.70	50.00	28.70	22.10	21.30	109.17
1952	28.90	58.80	114.40	97.10	354.60	419.60	283.10	231.80	77.30	39.90	27.90	26.00	146.62
1953	29.60	37.50	154.60	193.50	354.00	659.70	559.10	232.60	106.80	51.80	35.60	31.20	203.83
1954	35.10	146.60	101.10	220.30	496.20	904.30	1,040.00	420.40	182.00	97.80	61.60	51.00	313.03
1955	54.10	75.70	118.20	144.70	148.80	177.80	238.00	253.40	78.80	35.30	26.10	24.30	114.60
1956	25.20	58.90	157.60	140.60	232.90	334.00	557.80	266.50	99.80	48.40	31.40	27.50	165.05
1957	31.30	42.40	85.60	127.80	172.50	784.50	842.70	768.40	299.20	122.40	75.60	59.00	284.28
1958	81.50	194.50	219.50	376.20	299.70	370.30	221.70	108.70	50.00	28.80	24.50	23.80	166.60
1959	35.20	48.10	168.00	89.10	120.30	396.70	534.00	209.50	84.60	44.60	34.90	31.60	149.72
1960	38.30	53.00	58.10	90.10	69.40	73.10	114.60	86.40	32.80	14.30	14.50	14.10	54.89
1961	16.10	140.30	95.30	409.30	192.40	201.30	358.80	249.80	80.20	32.80	24.00	20.80	151.76
1962	23.70	89.70	72.40	168.30	112.80	91.20	95.70	66.50	54.10	61.40	76.70	69.70	81.85
1963	53.20	77.40	80.60	98.80	108.50	91.10	191.20	654.50	169.40	136.80	173.30	179.60	167.87
1964	174.30	183.80	218.00	198.20	172.50	211.80	263.50	100.80	81.80	94.30	111.00	118.50	160.71
1965	122.00	115.70	108.00	143.40	103.10	136.90	162.50	117.50	123.00	105.80	105.60	127.40	122.58
1966	128.50	111.30	111.20	121.90	155.70	161.90	125.90	105.50	91.20	115.10	116.70	114.70	121.63
1967	105.60	93.80	101.50	110.70	166.20	138.80	124.00	128.80	111.10	133.60	133.60	128.50	123.02
1968	114.00	161.50	124.00	104.10	174.30	249.50	354.80	284.90	128.10	144.40	158.80	162.30	180.06
1969	145.20	169.80	191.30	315.50	330.00	838.90	1,497.00	834.20	306.90	276.50	292.60	196.10	449.50
1970	213.90	264.70	240.40	392.90	266.70	277.90	193.00	176.00	187.80	220.00	213.80	206.40	237.79
1971	156.60	113.80	133.90	122.60	154.40	117.30	342.30	128.10	135.30	179.50	200.20	203.60	165.63

**Table 83.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1972	183.80	218.70	217.50	239.50	280.10	569.20	704.30	775.10	300.50	190.30	173.40	182.80	336.27
1973	182.30	168.20	205.30	206.30	226.80	240.60	173.80	145.40	107.80	103.20	106.30	111.10	164.76
1974	88.40	93.80	79.70	134.80	170.80	1,189.00	1,401.00	354.40	218.40	134.10	133.50	151.20	345.76
1975	169.40	162.90	228.60	159.40	216.30	237.20	163.20	178.40	136.50	113.60	116.70	153.90	169.68
1976	174.40	216.40	182.30	173.90	297.20	349.70	475.20	214.50	146.60	118.10	120.70	122.80	215.98
1977	136.30	193.40	169.30	156.10	147.30	113.40	138.00	92.40	73.80	72.80	81.00	71.20	120.42
1978	51.60	86.50	137.10	137.60	150.50	353.90	258.10	96.10	104.10	104.20	105.60	101.40	140.56
1979	99.50	83.00	238.90	286.90	345.90	148.60	79.90	91.90	79.10	91.50	114.20	116.60	148.00
1980	102.90	79.80	92.10	123.60	102.80	122.30	331.00	135.40	127.10	144.40	188.40	202.10	145.99
1981	128.20	188.20	153.40	289.30	224.40	476.10	438.90	276.40	151.00	154.20	148.20	133.70	230.17
1982	141.30	141.80	167.70	237.20	312.10	234.80	431.60	283.70	154.50	137.90	137.40	121.50	208.46
1983	125.70	130.50	232.40	189.80	286.60	362.80	260.10	205.10	143.20	144.40	156.90	166.40	200.33
1984	133.40	125.00	110.70	116.40	94.30	94.60	91.90	88.50	93.30	91.10	76.20	63.30	98.23
1985	53.30	127.30	298.60	292.30	501.20	385.70	339.30	172.10	159.10	—	325.20	290.30	267.67
1986	158.00	192.40	156.10	167.00	101.50	97.60	111.80	121.30	130.30	132.90	146.50	129.00	137.03
1987	118.50	143.70	145.90	139.30	133.90	135.30	149.70	143.90	145.60	149.00	200.30	200.50	150.47
1988	153.60	262.60	164.20	239.20	476.40	737.50	790.60	492.60	441.80	195.40	180.50	180.00	359.53
1989	153.10	135.70	136.70	143.90	116.20	121.60	147.70	140.10	150.90	175.50	197.40	185.00	150.32
1990	116.40	111.20	101.00	102.40	68.10	108.90	138.50	136.00	148.80	152.80	154.70	137.50	123.03
1991	115.50	133.00	121.50	64.40	65.50	139.80	116.50	115.50	128.70	139.80	145.00	135.00	118.35





**Figure 52.** Annual flow duration at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

**Table 84.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	21.60	33.50	48.10	65.50	72.40	89.30	94.20	79.90	40.10	24.60	19.40	18.60	27.10
90	25.80	38.40	57.30	76.20	89.00	99.00	116.70	92.80	48.60	28.40	22.40	21.40	35.70
85	28.70	42.80	67.50	88.40	99.80	113.90	130.10	105.80	58.50	31.90	24.80	23.50	46.50
80	31.70	47.10	73.00	98.00	113.80	127.20	143.10	116.60	68.50	38.30	28.40	26.50	57.20
75	34.10	52.20	77.60	106.20	124.40	145.30	155.40	124.20	75.80	44.00	32.80	29.70	70.30
70	36.60	57.00	86.70	113.60	134.90	168.40	168.70	131.50	84.10	49.80	36.50	32.10	83.70
65	40.80	62.30	95.30	121.70	145.70	188.70	186.70	138.40	94.20	57.60	40.80	35.50	96.70
60	47.80	68.80	102.00	130.10	157.30	210.90	209.60	145.80	102.00	65.10	49.60	43.70	108.50
55	51.60	77.60	107.80	139.50	173.90	231.60	239.30	159.10	108.90	76.40	58.30	49.00	117.90
50	56.00	87.10	114.90	149.30	191.40	249.70	283.40	174.10	117.20	86.30	69.70	58.40	127.40
45	66.00	98.80	122.90	161.20	210.50	272.00	320.60	191.80	123.80	98.60	81.30	73.40	137.20
40	97.70	108.70	131.50	174.00	232.20	298.30	361.50	213.20	130.00	106.80	109.50	111.00	147.00
35	110.30	119.40	140.40	187.60	251.50	333.00	407.00	235.60	136.80	114.80	121.30	121.00	161.50
30	120.00	129.30	151.10	205.40	272.00	374.80	462.40	265.80	144.30	123.70	129.70	129.00	179.60
25	129.30	138.50	164.30	225.80	296.90	416.00	515.70	304.20	151.60	134.50	144.10	139.10	200.60
20	140.00	157.10	181.30	249.80	333.00	468.10	576.20	354.60	159.00	143.60	154.50	155.40	231.10
15	151.90	181.70	200.20	280.40	379.40	535.40	666.90	419.50	173.70	152.30	169.70	172.30	279.50
10	167.60	200.20	228.30	332.90	451.90	630.40	806.50	497.30	211.50	161.00	190.50	185.40	362.90
5	184.60	240.20	299.40	443.00	556.00	928.80	1,121.80	643.40	270.80	199.70	215.20	202.00	528.30

**Table 85.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	382.75	316.48	271.58	238.11
0.50	2	722.44	570.91	468.52	399.69
0.20	5	1,335.50	1,044.30	839.77	700.76
0.10	10	1,826.20	1,440.00	1,157.10	956.64
0.05	20	2,354.70	1,883.00	1,520.20	1,248.70
0.02	50	3,120.50	2,554.60	2,085.30	1,702.60
0.01	100	3,754.90	3,136.60	2,588.20	2,106.40

**Table 86.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T17, Diyala River at discharge site, Iraq, water years 1930–91.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	44.74	47.35	49.42	51.26	54.59	57.73	74.26
0.2	5	26.31	26.96	27.58	28.32	29.68	31.35	44.39
0.1	10	19.97	20.11	20.36	20.78	21.54	22.69	33.71
0.05	20	15.91	15.80	15.87	16.10	16.50	17.33	26.78
0.02	50	12.33	12.05	11.99	12.09	12.21	12.77	20.59
0.01	100	10.41	10.06	9.96	9.98	9.99	10.41	17.24

## Tigris River Basin

### TIGRIS RIVER AT BAGHDAD (IRQ\_T18)

(U.S. Geological Survey identification number: 33243404420320)

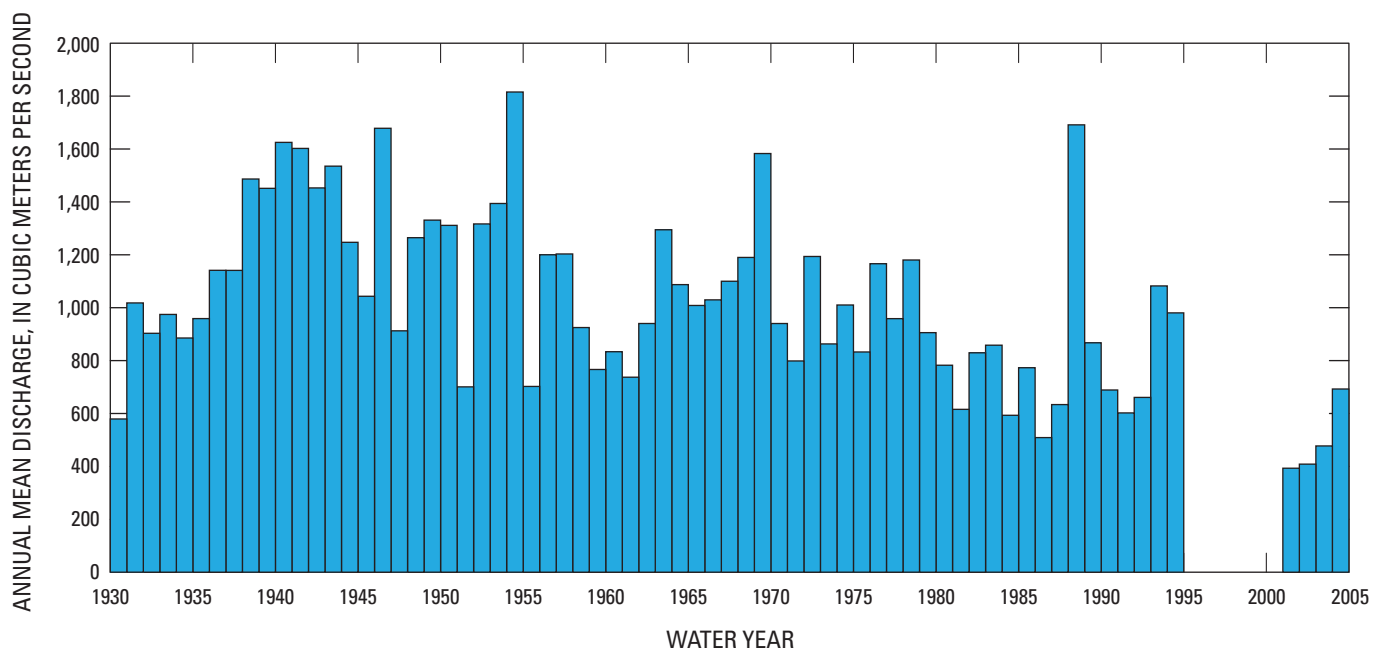
LOCATION: Latitude 33° 24' 34" N, Longitude 44° 20' 32" E.

DRAINAGE AREA: 134,000 square kilometers.

PERIOD OF RECORD: March 1930 to May 2004.

GAGE: The staff gage consists of enameled iron (1 meter long) strips bolted to the vertical wall on the left bank of the Tigris River 275 meters upstream of Al-Shohada Bridge. The gage is set to GTS datum. The automatic gage also is installed at the same location and set to record gage heights as high as 30.20 meters.

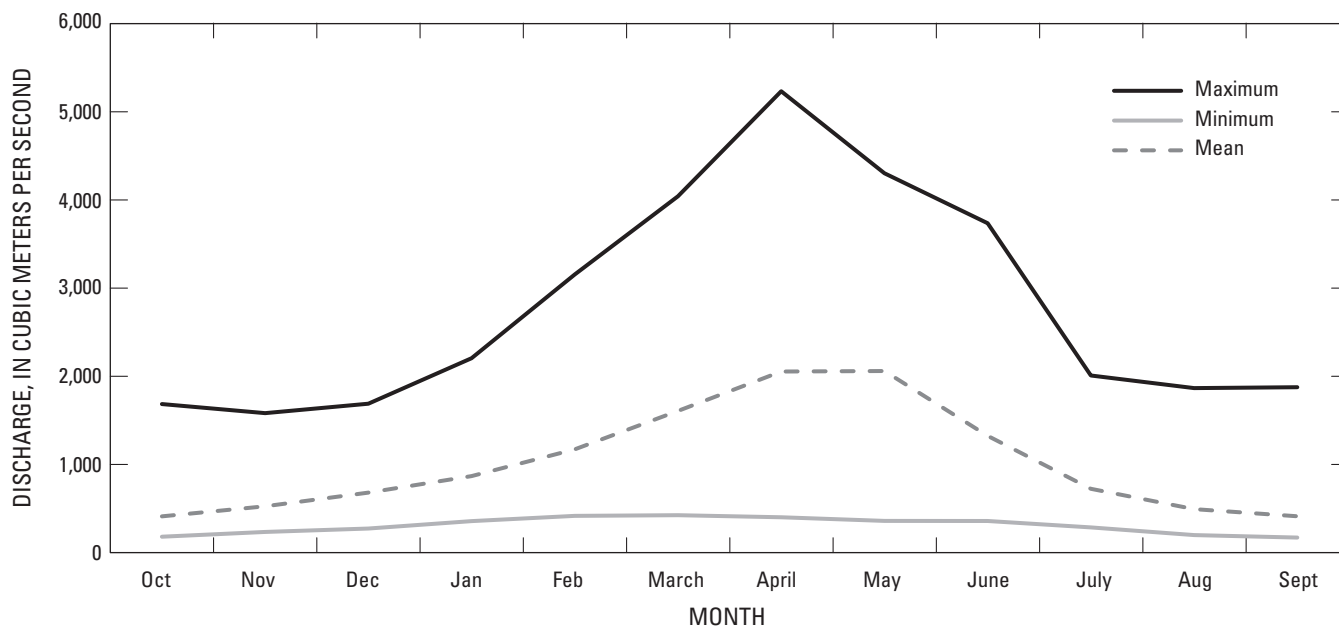
RECORDS: Discharge records are missing data from October 1995 to September 2000. Discharge measurements are made frequently from a boat attached to a permanent overhead cable. Discharge measurements are excellent.



**Figure 53.** Annual mean discharge at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

**Table 87.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,685.00	1989	180.50	1956	411.35	234.52	0.57	3.34
November	1,582.00	1989	234.50	1931	525.56	265.93	0.51	4.26
December	1,689.00	1969	273.20	1935	680.60	272.09	0.40	5.52
January	2,205.00	1940	357.30	2001	867.92	365.32	0.42	7.04
February	3,155.00	1940	416.90	2002	1,171.50	569.43	0.49	9.50
March	4,042.00	1954	424.50	2002	1,607.22	807.50	0.50	13.03
April	5,233.00	1954	401.00	1940	2,054.05	1,053.38	0.51	16.66
May	4,303.00	1946	359.80	2001	2,059.79	1,024.78	0.50	16.70
June	3,736.00	1938	358.80	2001	1,324.46	601.18	0.45	10.74
July	2,009.00	1988	286.00	1930	723.89	327.01	0.45	5.87
August	1,866.00	1988	199.00	1930	493.41	263.72	0.53	4.00
September	1,876.00	1988	170.70	1955	412.27	261.36	0.63	3.34
Annual	1,815.49	1954	393.14	2001	1,019.73	434.08	0.43	100.00

**Figure 54.** Monthly discharge at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

**Table 88.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

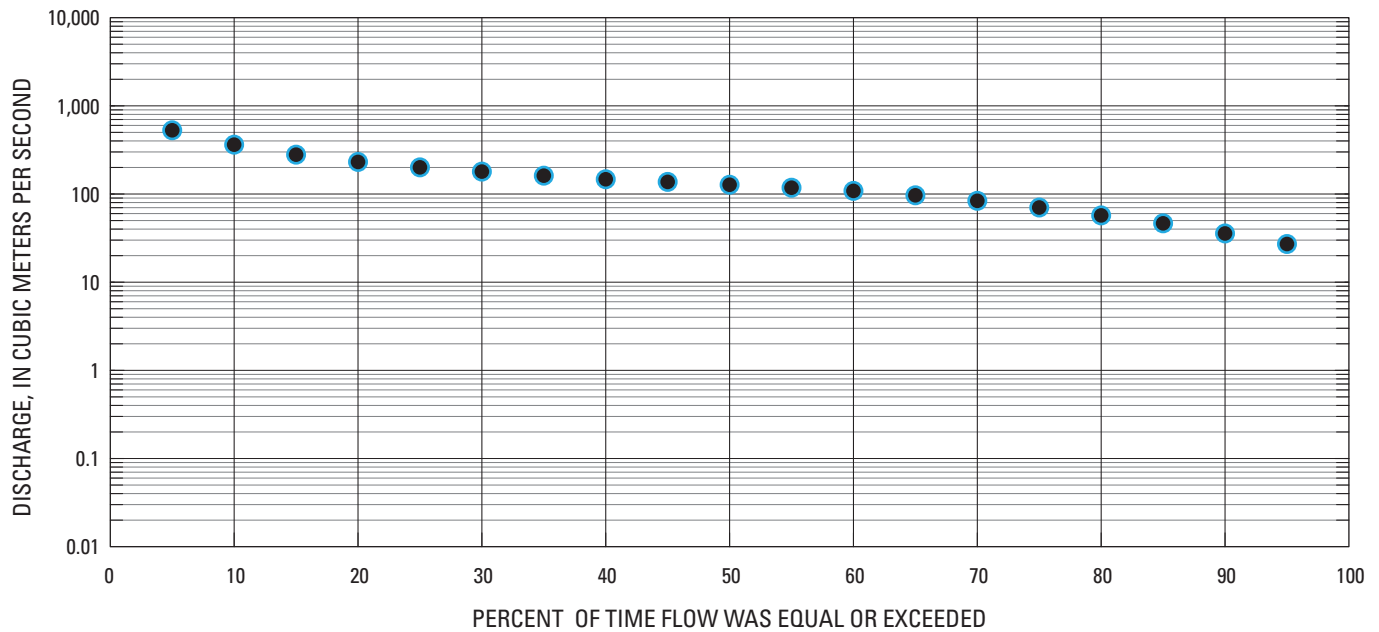
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1930	—	—	—	—	—	828.30	981.40	1,036.00	544.90	286.00	199.00	179.40	579.29
1931	189.70	234.50	540.70	1,195.00	1,024.00	1,452.00	2,666.00	2,105.00	1,494.00	693.20	360.10	262.30	1,018.04
1932	248.20	304.00	555.10	500.10	943.00	1,855.00	1,910.00	2,077.00	1,352.00	550.70	305.10	238.50	903.23
1933	225.20	377.20	327.50	610.50	915.60	1,646.00	2,124.00	2,698.00	1,469.00	697.20	352.40	252.00	974.55
1934	219.10	258.10	661.50	599.30	936.40	1,090.00	2,247.00	2,044.00	1,440.00	574.90	317.70	237.30	885.44
1935	222.50	240.00	273.20	814.10	1,823.00	1,765.00	2,385.00	2,054.00	989.90	457.80	264.50	217.20	958.85
1936	220.90	511.70	1,026.00	430.90	1,499.00	1,602.00	2,950.00	2,713.00	1,417.00	686.60	363.20	275.80	1,141.34
1937	253.60	467.70	1,028.00	816.20	1,582.00	1,793.00	2,939.00	2,320.00	1,276.00	630.50	338.20	248.80	1,141.08
1938	253.90	295.80	625.00	800.60	1,301.00	859.00	2,174.00	3,616.00	3,736.00	1,862.00	876.60	438.60	1,486.54
1939	307.00	507.50	806.50	1,378.00	1,613.00	2,435.00	3,978.00	3,382.00	1,555.00	737.60	401.60	314.20	1,451.28
1940	296.70	436.30	869.00	2,205.00	3,155.00	2,350.00	4,011.00	2,870.00	1,624.00	854.90	480.70	347.80	1,625.03
1941	490.70	539.70	860.50	1,584.00	3,049.00	3,599.00	3,076.00	3,218.00	1,485.00	665.50	375.50	283.80	1,602.23
1942	280.40	321.00	435.20	1,347.00	1,539.00	3,171.00	3,426.00	3,562.00	1,815.00	828.20	4,14.50	295.50	1,452.90
1943	378.50	1,399.00	1,439.00	1,327.00	1,379.00	2,366.00	3,194.00	3,563.00	1,730.00	889.70	451.20	305.50	1,535.16
1944	292.60	368.70	409.80	906.10	1,004.00	1,647.00	3,610.00	3,851.00	1,562.00	699.00	371.80	244.30	1,247.19
1945	258.40	774.30	425.70	1,631.00	1,193.00	1,417.00	2,149.00	2,146.00	1,374.00	572.00	336.90	241.30	1,043.22
1946	234.60	431.30	588.20	1,253.00	1,741.00	3,241.00	3,903.00	4,303.00	2,280.00	1,190.00	586.70	388.50	1,678.36
1947	544.40	415.20	394.30	1,172.00	1,362.00	2,003.00	1,840.00	1,437.00	909.40	410.60	253.50	210.00	912.62
1948	214.80	483.80	582.80	607.70	1,212.00	1,251.00	3,013.00	3,949.00	2,245.00	926.50	412.70	278.00	1,264.69
1949	267.70	278.20	401.80	422.90	1,000.00	2,422.00	4,039.00	3,703.00	1,960.00	791.70	400.80	286.20	1,331.11
1950	285.00	271.70	429.50	1,181.00	888.90	3,115.00	2,839.00	3,644.00	1,652.00	753.70	408.70	266.70	1,311.27
1951	315.60	309.20	360.60	790.00	842.80	1,142.00	1,463.00	1,583.00	846.40	365.40	213.00	178.00	700.75
1952	367.90	368.50	520.60	510.40	2,865.00	2,421.00	3,101.00	2,866.00	1,480.00	699.70	352.30	248.30	1,316.73
1953	223.60	235.80	463.20	853.50	1,937.00	3,138.00	3,674.00	2,895.00	1,759.00	860.30	419.70	269.20	1,394.03
1954	245.70	517.30	527.50	1,040.00	2,008.00	4,042.00	5,233.00	4,024.00	2,262.00	1,067.00	497.40	322.00	1,815.49
1955	304.40	377.80	468.60	749.90	687.10	990.40	1,474.00	1,825.00	819.00	356.30	204.70	170.70	702.33
1956	180.50	300.90	1,090.00	963.50	1,683.00	2,310.00	2,183.00	2,562.00	1,712.00	816.80	362.60	237.60	1,200.16
1957	231.00	266.00	444.10	497.40	856.10	3,273.00	2,520.00	2,773.00	1,907.00	925.90	437.30	307.30	1,203.18
1958	293.60	475.80	613.10	951.70	1,157.00	1,850.00	2,150.00	1,637.00	1,029.00	499.60	263.60	179.20	924.97
1959	246.10	266.20	589.90	571.60	455.40	1,046.00	1,958.00	1,967.00	1,028.00	511.80	311.30	246.10	766.45
1960	268.60	328.60	465.20	788.00	734.50	1,232.00	2,092.00	2,220.00	859.20	437.00	284.90	293.10	833.59
1961	359.90	653.30	491.90	674.30	759.30	725.90	1,448.00	1,875.00	786.60	440.20	310.50	322.10	737.25
1962	318.30	532.80	996.60	1,001.00	1,290.00	1,654.00	1,745.00	1,642.00	908.10	510.50	372.70	312.40	940.28
1963	297.30	307.80	717.40	1,037.00	1,651.00	1,815.00	2,630.00	2,317.00	2,184.00	1,284.00	767.20	528.10	1,294.65
1964	428.30	534.70	810.80	708.50	1,255.00	1,910.00	1,805.00	2,319.00	1,568.00	724.50	481.40	502.30	1,087.29
1965	389.10	353.20	599.10	701.50	1,209.00	1,612.00	2,079.00	2,081.00	1,529.00	715.00	457.90	375.70	1,008.46
1966	452.50	490.40	781.30	1,269.00	1,409.00	1,514.00	2,097.00	1,878.00	1,112.00	535.80	422.90	394.20	1,029.68
1967	467.00	409.40	591.30	884.40	1,004.00	1,780.00	2,252.00	2,497.00	1,591.00	791.70	527.00	405.60	1,100.03
1968	465.30	618.10	775.70	745.60	1,226.00	2,146.00	2,581.00	2,167.00	1,675.00	801.20	574.70	504.90	1,190.04
1969	416.60	564.50	1,689.00	1,675.00	1,880.00	2,104.00	2,210.00	2,647.00	2,619.00	1,435.00	1,009.00	745.30	1,582.87
1970	640.20	727.80	812.60	1,090.00	1,370.00	1,502.00	1,804.00	1,241.00	774.30	506.70	432.50	381.40	940.21
1971	367.40	359.70	519.80	388.70	445.50	909.70	2,580.00	1,845.00	926.80	490.10	407.50	344.00	798.68

**Table 88.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1972	412.30	445.30	776.50	621.50	960.00	1,747.00	2,837.00	2,865.00	1,825.00	774.50	568.70	491.30	1,193.68
1973	513.20	689.50	612.20	579.00	1,068.00	1,226.00	1,532.00	1,757.00	977.90	526.50	485.40	390.30	863.08
1974	403.50	476.00	576.60	645.80	645.10	1,463.00	2,317.00	2,534.00	1,498.00	626.10	494.60	443.10	1,010.23
1975	422.20	450.90	639.50	599.70	866.40	1,377.00	1,807.00	1,743.00	891.80	477.30	382.40	334.50	832.64
1976	356.50	388.20	603.80	1,134.00	1,407.00	1,332.00	2,473.00	2,591.00	1,850.00	840.10	543.10	476.50	1,166.27
1977	583.30	735.50	895.20	816.70	982.00	1,345.00	1,917.00	1,964.00	1,061.00	504.40	379.20	320.80	958.68
1978	383.00	469.20	901.40	988.70	1,375.00	1,963.00	2,240.00	2,275.00	1,367.00	939.10	738.60	524.00	1,180.33
1979	534.60	503.30	661.00	1,139.00	1,344.00	1,094.00	1,840.00	1,483.00	966.60	510.10	421.30	371.70	905.72
1980	400.20	619.10	700.20	693.50	631.00	1,044.00	1,348.00	1,262.00	1,065.00	693.50	511.80	421.70	782.50
1981	456.50	489.70	501.00	730.90	623.20	797.60	755.70	657.60	736.00	692.50	520.50	427.20	615.70
1982	460.20	469.80	543.50	971.50	1,164.00	1,192.00	977.80	1,002.00	1,238.00	736.90	606.70	591.70	829.51
1983	601.40	660.10	611.10	639.30	703.30	1,176.00	1,640.00	1,559.00	1,040.00	587.70	542.20	538.90	858.25
1984	482.40	630.90	839.70	424.70	639.50	597.40	862.40	890.70	733.80	405.20	319.50	292.70	593.24
1985	298.10	768.60	629.60	673.80	1,281.00	1,406.00	792.70	823.20	830.50	675.10	575.00	523.10	773.06
1986	445.10	502.20	483.30	460.10	545.90	504.70	653.40	601.10	548.10	487.90	440.50	434.80	508.93
1987	464.50	654.80	539.60	561.30	573.10	608.90	641.60	623.20	868.20	790.30	622.80	656.60	633.74
1988	776.00	967.20	1,074.00	1,181.00	1,248.00	2,018.00	2,372.00	2,651.00	2,258.00	2,009.00	1,866.00	1,876.00	1,691.35
1989	1,685.00	1,582.00	1,289.00	1,284.00	848.60	887.60	646.90	545.10	469.90	403.40	387.40	379.20	867.34
1990	581.00	701.60	877.40	793.30	706.90	677.80	613.60	581.50	771.90	674.00	659.90	627.30	688.85
1991	578.60	760.50	674.70	—	588.10	536.20	489.60	540.50	553.30	622.30	654.90	625.70	602.22
1992	540.10	704.80	708.80	543.00	649.80	661.30	585.40	597.20	671.40	741.20	779.70	747.40	660.84
1993	636.90	760.00	715.70	741.40	830.80	944.30	936.40	1,241.00	1,663.00	1,644.00	1,497.00	1,378.00	1,082.38
1994	1,348.00	1,494.00	1,279.00	1,214.00	911.00	844.70	792.00	772.80	765.80	788.40	802.60	753.00	980.44
1995	—	—	—	—	—	—	—	—	—	—	—	—	—
1996	—	—	—	—	—	—	—	—	—	—	—	—	—
1997	—	—	—	—	—	—	—	—	—	—	—	—	—
1998	—	—	—	—	—	—	—	—	—	—	—	—	—
1999	—	—	—	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	—	—	—	—	—	—	—	—
2001	373.20	467.30	—	357.30	—	462.10	405.20	359.80	358.80	366.20	388.40	—	393.14
2002	370.20	432.40	331.40	389.20	416.90	424.50	401.00	361.90	444.30	452.10	453.90	425.00	408.57
2003	423.60	476.40	447.50	427.80	425.90	—	596.70	—	—	—	528.30	492.70	477.36
2004	479.20	—	—	—	—	936.40	722.50	632.40	—	—	—	—	692.63



**Figure 55.** Annual flow duration at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

**Table 89.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	210.70	233.40	279.60	369.80	433.30	511.40	508.50	522.00	485.90	354.20	237.10	183.30	251.90
90	221.50	250.30	322.90	414.60	502.90	628.80	628.30	607.00	606.30	408.60	278.40	225.00	297.60
85	236.10	268.80	363.30	457.30	558.40	714.90	726.20	757.30	686.30	441.60	302.60	239.00	343.20
80	250.80	287.60	402.60	502.50	602.90	811.10	866.10	960.30	747.50	468.00	322.70	252.00	393.30
75	264.60	303.90	430.90	541.40	643.60	907.20	1,152.70	1,264.40	800.00	493.10	343.30	265.40	435.30
70	280.70	328.30	458.20	571.00	704.70	1,000.80	1,385.50	1,441.90	863.60	520.90	366.60	278.90	480.80
65	295.50	360.20	488.80	604.40	778.20	1,095.60	1,585.60	1,598.80	935.20	551.30	381.90	293.70	528.40
60	311.30	388.80	520.20	643.50	847.50	1,218.00	1,746.90	1,754.60	1,030.90	582.30	397.60	308.50	580.70
55	328.80	412.90	550.10	683.90	908.90	1,341.30	1,871.70	1,911.70	1,121.30	612.90	414.70	326.10	637.40
50	353.50	438.10	579.30	724.80	970.50	1,454.80	1,987.90	2,069.20	1,209.80	642.70	433.10	344.30	704.10
45	372.80	463.90	610.50	773.30	1,050.20	1,565.40	2,100.60	2,183.30	1,296.20	670.80	452.90	370.10	784.80
40	396.50	492.10	650.50	826.90	1,139.80	1,672.70	2,204.50	2,304.40	1,390.20	699.30	476.50	393.10	886.70
35	421.40	524.00	691.20	895.80	1,229.00	1,774.70	2,310.20	2,435.40	1,496.60	733.50	501.70	414.00	1,035.60
30	445.40	561.70	748.50	984.20	1,330.80	1,887.20	2,434.20	2,551.30	1,615.70	774.30	527.70	441.00	1,226.00
25	474.10	621.10	815.60	1,079.10	1,445.60	2,011.10	2,574.40	2,661.80	1,740.60	824.70	553.20	473.10	1,437.10
20	507.90	690.30	904.90	1,184.20	1,582.00	2,160.70	2,770.00	2,839.30	1,866.90	894.90	585.70	514.10	1,673.50
15	547.90	737.60	1,059.50	1,315.10	1,761.70	2,348.30	3,158.10	3,100.00	2,007.00	982.10	632.30	562.10	1,946.90
10	610.10	838.60	1,191.30	1,496.10	1,964.40	2,682.30	3,637.00	3,453.60	2,208.00	1,167.40	741.70	634.60	2,290.50
5	748.50	1,187.00	1,407.80	1,759.40	2,398.40	3,399.30	4,456.10	4,037.60	2,490.70	1,551.50	924.20	753.20	2,851.60

**Table 90.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,856.400	1,748.600	1,635.100	1,526.300
0.50	2	3,139.300	2,877.100	2,633.800	2,426.600
0.20	5	4,937.100	4,343.900	3,839.200	3,489.700
0.10	10	6,086.000	5,217.900	4,507.300	4,068.100
0.05	20	7,136.200	5,976.900	5,056.800	4,537.700
0.02	50	8,416.100	6,853.100	5,655.300	5,042.500
0.01	100	9,319.200	7,440.300	6,034.500	5,358.500

**Table 91.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T18, Tigris River at Baghdad, Iraq, water years 1930–2004.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	285.21	293.81	300.08	311.15	328.79	346.30	456.72
0.2	5	223.74	227.82	231.10	236.73	248.67	261.93	367.17
0.1	10	200.99	203.10	205.48	208.92	218.42	230.58	334.87
0.05	20	185.71	186.37	188.22	190.09	197.83	209.44	313.61
0.02	50	171.57	170.74	172.17	172.50	178.47	189.74	294.38
0.01	100	163.64	161.89	163.12	162.53	167.43	178.60	283.84



## Tigris River Basin

### GHARRAF CANAL (IRQ\_T19)

(U.S. Geological Survey identification number: 32315504547250)

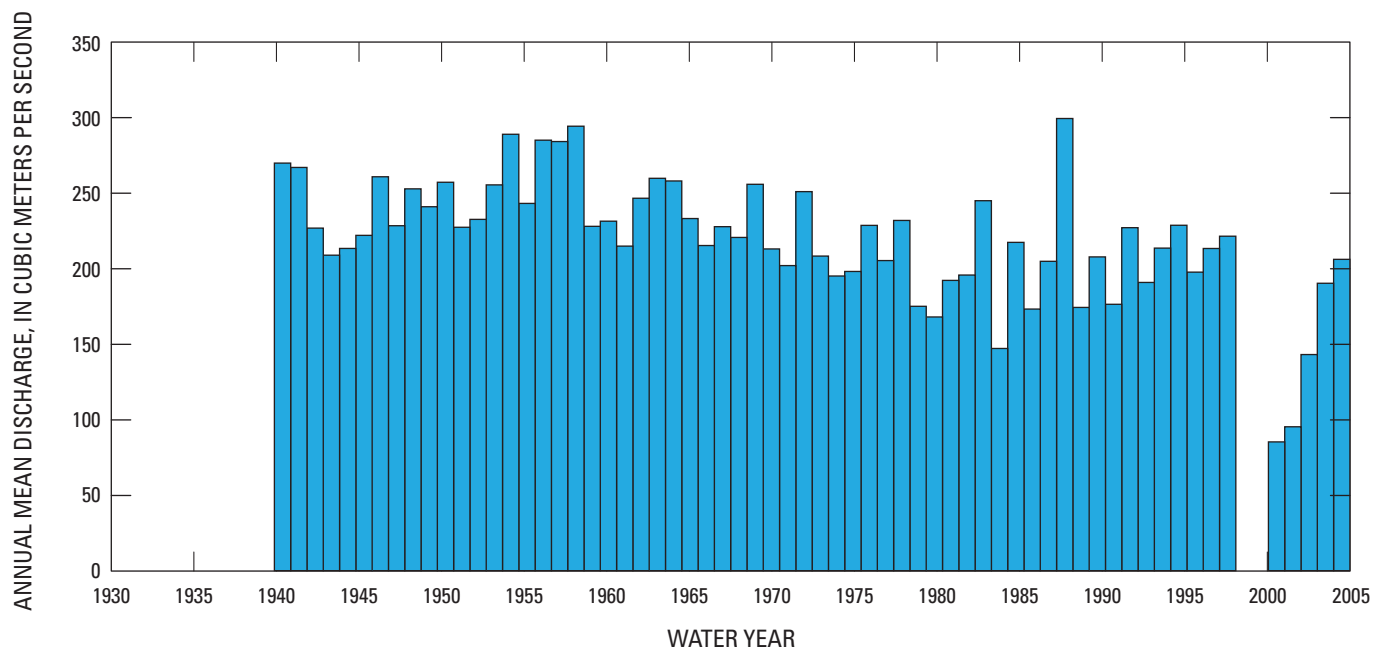
LOCATION: Latitude 32° 31' 55" N, Longitude 45° 47' 25" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: December 1940 to March 2005.

GAGE: The staff gage is located downstream of the head regulator at Kut Barrage. Discharge measurements are made regularly from a boat. The gage is set to the GTS datum.

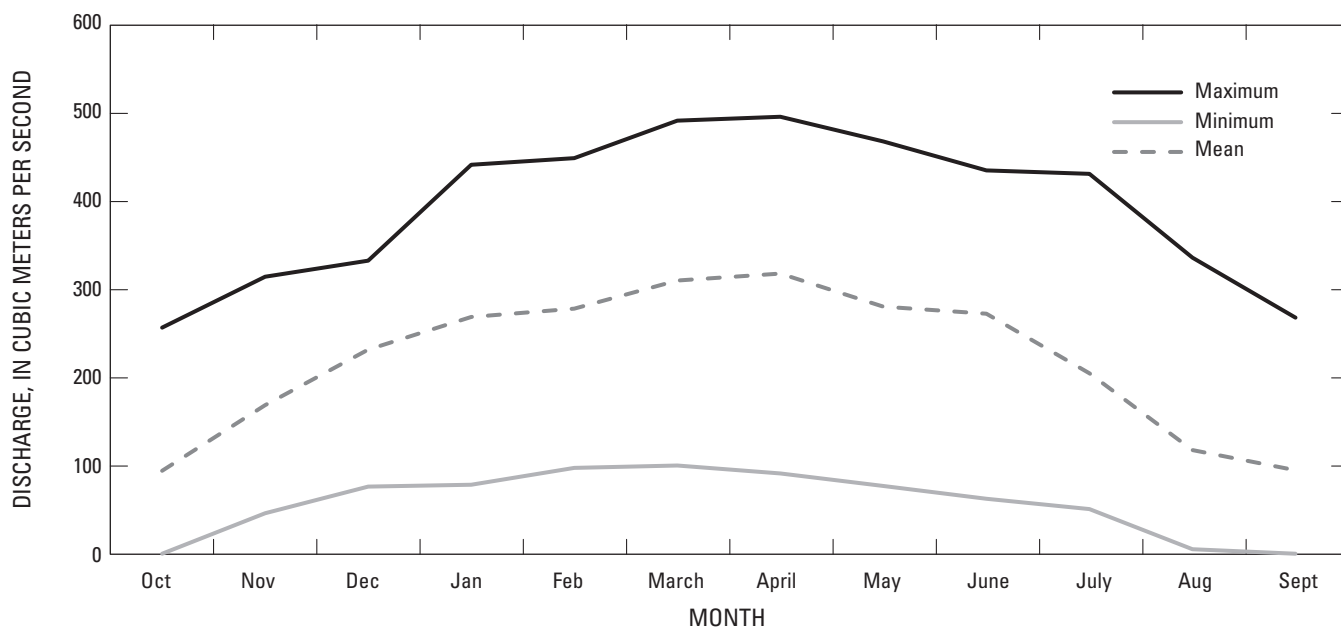
RECORDS: Discharge records are missing data from October 1999 to September 2000, and for March 2003, November, April, July–September 2004, and December–February 2005. Discharge records are fair.



**Figure 56.** Annual mean discharge at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.

**Table 92.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	256.30	1988	0.00	1943	94.03	67.45	0.72	3.57
November	314.00	1996	45.90	1956	168.43	67.82	0.40	6.39
December	332.20	1965	76.10	2002	231.36	60.29	0.26	8.78
January	440.90	1956	78.20	2002	268.37	92.03	0.34	10.18
February	448.40	1956	97.30	2001	277.80	91.12	0.33	10.54
March	490.90	1958	100.00	2001	309.67	91.23	0.29	11.75
April	495.30	1941	91.00	2001	317.56	100.74	0.32	12.05
May	467.30	1941	76.80	2001	280.05	92.29	0.33	10.62
June	434.50	1957	62.30	1984	272.06	82.44	0.30	10.32
July	430.60	1957	50.60	1984	204.51	76.42	0.37	7.76
August	335.60	1995	5.10	1942	117.49	76.47	0.65	4.46
September	267.60	1995	0.00	1942	94.65	68.35	0.72	3.59
Annual	299.38	1988	85.27	2001	219.89	40.98	0.19	100.00

**Figure 57.** Monthly discharge at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.

**Table 93.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.

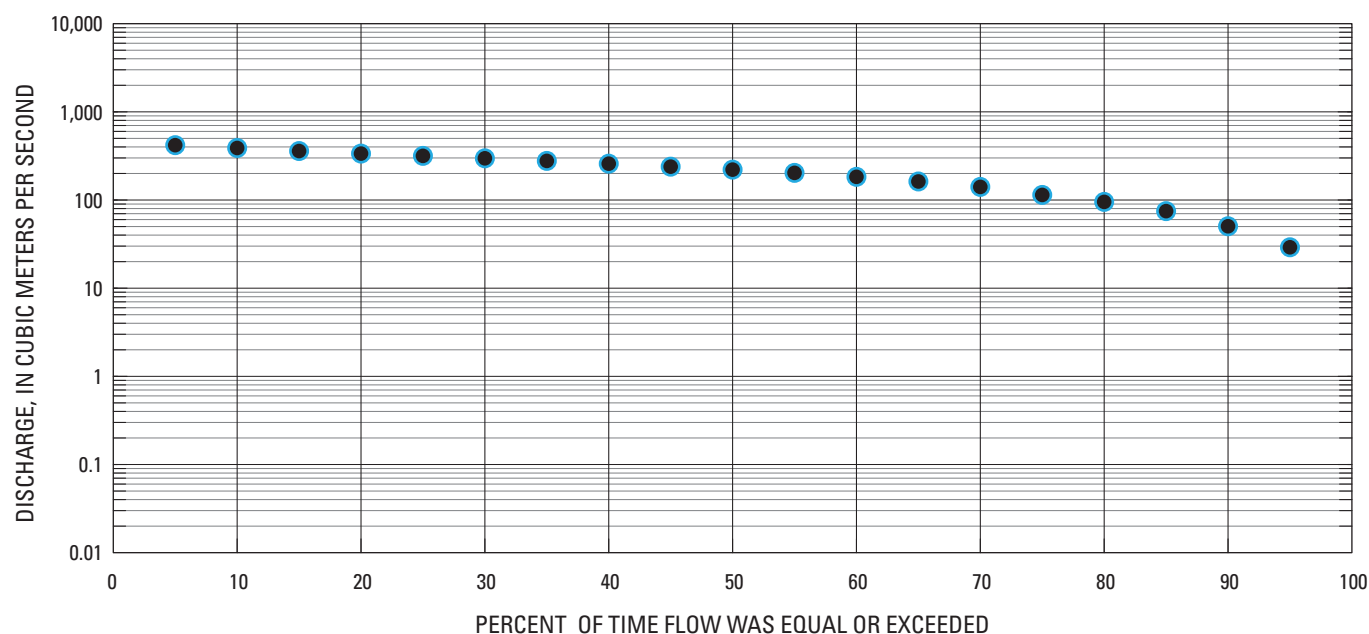
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1940	—	—	148.70	372.70	357.30	352.50	446.10	392.00	295.50	161.50	115.40	56.90	269.86
1941	96.50	182.90	249.50	399.30	341.50	393.40	495.30	467.30	357.80	141.40	32.90	46.00	266.98
1942	59.60	86.90	144.70	288.10	352.80	436.30	436.00	356.80	345.00	210.50	5.10	0.00	226.82
1943	0.00	50.10	278.40	335.80	280.50	310.50	360.80	308.10	343.50	219.80	19.20	0.00	208.89
1944	6.61	97.80	82.00	327.90	341.40	383.00	422.80	362.40	271.10	187.10	46.50	31.70	213.36
1945	38.70	140.40	174.90	321.60	339.00	339.70	419.30	347.50	294.40	192.70	40.50	15.50	222.02
1946	12.50	99.70	248.00	343.10	351.80	399.50	409.70	401.10	340.00	311.40	174.00	39.00	260.82
1947	52.50	155.00	185.00	338.80	389.10	393.80	410.10	341.80	275.00	143.90	28.80	27.00	228.40
1948	40.50	189.10	275.70	343.50	315.20	384.70	410.00	371.00	345.00	251.20	79.50	28.40	252.82
1949	30.50	115.50	208.70	226.00	378.50	400.70	406.00	374.10	353.10	268.50	85.40	44.70	240.98
1950	49.50	135.10	220.90	389.20	390.00	386.40	406.00	389.00	348.80	275.20	66.50	29.50	257.18
1951	41.30	125.00	203.50	361.50	392.20	423.40	433.60	318.10	289.20	88.20	26.90	25.60	227.38
1952	33.40	131.90	243.10	336.60	371.90	430.90	413.70	312.60	287.00	174.10	33.50	22.50	232.60
1953	51.60	98.90	143.00	421.80	409.10	421.90	424.30	344.10	340.70	297.90	63.50	48.50	255.44
1954	41.50	181.00	326.20	413.30	428.30	417.50	411.00	415.00	384.60	312.00	71.50	65.50	288.95
1955	50.80	188.70	202.90	404.30	391.10	438.20	428.40	371.40	292.30	106.80	24.80	18.30	243.17
1956	17.10	45.90	325.30	440.90	448.40	461.30	456.10	390.70	406.90	343.70	56.60	27.60	285.04
1957	22.10	124.80	274.80	334.50	408.70	459.60	429.40	360.50	434.50	430.60	87.10	43.00	284.13
1958	36.40	271.20	232.60	433.30	437.80	490.90	487.10	438.50	422.80	214.90	46.50	19.40	294.28
1959	17.40	73.20	217.00	305.50	304.60	389.60	418.70	356.70	371.00	202.50	54.70	25.00	227.99
1960	17.70	70.90	228.50	381.30	348.60	401.80	407.30	346.80	327.60	184.30	33.70	28.30	231.40
1961	9.23	62.80	208.00	338.30	365.10	295.60	369.40	328.00	325.20	187.40	58.40	31.30	214.89
1962	33.90	91.00	317.30	413.90	413.50	396.00	397.10	312.40	324.80	179.50	45.70	34.00	246.59
1963	37.70	106.80	142.10	341.90	354.70	363.90	377.70	353.30	371.00	340.70	201.40	126.30	259.79
1964	80.40	174.80	324.20	294.40	322.80	359.10	371.20	326.00	334.10	259.40	134.20	115.80	258.03
1965	84.90	126.60	332.20	279.50	305.50	346.90	348.70	252.10	300.80	242.80	109.60	68.20	233.15
1966	91.90	153.40	302.70	299.00	204.10	331.80	336.00	289.90	282.50	171.50	65.40	55.20	215.28
1967	75.30	183.00	207.30	296.70	284.20	325.90	312.30	320.50	305.80	257.90	115.70	48.60	227.77
1968	85.90	172.80	194.80	291.10	241.80	322.00	286.10	250.60	273.90	248.60	148.30	131.80	220.64
1969	28.90	181.30	299.30	279.70	310.20	312.60	298.50	323.50	357.20	303.30	214.30	161.10	255.83
1970	95.70	112.70	302.10	294.40	288.00	319.40	333.10	257.50	217.30	132.20	101.80	102.10	213.03
1971	73.00	118.40	236.40	162.40	195.30	291.50	305.20	342.70	320.30	167.20	117.60	94.00	202.00
1972	70.10	187.10	262.60	226.50	261.80	279.70	332.90	367.60	369.50	287.30	214.20	152.40	250.98
1973	152.00	187.10	255.00	263.40	246.90	261.20	299.10	276.10	246.80	163.30	93.30	55.40	208.30
1974	91.60	105.20	164.50	190.30	185.20	278.10	318.00	284.10	290.90	195.40	125.60	112.30	195.10
1975	108.50	159.20	272.00	203.10	210.90	293.80	324.50	263.40	240.00	117.70	84.70	99.60	198.12
1976	110.30	185.90	268.60	223.20	245.20	272.30	279.50	278.60	271.00	241.80	202.40	164.70	228.63
1977	122.30	220.40	259.10	190.70	233.60	277.90	252.10	286.50	303.70	164.70	92.40	60.50	205.33
1978	93.90	179.20	231.60	238.40	280.90	280.40	309.00	301.50	263.60	238.70	213.50	152.00	231.89
1979	139.20	174.40	193.00	219.10	211.10	242.30	233.70	205.30	202.00	126.10	80.20	74.10	175.04
1980	72.30	245.90	215.40	179.00	157.90	181.80	223.40	207.10	215.70	123.10	96.00	98.20	167.98

**Table 93.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1981	84.20	186.70	234.80	221.20	217.50	225.00	241.00	241.00	233.00	214.60	132.10	75.30	192.20
1982	100.60	151.90	203.50	249.30	252.60	243.90	236.10	225.50	221.40	228.30	119.20	116.60	195.74
1983	181.70	232.00	272.10	261.50	235.40	253.70	303.00	303.00	280.60	—	—	126.60	244.96
1984	79.80	131.40	311.20	179.60	254.50	226.60	279.90	108.50	62.30	50.60	42.90	38.20	147.13
1985	37.70	228.40	293.50	269.00	323.80	371.30	317.20	264.10	193.20	99.10	92.30	118.90	217.38
1986	102.80	201.20	240.20	221.90	250.20	194.30	214.10	222.40	150.30	91.80	88.50	100.90	173.22
1987	131.10	299.90	246.60	257.60	196.70	225.10	213.10	191.10	188.90	177.40	159.40	171.10	204.83
1988	256.30	277.40	281.90	287.70	306.90	351.60	334.20	333.80	336.00	336.00	298.80	192.00	299.38
1989	250.30	274.00	248.90	134.80	183.10	166.50	198.00	167.90	146.40	104.20	107.00	110.50	174.30
1990	125.00	229.50	292.20	283.90	226.80	260.50	200.10	156.00	201.40	176.90	170.80	170.00	207.76
1991	145.80	269.50	231.20	159.00	138.40	230.30	178.30	159.50	171.50	138.50	152.50	142.00	176.38
1992	136.90	232.60	256.60	177.00	256.70	224.50	286.90	207.60	227.30	257.50	236.50	225.10	227.10
1993	204.70	249.50	188.60	133.00	159.10	176.00	170.80	134.70	211.70	237.00	237.30	187.70	190.84
1994	205.40	242.70	231.70	188.00	185.20	239.70	196.90	176.50	193.10	223.20	252.80	227.70	213.58
1995	212.40	256.10	203.70	167.70	187.40	236.60	187.10	171.20	234.10	284.90	335.60	267.60	228.70
1996	245.00	314.00	240.20	165.60	150.80	154.50	152.90	173.20	205.00	198.60	185.90	186.30	197.67
1997	202.10	292.60	295.10	242.00	157.00	287.00	210.50	155.50	154.70	175.50	191.60	196.30	213.33
1998	210.20	—	200.00	161.60	211.40	232.90	175.30	203.90	235.40	255.50	287.10	262.70	221.45
1999	—	—	—	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	—	—	—	—	—	—	—	—
2001	80.20	96.20	94.20	83.90	97.30	100.00	91.00	76.80	72.80	75.00	78.50	77.30	85.27
2002	71.90	90.00	76.10	78.20	105.00	102.30	113.00	90.30	100.00	105.00	106.60	105.00	95.28
2003	90.00	110.30	110.00	110.00	110.00	—	150.00	160.60	180.30	178.70	183.90	190.30	143.10
2004	196.10	—	221.80	131.00	199.10	257.70	—	127.70	198.70	—	—	—	190.30
2005	200.60	216.30	—	—	—	201.50	—	—	—	—	—	—	206.13



**Figure 58.** Annual flow duration at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.

**Table 94.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T19, Gharraf Canal, Iraq, water years 1940–2005.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharged equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	3.10	33.90	81.70	97.20	106.50	127.10	144.00	106.70	105.60	73.10	21.90	4.54	29.10
90	14.60	51.70	107.80	128.40	139.80	176.00	159.60	145.80	154.30	86.00	29.50	19.80	50.40
85	24.80	74.90	123.80	145.50	156.00	204.40	186.30	158.60	177.30	104.00	36.50	25.70	74.80
80	29.90	88.50	154.10	166.60	177.90	223.30	209.50	180.60	200.10	118.30	44.10	29.50	95.20
75	35.20	99.90	176.20	187.50	197.30	238.30	234.10	199.30	212.50	141.70	50.60	33.20	114.20
70	41.00	113.20	193.00	202.70	213.10	249.90	248.70	223.80	224.90	156.40	59.50	37.50	140.80
65	48.50	122.70	206.10	220.70	228.50	262.50	280.80	244.30	237.80	167.00	70.40	46.70	162.30
60	59.30	135.40	217.70	241.10	244.70	282.20	299.30	271.80	252.70	176.70	78.30	53.90	183.20
55	68.00	151.90	230.70	254.60	262.10	301.50	313.20	283.70	265.40	188.50	87.20	64.70	203.20
50	76.60	167.30	244.40	267.90	280.30	320.60	326.00	296.20	277.50	201.20	98.80	77.60	221.10
45	85.10	179.80	254.50	283.40	300.00	335.30	339.70	313.10	292.10	213.50	110.90	87.70	238.90
40	93.60	190.50	262.80	301.30	321.50	348.60	359.40	325.40	306.70	228.40	123.40	98.00	258.30
35	104.90	201.50	271.00	320.60	337.10	362.00	380.60	333.70	320.40	243.10	136.70	110.40	277.70
30	120.10	218.50	279.40	338.30	350.10	380.20	397.70	342.10	333.40	257.20	153.30	130.00	297.10
25	141.50	235.60	292.00	356.00	361.60	398.80	407.40	350.40	342.90	269.40	172.00	150.60	316.70
20	162.70	253.50	304.60	373.80	375.10	413.60	417.00	364.30	352.40	282.20	188.80	168.50	336.20
15	190.60	271.40	319.50	391.40	398.20	426.40	428.10	378.70	361.90	300.10	208.30	186.60	359.30
10	213.50	295.10	338.60	409.10	416.30	439.30	445.90	395.50	380.00	322.10	243.70	204.80	389.10
5	233.80	322.70	367.80	433.30	434.80	452.10	483.30	413.20	404.20	352.80	285.20	238.40	418.90



## Tigris River Basin

### TIGRIS RIVER DOWNSTREAM OF KUT BARRAGE (IRQ\_T20)

(U.S. Geological Survey identification number: 32290004550000)

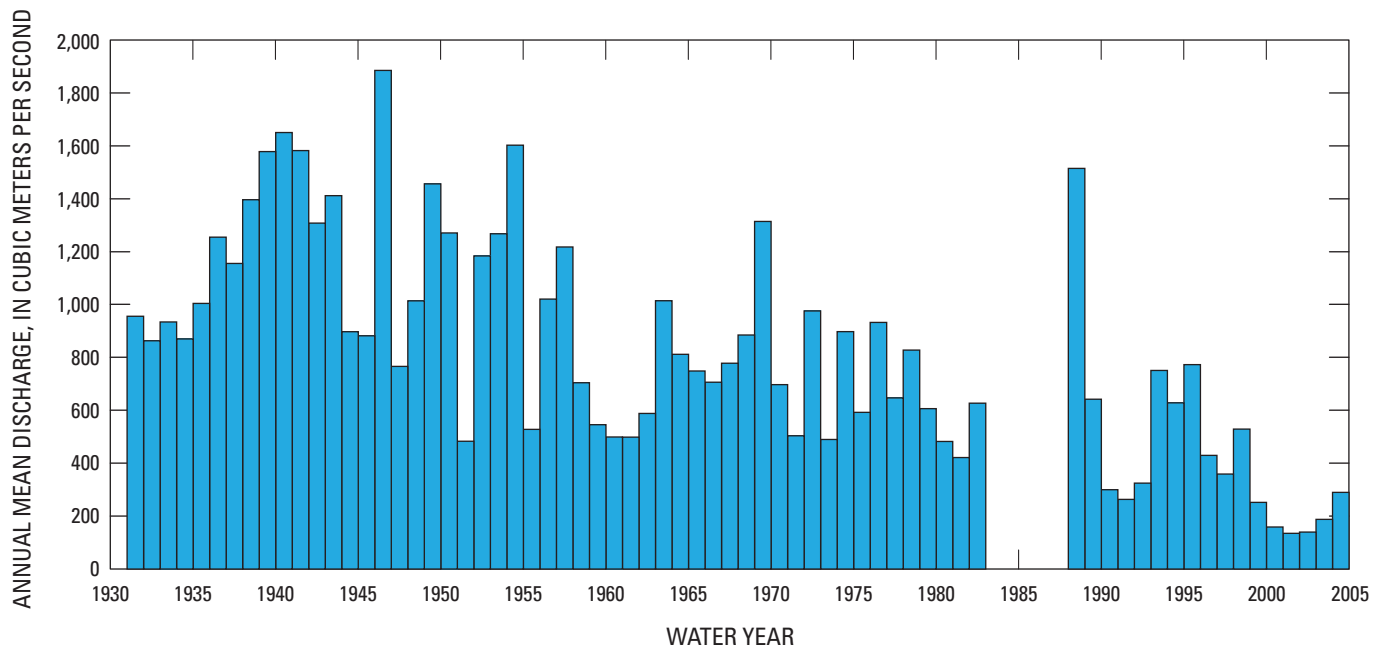
LOCATION: Latitude 32° 29' 00" N, Longitude 45° 50' 00" E.

DRAINAGE AREA: 166,200 square kilometers.

PERIOD OF RECORD: October 1931 to November 2005.

GAGE: The gage known as the “Downstream Kut Barrage” is located on the wall of the navigation lock immediately downstream of Kut Barrage. The gage is set to the GTS datum.

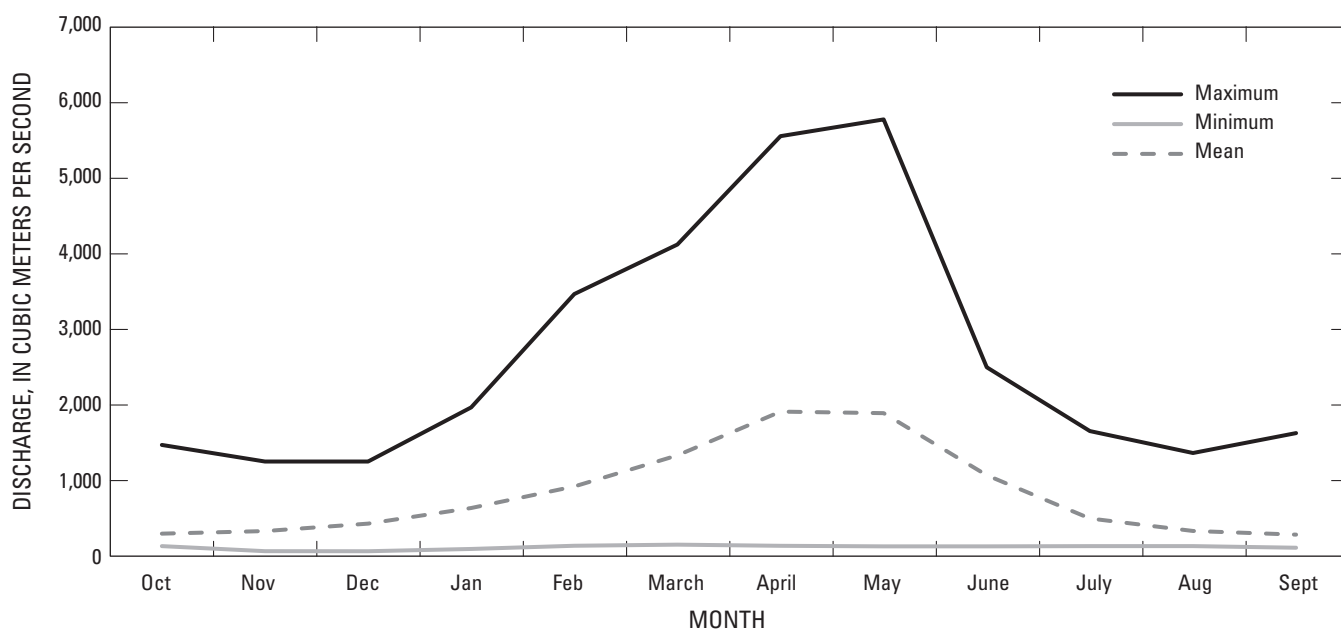
RECORDS: Discharge records are missing data from October 1983 to September 1987. Discharge measurements are made regularly from a boat attached to a permanent overhead cable 3 kilometers downstream of Kut Barrage.



**Figure 59.** Annual mean discharge at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

**Table 97.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,475.00	1989	133.10	2002	298.55	190.13	0.64	2.99
November	1,255.00	1989	66.10	1953	332.69	241.19	0.72	3.34
December	1,255.00	1937	65.30	1951	431.39	274.60	0.64	4.33
January	1,973.00	1940	95.50	2002	638.50	386.60	0.61	6.41
February	3,476.00	1940	137.90	2003	924.47	647.03	0.70	9.27
March	4,133.00	1941	152.60	2001	1,336.60	974.47	0.73	13.41
April	5,570.00	1946	137.30	2001	1,916.88	1,267.24	0.66	19.23
May	5,792.00	1946	130.00	2001	1,896.54	1,259.89	0.66	19.03
June	2,505.00	1946	130.00	2001	1,073.24	641.75	0.60	10.77
July	1,659.00	1988	133.10	2001	499.73	302.84	0.61	5.01
August	1,368.00	1988	133.30	1951	334.18	191.34	0.57	3.35
September	1,632.00	1988	111.70	1958	285.43	201.00	0.70	2.86
Annual	1,881.43	1946	134.80	2001	815.50	418.31	0.51	100.00

**Figure 60.** Monthly discharge at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

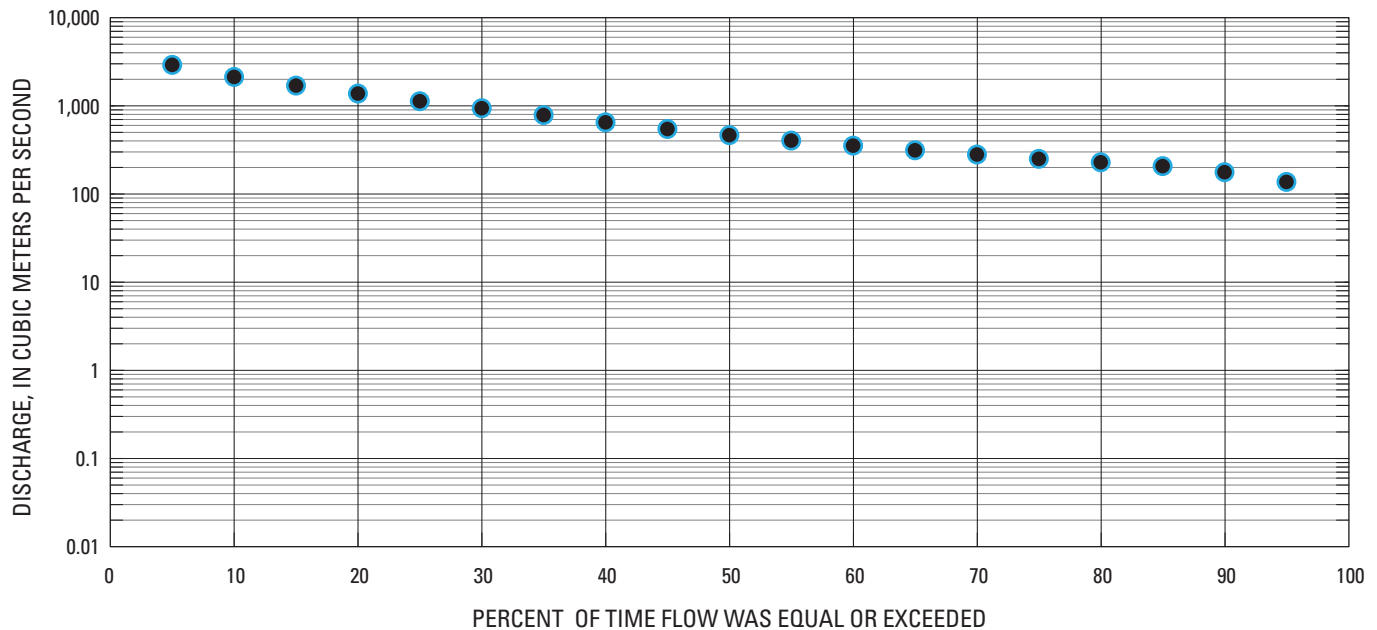


**Table 98.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1931	187	207.3	464.8	1,210	1,088	1,362	2,198	1,935	1,450	717.1	372.2	254.3	953.81
1932	229.5	238.7	513.9	493.6	823.4	1,790	1,791	1,911	1,375	620.5	321.5	228.2	861.36
1933	211.4	285.4	346.9	543.3	1,045	1,658	1,980	2,462	1,358	683.6	364	250.4	932.33
1934	227.8	227.9	526.8	709.8	939.9	1,023	2,076	2,033	1,500	617.8	309.8	227.3	868.26
1935	211.9	225.8	261.2	795.5	1,731	1,807	2,392	2,279	1,234	570	301.3	219	1,002.31
1936	207.4	471	1,084	617.5	1,644	1,748	3,075	2,828	1,653	850.8	505.9	342.8	1,252.28
1937	292.3	319.9	1,255	802.5	1,593	1,768	2,757	22,52	1,355	729	419.2	294.1	1,153.08
1938	252.8	517.2	620.2	1,360	1,830	1,995	3,514	3,438	1,612	801.6	441.9	339.6	1,393.53
1939	319.4	448.9	865.9	1,378	1,875	2,628	4,531	3,616	1,782	815.2	354.7	287.9	1,575.17
1940	264.9	345.2	623.4	1,973	3,476	2,899	3,496	2,942	1,986	943.5	471	344.6	1,647.05
1941	356.9	453	564.6	1,377	3,114	4,133	3,199	3,048	1,449	645	370.5	237.5	1,578.96
1942	208.3	172.7	225.4	942	1,233	3,208	3,400	3,436	1,626	660.7	343.7	208	1,305.32
1943	252.7	1,249	1,195	858.4	979.3	2,201	3,182	4,104	1,538	667.3	405.5	274.2	1,408.87
1944	269.4	249.6	237.1	543.5	565.5	1,096	2,840	2,868	1,174	426.6	267.4	209.2	895.53
1945	215.6	562.2	351.6	1,361	1,028	1,109	1,783	2,048	1,210	427.7	265	199.8	880.08
1946	171.9	223.6	354.2	1,056	1,354	3,763	5,570	5,792	2,505	986.3	452.5	348.6	1,881.43
1947	400.1	290.2	203.9	787.3	1,281	2,006	1,783	1,199	652.1	246.2	180.5	146.6	764.66
1948	142.6	166.3	202	219.2	633.2	735.4	2,461	3,727	2,090	949	487.8	330.8	1,012.03
1949	272.7	130.8	126.5	159.1	786.2	2,382	5,465	4,745	1,998	704.2	395	275.8	1,453.36
1950	234.2	84.6	118.5	1,033	528.7	3,183	2,964	4,207	1,692	590.9	347.5	234.8	1,268.18
1951	214.7	105.3	65.3	356.4	595	831.8	1,130	1,433	566.3	230.9	133.3	125.2	482.27
1952	243.7	159.7	153	150.6	2,429	2,329	3,068	3,117	1,498	542.1	292.8	194.6	1,181.46
1953	160.9	66.1	163.6	512.1	1,493	3,104	3,619	3,016	1,746	663.9	392.4	244	1,265.08
1954	218.7	275	302.2	676.7	1,758	3,482	4,278	3,863	2,479	1,019	528.7	311.7	1,599.33
1955	315.5	233.8	333.2	462.7	338.4	548.9	1,153	1,715	679.5	255.6	165.7	123.4	527.06
1956	142.8	120.4	545.5	715.2	1,116	2,132	2,251	2,533	1,519	570.7	338.4	239.4	1,018.62
1957	224.8	119.4	149.6	142.8	360.9	3,277	3,159	3,649	2,075	726.2	422.8	276.5	1,215.25
1958	284	320	533.9	734.2	811.6	1,398	1,853	1,347	666.4	206.5	169.3	111.7	702.97
1959	156.4	128.6	343.7	175.5	158.2	707.5	1,785	1,747	725.2	240.4	191	177.4	544.66
1960	210.8	168.5	149.1	328.8	217	641.5	1,319	1,893	523.4	182.1	176.8	169.8	498.32
1961	280.7	474.2	237.1	448.6	420.4	355.2	1,098	1,659	476.9	154	169.7	199.5	497.78
1962	223.6	308.6	577.5	598.4	745.7	1,029	1,126	1,229	549.3	212.5	247.5	198.7	587.15
1963	211.8	165.1	343.6	492.8	1,178	1,332	2,086	2,574	1,838	969.9	566.7	390.6	1,012.38
1964	400.8	381	520.2	457	835.2	1,450	1,429	1,869	1,320	434.7	294.3	331.5	810.23
1965	344.4	187.9	307	476	866.5	1,171	1,645	1,855	1,200	402.7	252.1	259.8	747.28
1966	365	279.4	334.8	584.2	1,259	1,003	1,466	1,556	813.4	292.2	255.2	251.4	704.97
1967	320.1	203	239.3	476.3	667	1,268	1,820	2,101	1,227	432	288.1	277.7	776.63
1968	350.2	445.7	523.3	371.3	789.8	1,556	2,150	2,009	1,288	444.7	319.9	349.2	883.09
1969	375.9	325.7	1,149	1,262	1,505	1,802	2,367	2,434	2,124	1,052	750.6	591.6	1,311.57
1970	605.9	731	494.4	938.7	1,125	1,084	1,312	961.6	448.1	257.5	207.1	184.7	695.83
1971	222.3	163.5	184.7	143	1,59.7	290.4	2,078	1,566	572.3	249.1	205.5	199.8	502.86
1972	260.5	204.6	352.3	414.1	556.6	1,304	2,632	3,090	1,634	554.5	338.4	345.9	973.91





**Figure 61.** Annual flow duration at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

**Table 99.** Monthly and annual flow duration at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	1.07	3.10	3.94	4.85	5.38	13.60	28.40	26.50	7.95	2.99	1.06	1.03	2.19
90	2.04	3.19	4.94	5.08	8.08	16.30	30.50	28.50	10.50	3.83	2.04	1.07	2.78
85	2.91	4.08	5.81	5.81	9.34	17.90	32.30	30.30	13.60	4.05	2.14	1.10	3.93
80	2.96	4.86	6.00	6.04	10.30	21.20	34.10	31.90	16.10	5.16	3.09	3.08	4.47
75	3.02	5.02	6.19	6.93	10.80	22.80	35.90	33.40	17.70	6.17	3.30	3.16	5.01
70	3.07	5.18	6.91	7.32	11.70	24.10	38.30	35.80	19.10	7.38	4.16	3.24	5.51
65	3.93	5.99	7.09	7.71	12.90	25.40	40.80	38.40	19.90	8.18	4.46	3.43	6.02
60	3.99	6.09	7.27	8.09	14.40	26.40	43.40	39.60	20.70	8.83	4.83	3.78	6.92
55	4.05	6.18	8.03	9.22	15.20	27.50	46.00	41.40	22.00	10.30	4.98	4.05	8.25
50	4.92	6.28	8.40	9.57	16.10	28.80	47.80	43.50	23.60	11.00	5.31	4.11	10.10
45	5.00	6.87	8.87	10.20	17.50	30.20	49.20	45.80	24.90	11.50	5.72	4.18	12.30
40	5.07	7.04	10.10	11.00	18.80	31.60	50.60	48.10	26.30	12.00	5.88	4.24	15.10
35	5.15	7.33	11.40	11.70	20.00	33.50	52.00	50.20	27.60	13.00	6.03	5.01	17.80
30	5.92	8.05	12.70	12.40	22.00	35.70	53.40	52.70	28.70	14.20	6.73	5.11	21.30
25	5.98	9.12	14.80	13.20	24.00	39.00	56.00	55.50	30.00	15.40	6.96	5.21	25.50
20	6.03	11.10	16.30	14.50	25.90	42.10	59.80	59.30	31.20	16.70	7.18	5.74	29.50
15	6.09	13.60	18.40	15.90	28.30	45.00	65.00	63.60	33.20	18.20	8.43	7.05	35.10
10	6.15	14.70	20.00	17.60	34.50	48.90	73.30	77.00	42.00	20.40	10.10	7.85	42.30
5	6.26	19.50	25.60	21.00	43.20	57.50	86.50	97.60	50.80	23.80	12.90	9.22	52.20

**Table 100.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.50	2	2,899.50	2,682.50	2,448.60	2,238.20
0.20	5	4,851.00	4,395.20	3,936.90	3,567.40
0.10	10	5,880.60	5,274.80	4,686.30	4,231.00
0.05	20	6,662.10	5,930.00	5,237.60	4,716.70
0.02	50	7,423.80	6,556.60	5,758.30	5,173.10
0.01	100	7,849.70	6,900.50	6,040.80	5,419.70

**Table 101.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_T20, Tigris River downstream of Kut Barrage, Iraq, water years 1931–2006.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	144.12	161.22	178.69	193.82	210.48	218.47	291.17
0.2	5	73.71	91.28	113.84	127.67	141.87	158.14	208.87
0.1	10	48.87	64.77	88.58	101.46	115.26	136.98	178.83
0.05	20	33.68	47.59	71.43	83.42	97.01	123.16	158.76
0.02	50	21.36	32.74	55.57	66.47	79.83	110.65	140.18
0.01	100	15.43	25.09	46.76	56.91	70.07	103.76	129.73

Euphrates River Basin

EUPHRATES RIVER AT HUSAYBAH (IRQ\_E1)

(U.S. Geological Survey identification number: 34252004100380)

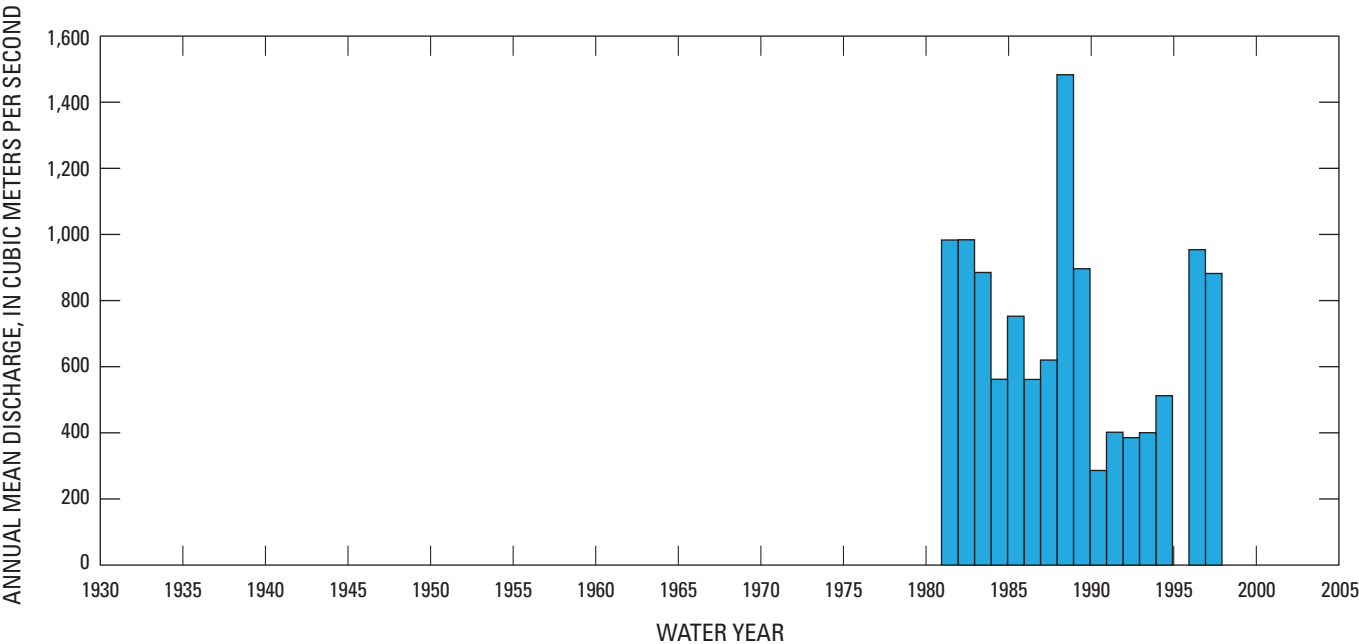
LOCATION: Latitude 34° 25' 20" N, Longitude 41° 00' 38" E.

DRAINAGE AREA: No information available for this site.

PERIOD OF RECORD: November 1981 to September 1997.

GAGE: No information available for this site.

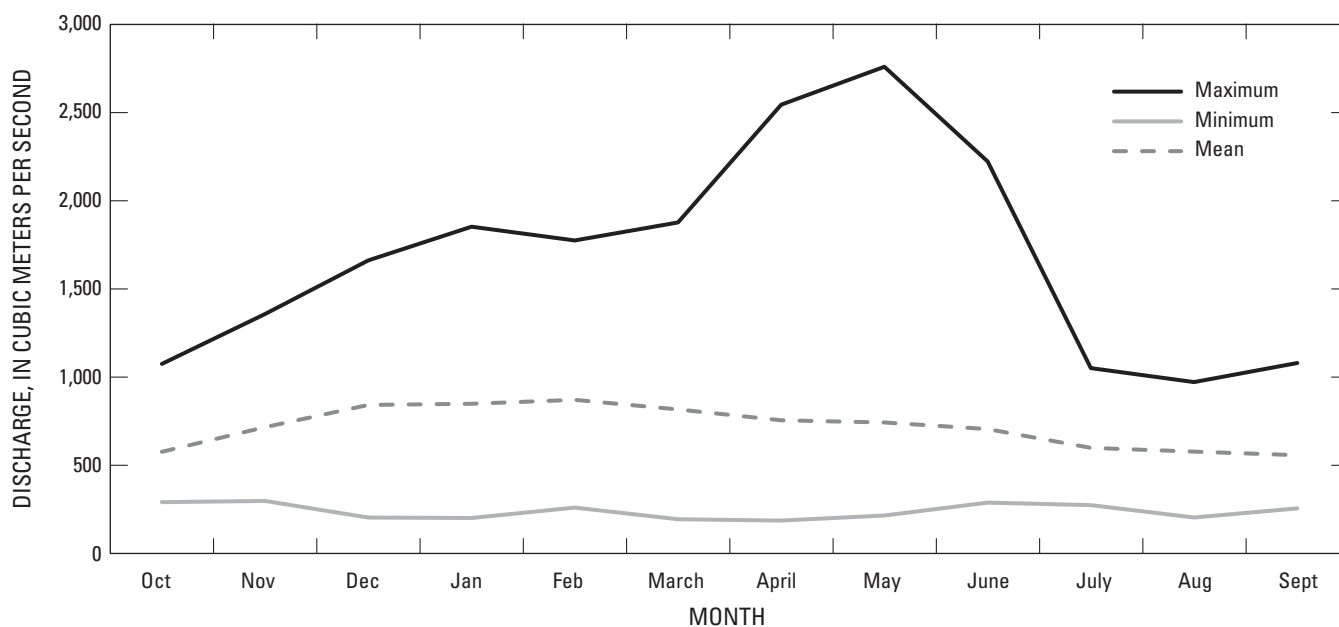
RECORDS: Discharge records are missing data for water year 1995.



**Figure 62.** Annual mean discharge at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

**Table 102.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,075.00	1989	290.80	1992	576.51	248.12	0.43	6.70
November	1,358.00	1989	297.80	1992	716.21	301.69	0.42	8.32
December	1,662.00	1989	203.50	1990	842.19	337.67	0.40	9.78
January	1,853.00	1989	201.00	1990	848.81	448.77	0.53	9.86
February	1,775.00	1988	260.00	1990	871.04	462.04	0.53	10.12
March	1,877.00	1988	193.90	1990	816.73	470.64	0.58	9.49
April	2,545.00	1988	186.40	1991	755.02	597.73	0.79	8.77
May	2,760.00	1988	215.20	1990	742.79	634.40	0.85	8.63
June	2,223.00	1988	288.30	1989	705.26	480.29	0.68	8.19
July	1,051.00	1988	273.90	1989	598.70	245.42	0.41	6.96
August	971.80	1982	203.80	1989	577.41	206.75	0.36	6.71
September	1,080.00	1988	255.50	1992	557.30	231.67	0.42	6.47
Annual	1,514.32	1988	281.50	1990	734.43	326.55	0.44	100.00

**Figure 63.** Monthly discharge at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

**Table 103.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1981	—	903.70	1,209.00	1,298.00	1,336.00	1,242.00	1,064.00	996.50	777.60	708.00	715.80	528.50	1,025.06
1982	801.10	824.70	1,026.00	792.50	965.40	981.70	706.00	1,599.00	1,233.00	948.30	971.80	915.90	986.32
1983	1,060.00	992.60	1,075.00	1,078.00	939.50	923.80	960.80	737.50	1,006.00	559.50	736.50	515.30	915.38
1984	428.30	600.80	796.00	797.70	665.50	580.40	437.70	381.70	443.90	458.10	574.50	557.90	560.42
1985	605.40	937.40	1,041.00	845.70	1,057.00	790.10	785.50	726.70	714.30	383.70	534.50	580.40	765.57
1986	591.00	615.90	739.70	517.10	471.80	451.20	403.00	481.20	494.50	737.20	592.10	620.40	554.06
1987	511.60	626.20	654.90	555.60	412.80	685.60	405.20	457.70	752.20	920.00	717.50	717.20	609.03
1988	473.70	748.40	876.70	1,499.00	1,775.00	1,877.00	2,545.00	2,760.00	2,223.00	1,051.00	828.70	1,080.00	1,514.32
1989	1,075.00	1,358.00	1,662.00	1,853.00	1,450.00	1,256.00	606.20	420.30	288.30	273.90	203.80	272.30	949.68
1990	303.50	336.90	203.50	201.00	260.00	193.90	249.60	215.20	307.70	432.70	392.50	326.20	281.50
1991	382.20	385.00	576.00	506.10	396.90	328.50	186.40	428.70	388.80	405.20	447.00	374.80	402.80
1992	290.80	297.80	652.50	537.50	624.70	374.20	314.20	321.90	357.10	310.30	272.90	255.50	395.81
1993	357.30	439.60	435.30	375.90	353.70	400.10	367.20	454.70	513.70	422.60	381.90	286.50	409.27
1994	432.40	429.60	666.00	491.90	613.30	448.20	485.50	364.40	522.50	439.10	519.60	714.30	492.05
1995	—	—	—	—	—	—	—	—	—	—	—	—	—
1996	590.10	1,083.00	919.40	1,170.00	1,308.00	1,410.00	1,498.00	815.30	502.40	696.10	753.30	663.00	976.87
1997	745.30	879.70	942.00	1,062.00	1,307.00	1,125.00	1,066.00	723.90	759.10	833.50	596.20	508.60	912.70

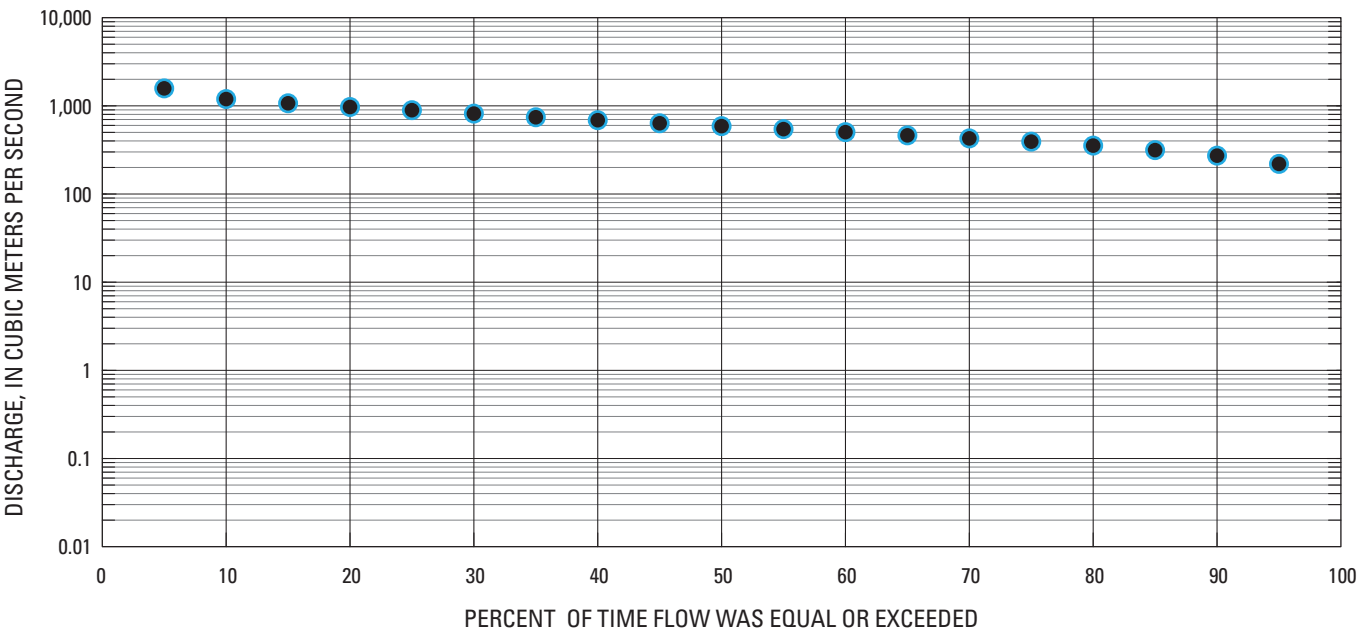


Figure 64. Annual flow duration at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

Table 104. Monthly and annual flow duration at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	241.00	250.90	220.70	217.60	257.30	214.00	153.40	225.40	247.40	210.60	196.30	229.20	219.60
90	270.80	292.20	436.20	356.10	320.30	293.10	215.70	277.30	280.70	281.20	243.40	258.80	272.40
85	310.60	358.60	503.70	400.00	364.50	321.30	275.80	303.60	312.10	326.90	299.60	283.80	314.60
80	340.00	396.90	537.80	440.70	401.10	357.80	310.50	329.30	340.80	355.00	379.20	309.40	354.10
75	373.50	437.20	565.60	488.80	440.30	397.70	359.00	355.70	372.70	383.40	422.90	340.20	392.80
70	405.00	488.70	597.00	526.50	496.60	447.80	389.50	386.90	403.30	412.70	456.10	393.10	427.40
65	425.70	552.80	632.00	578.50	552.20	508.60	417.40	420.80	425.80	444.50	480.50	459.50	462.80
60	446.50	604.00	677.80	631.30	634.80	581.70	443.50	456.00	454.80	478.70	512.80	493.20	503.20
55	467.40	646.60	733.10	683.70	695.80	638.20	487.70	492.50	491.40	511.30	548.60	520.80	544.40
50	499.60	694.80	799.00	739.10	810.20	697.50	545.60	535.50	531.60	548.50	571.50	537.70	588.90
45	523.60	754.00	868.40	807.40	914.90	843.10	623.50	584.60	575.50	582.20	605.20	555.70	634.50
40	569.90	818.00	906.70	892.90	1,001.70	946.20	687.80	651.10	635.60	618.00	650.40	578.40	687.40
35	627.70	863.50	944.70	973.50	1,059.30	1,014.30	776.10	715.20	688.20	660.80	682.60	612.90	742.10
30	688.30	898.00	1,000.00	1,064.50	1,126.60	1,074.90	887.80	763.60	735.90	709.50	713.30	653.00	816.90
25	736.50	932.40	1,067.10	1,165.00	1,263.70	1,130.00	973.80	814.00	795.50	764.20	745.70	692.80	892.80
20	787.50	977.30	1,125.40	1,266.20	1,371.00	1,197.00	1,121.70	904.90	869.90	817.20	780.10	740.30	970.20
15	902.20	1,025.80	1,186.20	1,358.80	1,467.40	1,277.30	1,258.00	997.70	992.80	873.80	826.00	840.70	1,069.30
10	1,018.00	1,112.40	1,282.20	1,464.40	1,561.00	1,435.20	1,450.00	1,111.40	1,210.00	941.90	885.70	897.40	1,193.70
5	1,105.00	1,299.20	1,555.20	1,798.70	1,740.60	1,782.00	2,112.50	2,724.30	2,132.00	1,058.00	975.20	1,055.00	1,578.30



**Table 105.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,172.30	871.77	729.81	663.16
0.50	2	1,834.30	1,345.90	1,120.60	1,001.30
0.20	5	2,778.80	2,115.10	1,778.10	1,581.20
0.10	10	3,409.70	2,698.20	2,293.80	2,044.90
0.05	20	4,011.80	3,311.50	2,850.60	2,553.60
0.02	50	4,785.00	4,186.90	3,668.70	3,314.20
0.01	100	5,360.50	4,907.50	4,360.60	3,968.60

**Table 106.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E1, Euphrates River at Husaybah, Iraq, water years 1981–97.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	268.80	287.62	317.93	348.51	405.15	449.10	520.69
0.2	5	156.36	172.65	202.39	231.77	272.88	305.03	358.84
0.1	10	116.38	131.05	159.32	187.51	223.48	250.11	296.53
0.05	20	90.63	103.88	130.53	157.52	190.17	212.69	253.82
0.02	50	67.92	79.57	104.10	129.56	159.19	177.60	213.52
0.01	100	55.81	66.41	89.44	113.79	141.70	157.67	190.52

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## Euphrates River Basin

### EUPHRATES RIVER AT HIT (IRQ\_E2)

(U.S. Geological Survey identification number: 33362304250140)

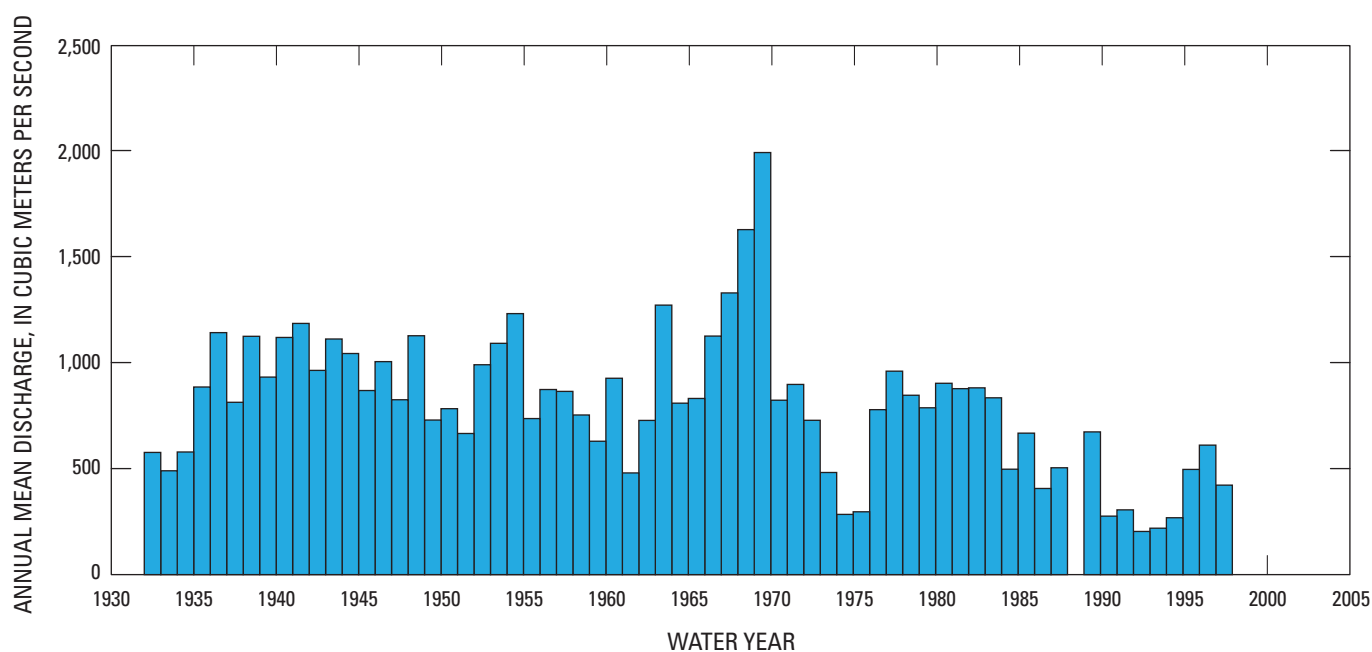
LOCATION: Latitude 33° 36' 23" N, Longitude 42° 50' 14" E.

DRAINAGE AREA: 264,100 square kilometers.

PERIOD OF RECORD: October 1932 to May 1997.

GAGE: The "1928" masonry step gage is located on the right bank of the Euphrates River 300 meters downstream of the former 1923 staff gage, which was located near Hit Sarai. The gage is set to the GTS datum.

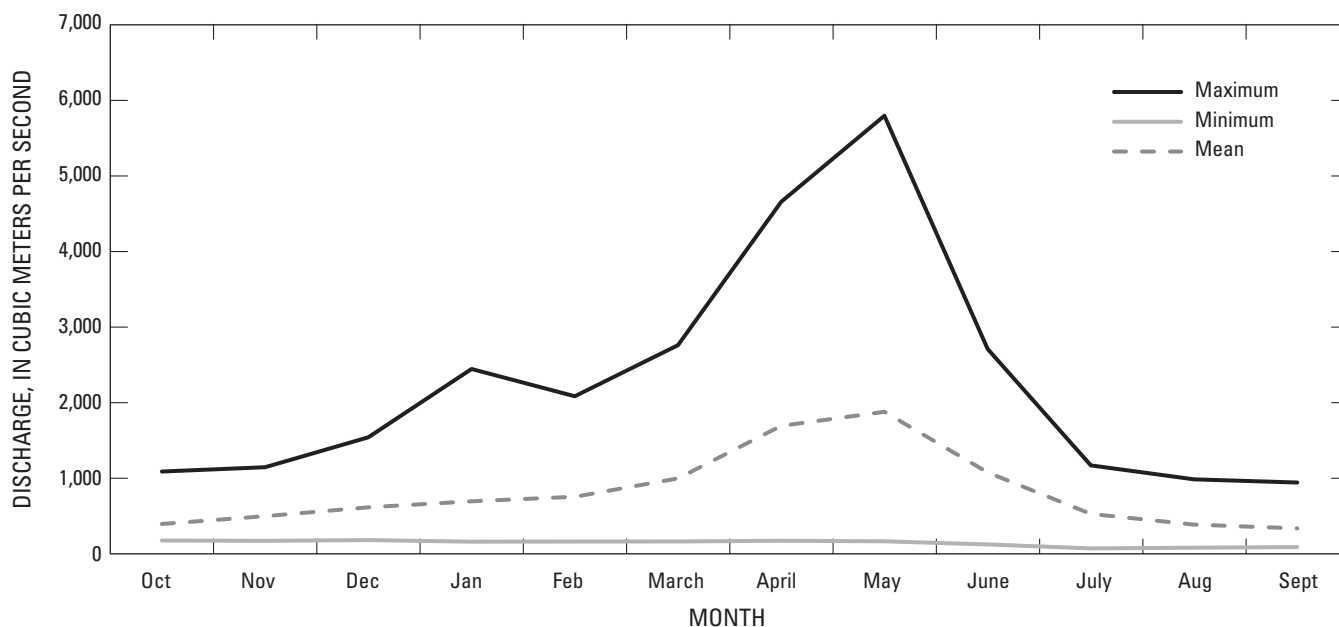
RECORDS: Discharge records are missing data for water year 1988 (October through May, and August and September), and water year 1992. Until April 1968 when the cable was damaged, discharge measurements were made regularly by boat attached to a permanent overhead cable 3 kilometers downstream of the town of Hit. In 1973, a new cableway was installed at Hit and measurements were made regularly thereafter.



**Figure 65.** Annual mean discharge at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

**Table 107.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,089.00	1983	176.20	1993	395.06	177.38	0.45	4.01
November	1,146.00	1989	171.90	1989	498.07	218.98	0.44	5.05
December	1,542.00	1969	181.80	1990	615.57	294.25	0.48	6.24
January	2,446.00	1969	160.60	1990	695.09	360.39	0.52	7.05
February	2,085.00	1966	162.50	1990	755.12	353.27	0.47	7.66
March	2,761.00	1969	163.70	1993	997.85	522.49	0.52	10.12
April	4,658.00	1969	173.10	1990	1,693.72	1,028.02	0.61	17.18
May	5,797.00	1969	165.70	1974	1,879.26	1,249.96	0.67	19.06
June	2,711.00	1963	124.40	1974	1,077.19	553.77	0.51	10.93
July	1,170.00	1976	71.50	1974	528.04	221.76	0.42	5.36
August	985.50	1982	81.20	1973	386.74	194.48	0.50	3.92
September	943.50	1982	89.30	1973	336.50	160.99	0.48	3.41
Annual	2,004.74	1969	220.48	1993	817.65	328.27	0.40	100.00

**Figure 66.** Monthly discharge at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

**Table 108.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

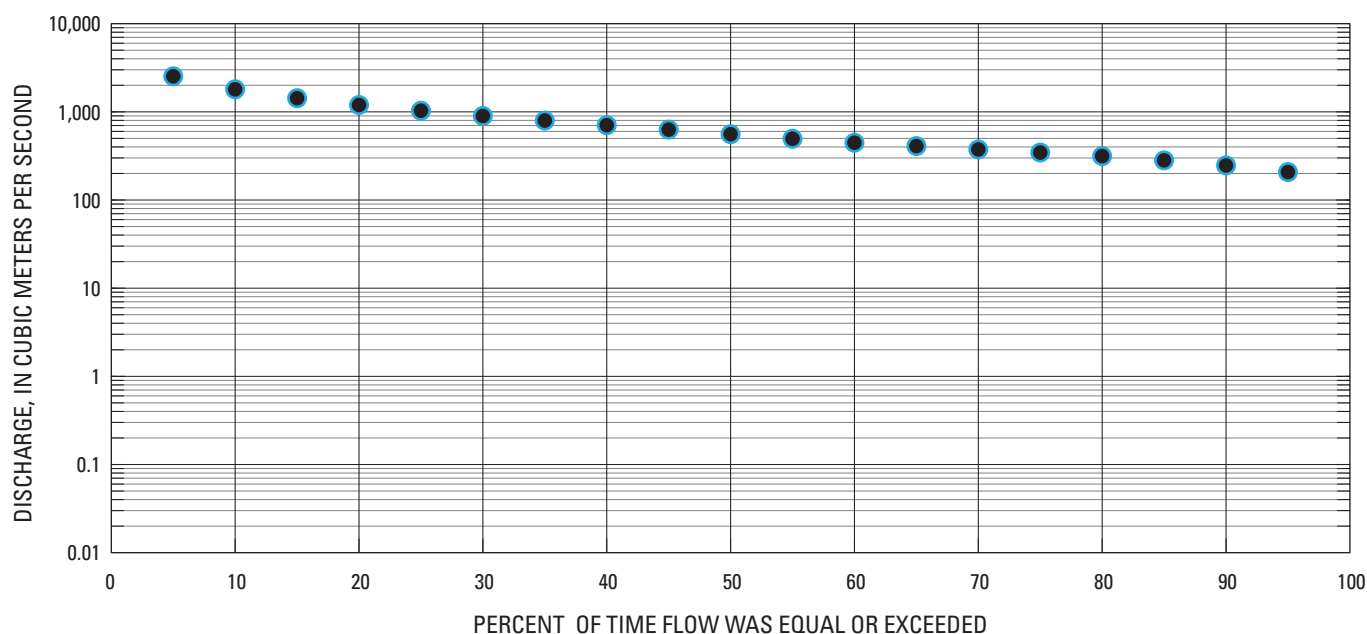
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1932	303.0	307.5	354.6	342.6	350.3	749.8	1,273.0	1,621.0	833.5	374.5	241.5	213.0	580.4
1933	232.0	250.0	269.8	275.0	312.0	480.1	501.3	1,595.0	1,109.0	443.4	236.2	214.7	493.2
1934	208.8	231.0	316.9	397.8	448.4	690.7	1,532.0	1,272.0	930.5	413.2	305.7	242.5	582.5
1935	236.4	351.0	267.7	680.5	884.8	1,263.0	2,564.0	2,333.0	939.6	527.5	396.6	249.5	891.1
1936	356.5	747.6	1,314.0	878.8	1,139.0	1,292.0	2,251.0	2,527.0	1,626.0	810.6	519.2	331.3	1,149.4
1937	321.4	381.8	756.9	524.7	620.0	1,071.0	2,080.0	1,802.0	1,091.0	557.8	340.4	2,75.0	818.5
1938	290.8	679.4	1,090.0	1,127.0	971.3	966.8	2,218.0	3,195.0	1,451.0	777.6	461.1	354.8	1,131.9
1939	359.0	491.4	526.5	730.8	761.3	1,117.0	2,004.0	2,530.0	1,227.0	684.5	452.5	374.7	938.2
1940	356.7	395.2	585.5	1,014.0	1,081.0	1,285.0	3,063.0	2,946.0	1,332.0	698.3	418.1	342.5	1,126.4
1941	411.2	729.2	909.1	921.9	1,298.0	2,703.0	2,703.0	2,424.0	1,039.0	547.5	312.7	318.7	1,193.1
1942	341.9	424.0	390.1	605.6	821.2	1,215.0	2,645.0	3,034.0	1,193.0	451.3	281.4	237.5	970.0
1943	329.1	919.4	1,214.0	1,221.0	979.4	990.3	2,346.0	2,987.0	1,186.0	572.6	376.0	308.7	1,119.1
1944	329.7	482.7	485.8	665.9	754.6	1,647.0	2,248.0	3,213.0	1,402.0	621.5	393.4	358.8	1,050.2
1945	379.5	633.4	512.5	903.9	726.0	847.5	1,674.0	2,116.0	1,422.0	629.6	358.0	290.3	874.4
1946	300.6	371.2	574.5	580.2	655.7	1,133.0	2,163.0	3,097.0	1,660.0	765.4	462.9	376.3	1,011.7
1947	591.0	611.5	472.6	870.0	879.0	1,562.0	2,081.0	1,137.0	745.4	450.0	300.8	267.3	830.6
1948	282.4	548.8	581.8	553.5	1,158.0	917.9	2,560.0	3,561.0	1,946.0	749.4	407.7	348.8	1,134.6
1949	356.0	367.7	494.6	407.3	541.6	585.3	1,671.0	2,200.0	1,123.0	471.5	319.4	273.0	734.2
1950	283.4	310.5	354.6	448.5	353.8	1,005.0	1,970.0	2,526.0	1,136.0	494.1	311.4	264.5	788.2
1951	330.3	388.5	373.2	551.3	502.4	768.0	1,870.0	1,581.0	836.5	371.1	245.9	225.8	670.3
1952	399.0	475.7	572.9	451.2	1,272.0	1,145.0	2,952.0	2,351.0	1,174.0	554.8	334.2	280.7	996.9
1953	317.3	343.2	415.7	537.3	1,026.0	1,311.0	3,011.0	3,112.0	1,658.0	712.0	397.2	342.0	1,098.6
1954	359.5	483.5	478.4	644.1	889.6	1,628.0	3,823.0	3,383.0	1,668.0	761.2	422.6	335.5	1,239.7
1955	374.5	507.7	614.9	1,089.0	705.7	900.5	1,410.0	1,729.0	765.2	340.4	229.7	228.2	741.2
1956	284.3	317.2	521.3	750.8	832.8	991.0	1,761.0	2,725.0	1,226.0	557.6	314.2	268.8	879.2
1957	325.3	369.6	402.1	361.5	440.1	1,577.0	1,636.0	2,691.0	1,521.0	587.8	293.9	238.1	870.3
1958	300.3	420.8	639.1	676.2	643.8	1,082.0	1,821.0	1,554.0	1,140.0	414.6	211.1	195.8	758.2
1959	281.1	346.0	455.9	461.0	435.8	626.3	1,672.0	1,490.0	984.4	335.3	313.8	201.0	633.6
1960	308.5	417.5	390.2	855.5	615.2	1,232.0	2,673.0	2,662.0	1,048.0	462.4	283.1	244.5	932.7
1961	332.9	389.5	383.3	452.4	526.0	434.0	1,298.0	1,165.0	443.4	192.3	85.7	93.4	483.0
1962	223.0	418.8	882.3	691.5	939.3	1,197.0	1,727.0	1,366.0	774.3	278.9	142.5	148.5	732.4
1963	250.4	288.9	451.8	684.9	1,173.0	1,245.0	2,547.0	4,354.0	2,711.0	887.2	436.7	330.5	1,280.0
1964	459.4	601.2	519.6	445.9	522.9	1,304.0	2,708.0	1,557.0	969.1	349.7	159.8	175.3	814.3
1965	310.9	351.3	614.5	484.3	903.8	1,303.0	2,212.0	2,090.0	970.7	400.5	213.7	185.9	836.7
1966	366.9	483.4	620.8	1,303.0	2,085.0	1,485.0	2,159.0	2,554.0	1,407.0	569.2	292.2	271.1	1,133.1
1967	456.5	553.6	740.7	909.9	885.2	1,181.0	2,700.0	4,880.0	2,094.0	911.8	409.7	333.2	1,338.0
1968	564.0	1,020.0	1,202.0	1,261.0	1,199.0	2,395.0	3,834.0	4,267.0	2,276.0	852.0	411.2	382.8	1,638.7
1969	477.5	650.2	1,542.0	2,446.0	1,655.0	2,761.0	4,658.0	5,797.0	2,316.0	895.4	453.6	405.2	2,004.7
1970	585.2	637.5	638.8	732.5	895.0	1,415.0	2,387.0	1,397.0	683.7	251.7	149.9	167.0	828.4
1971	305.5	347.7	660.9	412.8	367.8	999.3	3,212.0	2,316.0	1,273.0	435.4	250.4	259.0	903.3
1972	375.2	411.2	511.1	402.7	398.7	692.0	1,464.0	2,236.0	1,334.0	508.0	223.9	239.0	733.0
1973	329.1	457.3	411.7	316.8	340.1	594.9	1,125.0	1,275.0	608.3	192.1	81.2	89.3	485.1

**Table 108.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.—Continued

[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1974	269.9	291.8	406.7	356.0	316.1	648.6	351.3	165.7	124.4	71.5	152.0	278.5	286.0
1975	276.2	272.9	277.2	287.2	297.1	264.2	258.6	252.3	334.4	393.0	356.0	312.5	298.5
1976	353.8	380.2	401.4	420.7	472.1	445.4	1,051.0	1,428.0	1,678.0	1,170.0	874.7	726.7	783.5
1977	641.3	727.0	921.4	1,231.0	941.1	1,170.0	1,170.0	1,507.0	1,690.0	553.1	548.2	495.8	966.3
1978	594.3	644.4	723.3	730.1	706.0	1,227.0	882.3	1,542.0	1,450.0	563.4	534.7	625.5	851.9
1979	663.7	765.3	826.4	868.0	1,006.0	898.1	788.3	683.7	681.4	747.9	826.4	754.1	792.4
1980	621.6	805.6	617.3	642.8	652.1	696.9	1,987.0	1,857.0	1,077.0	651.5	599.0	697.8	908.8
1981	753.2	779.2	895.5	1,062.0	1,111.0	1,193.0	1,019.0	1,001.0	791.8	681.5	739.0	573.3	883.3
1982	740.2	802.9	852.4	711.2	714.6	752.9	671.6	1,311.0	1,180.0	980.2	985.5	943.5	887.2
1983	1,089.0	1,001.0	945.2	988.1	943.6	930.0	932.1	750.1	794.8	507.5	702.9	493.9	839.9
1984	409.2	556.6	589.6	743.5	650.2	504.9	394.0	347.4	398.4	410.9	497.1	506.8	500.7
1985	571.1	912.3	955.1	799.3	1,030.0	792.6	783.3	416.3	493.2	345.8	478.4	485.9	671.9
1986	555.7	352.8	521.1	473.1	452.0	375.2	248.3	244.8	365.0	497.7	414.6	409.8	409.2
1987	419.8	425.7	504.0	548.6	425.8	600.0	353.8	364.2	539.4	740.6	607.5	561.3	507.6
1988	—	—	—	—	—	—	—	—	—	—	—	—	—
1989	970.1	1,146.0	1,442.0	1,307.0	915.7	843.3	406.4	219.6	222.0	226.9	227.5	208.6	677.9
1990	195.4	191.6	181.8	160.6	162.5	173.7	173.1	170.5	429.9	292.4	897.5	304.4	277.8
1991	210.7	235.1	344.3	633.0	621.4	213.1	189.6	—	—	175.2	217.3	236.5	307.6
1992	—	—	—	—	—	—	—	—	226.80	224.40	—	—	205.03
1993	176.2	171.9	260.7	241.6	176.1	163.7	198.9	234.5	249.6	269.5	263.4	239.7	220.5
1994	225.4	236.3	266.0	263.5	299.4	248.9	216.3	214.6	302.1	327.4	281.7	360.6	270.2
1995	456.9	—	845.6	852.0	1,032.0	602.5	426.0	295.5	273.8	196.3	247.6	268.4	499.7
1996	252.9	406.9	636.1	624.5	670.2	871.9	1,322.0	460.1	437.1	602.6	662.7	433.2	615.0
1997	251.5	359.1	468.5	471.6	743.3	457.9	368.0	280.2	—	—	—	—	425.0



**Figure 67.** Annual flow duration at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

**Table 109.** Monthly and annual flow duration at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	208.50	217.40	259.10	268.90	240.00	221.30	196.40	209.30	235.10	179.70	134.10	144.10	207.50
90	229.50	265.40	286.90	320.80	309.60	340.30	271.50	251.20	309.50	226.20	191.00	195.30	246.70
85	244.10	298.50	344.40	353.90	340.10	421.30	387.10	322.10	405.50	267.80	216.70	209.60	281.90
80	263.90	324.70	372.70	382.70	369.00	497.70	549.00	523.80	503.60	304.90	233.00	221.70	314.90
75	277.40	340.40	393.20	410.50	415.20	577.50	757.20	899.70	571.30	339.60	248.90	232.30	345.50
70	289.00	355.40	410.80	435.50	462.60	666.20	915.90	1,168.20	669.20	375.30	265.10	243.30	374.60
65	301.20	368.50	432.30	460.60	512.10	747.20	1,106.40	1,320.40	752.30	406.00	283.10	255.50	409.00
60	313.60	381.50	455.90	498.50	566.80	808.30	1,233.80	1,450.80	826.40	434.10	302.30	267.50	446.20
55	326.90	400.10	481.20	543.60	625.50	861.80	1,364.70	1,580.50	897.10	459.80	322.50	279.50	495.80
50	340.00	419.50	509.10	601.10	685.20	915.10	1,503.80	1,704.40	965.70	487.50	343.00	291.80	557.80
45	352.80	440.20	541.40	653.50	742.00	969.10	1,639.90	1,836.60	1,078.20	516.70	364.30	310.30	629.00
40	366.70	464.40	581.90	706.50	798.80	1,032.60	1,776.00	2,020.20	1,163.50	550.00	384.90	326.80	706.70
35	381.30	503.00	636.80	761.60	856.10	1,108.90	1,946.60	2,208.70	1,245.70	584.80	404.30	340.60	796.00
30	418.90	560.80	704.90	818.60	910.20	1,171.10	2,188.00	2,398.40	1,330.60	623.10	424.60	354.40	897.80
25	454.50	619.00	782.20	877.10	962.10	1,235.60	2,421.50	2,587.80	1,427.50	661.70	456.50	376.00	1,030.40
20	492.20	680.10	853.20	952.90	1,027.00	1,347.60	2,678.50	2,890.40	1,541.40	701.10	500.20	405.80	1,195.70
15	562.40	755.70	909.80	1,040.40	1,109.70	1,478.30	2,993.60	3,296.30	1,670.50	762.50	557.40	467.90	1,428.30
10	659.30	840.60	1,024.90	1,150.70	1,233.70	1,708.60	3,398.00	3,730.20	1,846.90	858.60	639.50	573.40	1,801.60
5	783.10	966.70	1,331.80	1,422.10	1,531.30	2,098.00	3,995.20	4,291.30	2,244.10	991.70	829.60	696.90	2,531.90

**Table 110.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,600.20	1,491.10	1,355.90	1,214.80
0.50	2	2,902.50	2,732.30	2,480.70	2,213.70
0.20	5	4,408.00	4,199.70	3,850.90	3,440.90
0.10	10	5,156.50	4,945.40	4,573.30	4,095.60
0.05	20	5,710.00	5,505.90	5,133.00	4,608.20
0.02	50	6,240.10	6,052.10	5,697.40	5,131.40
0.01	100	6,533.20	6,359.40	6,026.30	5,439.90

**Table 111.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E2, Euphrates River at Hit, Iraq, water years 1932–97.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	260.60	263.93	268.09	276.98	289.50	312.81	405.20
0.2	5	168.17	171.05	173.21	178.89	193.59	218.01	297.78
0.1	10	127.38	130.53	132.84	137.33	154.88	179.54	253.43
0.05	20	98.60	101.96	104.59	108.29	127.96	152.50	221.81
0.02	50	71.75	75.21	78.17	81.12	102.45	126.52	190.88
0.01	100	57.02	60.43	63.52	66.06	87.96	111.50	172.68



## Euphrates River Basin

### EUPHRATES RIVER DOWNSTREAM OF HINDIYA BARRAGE (IRQ\_E3)

(U.S. Geological Survey identification number: 32430104416010)

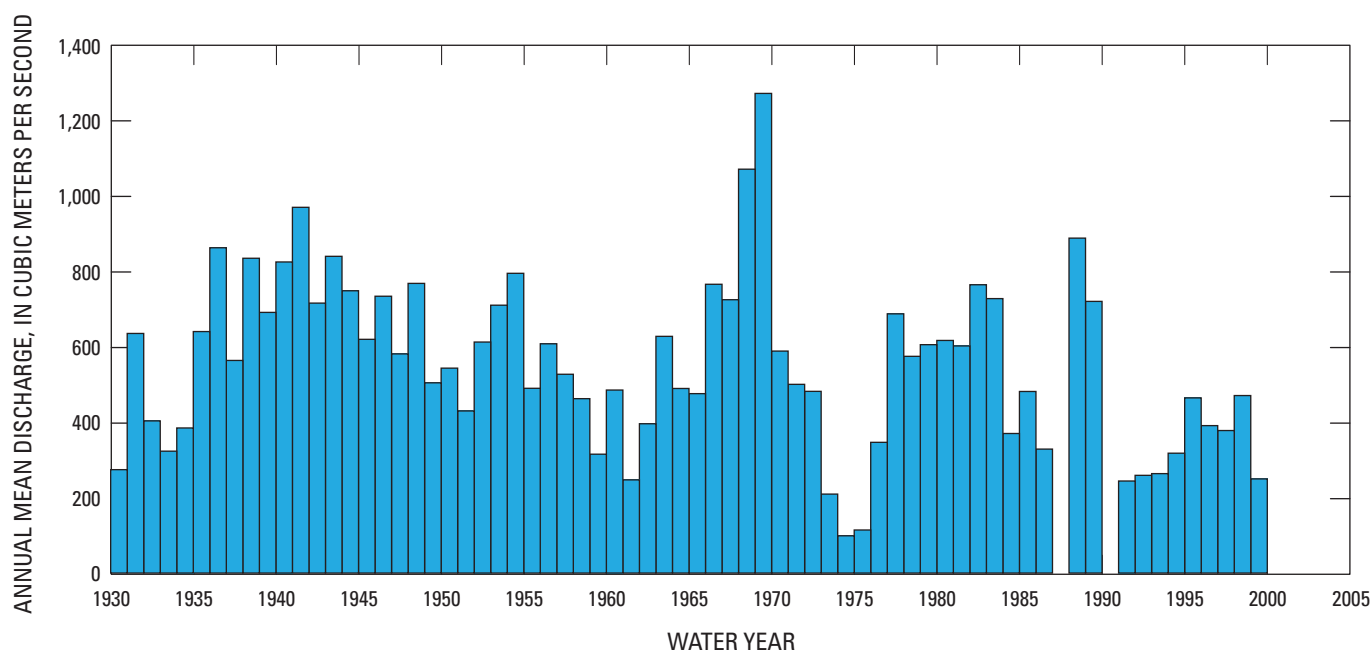
LOCATION: Latitude 32° 43' 01" N, Longitude 44° 16' 01" E.

DRAINAGE AREA: 274,100 square kilometers.

PERIOD OF RECORD: February 1930 to September 1999.

GAGE: The staff is located on the left bank of the Euphrates River. Discharge measurements are made from a boat attached to a permanent stag line 2 kilometers downstream of Hindiya Barrage. The gage is set to the GTS datum.

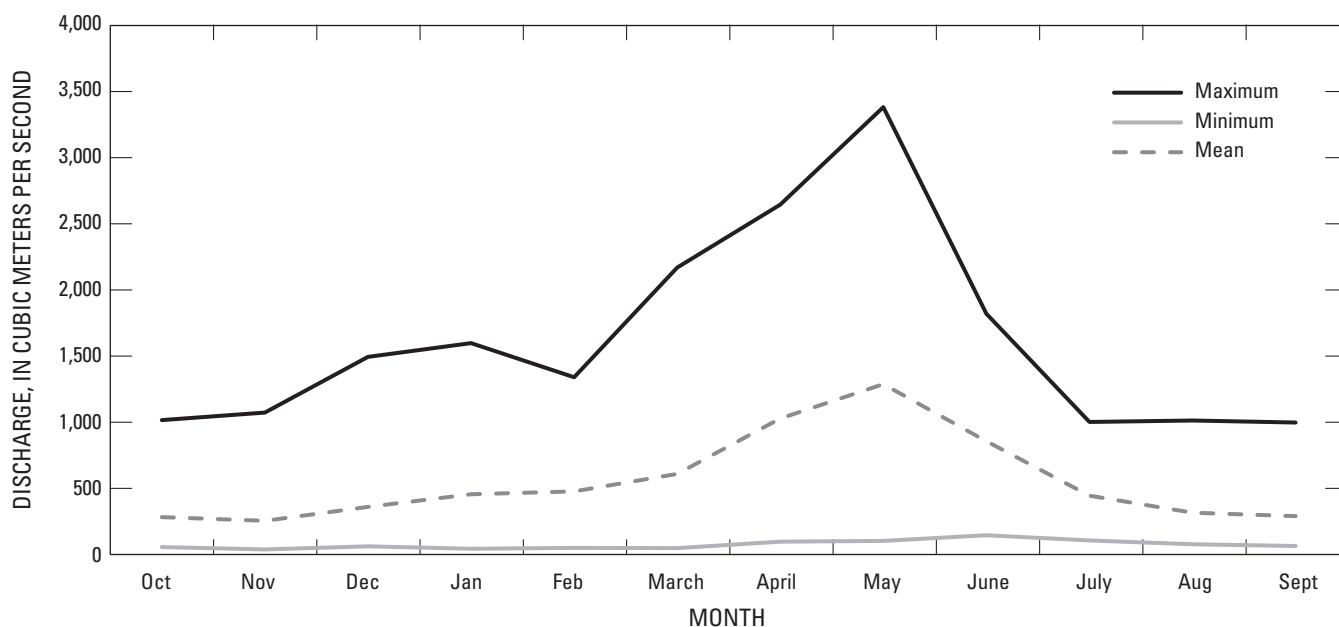
RECORDS: Discharge records are missing data for water years 1987 and 1990. Discharge measurements are considered to be fair because they are affected by the operation of the barrage.



**Figure 68.** Annual mean discharge at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

**Table 112.** Extremes and statistics for monthly and annual mean discharge at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.[m<sup>3</sup>/s, cubic meters per second]

Month	Maximum		Minimum		Statistics			
	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Discharge (m <sup>3</sup> /s)	Water year of occurrence	Mean discharge (m <sup>3</sup> /s)	Standard deviation (m <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
October	1,016.00	1989	56.10	1962	282.58	189.54	0.67	4.24
November	1,073.00	1989	38.30	1974	254.78	168.72	0.66	3.82
December	1,494.00	1989	61.90	1933	360.03	263.63	0.73	5.40
January	1,598.00	1989	43.40	1974	455.47	297.25	0.65	6.84
February	1,340.00	1966	50.00	1974	477.18	298.87	0.63	7.16
March	2,169.00	1941	48.20	1974	609.20	384.27	0.63	9.14
April	2,645.00	1969	97.10	1975	1,028.06	674.17	0.66	15.43
May	3,382.00	1969	102.70	1999	1,287.81	821.32	0.64	19.33
June	1,820.00	1969	145.70	1975	855.95	374.31	0.44	12.85
July	1,002.00	1988	106.20	1961	444.55	209.29	0.47	6.67
August	1,013.00	1982	77.40	1961	316.07	200.55	0.63	4.74
September	997.70	1988	64.40	1947	289.91	216.04	0.75	4.35
Annual	1,272.30	1969	98.85	1974	554.82	226.31	0.41	100.00

**Figure 69.** Monthly discharge at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

**Table 113.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

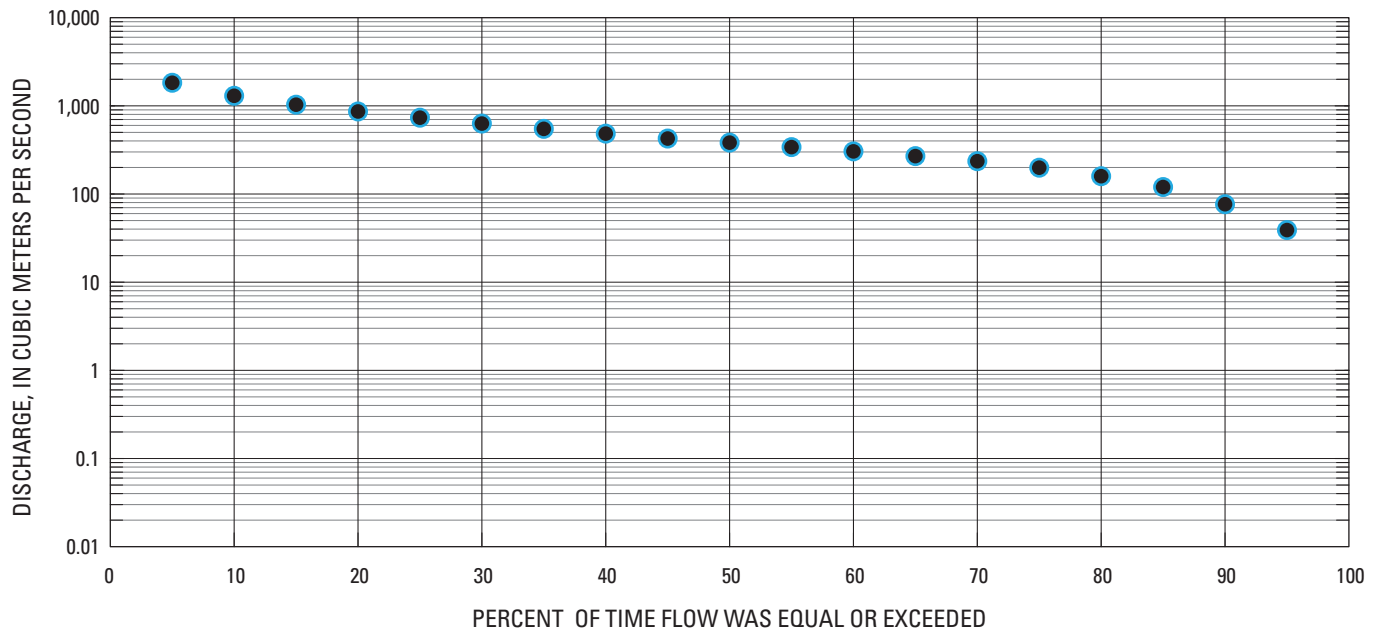
[Discharge measured in cubic meters per second; —, no data available]

Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
1930	—	—	—	—	295.30	257.70	431.00	524.90	302.80	179.60	104.60	98.40	274.29
1931	139.90	87.80	212.90	392.60	379.80	644.20	1,614.00	1,846.00	1,268.00	591.90	258.90	190.90	635.58
1932	196.60	161.00	177.40	203.10	148.80	441.30	959.20	1,411.00	666.00	251.80	128.20	99.30	403.64
1933	97.50	89.10	61.90	140.50	134.00	234.00	259.90	1,495.00	893.50	286.80	101.70	86.20	323.34
1934	82.90	75.00	104.90	245.10	319.60	328.40	1,166.00	1,047.00	779.30	244.60	127.80	98.00	384.88
1935	115.80	119.20	128.50	433.20	589.20	974.70	1,919.00	1,986.00	793.00	333.30	183.60	111.90	640.62
1936	172.60	420.70	1,150.00	575.00	810.30	1,004.00	1,672.00	2,185.00	1,285.00	541.20	331.60	207.30	862.89
1937	234.70	227.80	348.70	313.40	362.60	658.40	1,678.00	1,493.00	786.70	348.90	181.10	134.30	563.97
1938	217.90	386.40	835.80	985.30	812.40	588.80	1,611.00	2,416.00	1,216.00	499.00	268.90	183.00	835.04
1939	268.20	234.70	378.40	553.30	532.40	809.70	1,747.00	2,133.00	878.80	383.10	230.00	148.60	691.43
1940	197.70	191.00	278.10	863.00	763.90	1,100.00	1,992.00	2,212.00	1,296.00	560.80	264.80	183.30	825.22
1941	214.00	478.60	606.80	703.90	1,211.00	2,169.00	2,307.00	2,183.00	973.80	400.60	234.20	160.00	970.16
1942	229.50	247.70	233.50	364.40	581.30	1,141.00	1,906.00	2,293.00	939.80	379.60	151.90	125.30	716.08
1943	224.80	549.50	975.70	980.20	839.60	740.70	1,657.00	2,378.00	942.20	405.60	240.00	148.60	840.16
1944	236.40	220.20	185.00	438.00	467.70	1,188.00	1,648.00	2,264.00	1,299.00	575.40	287.90	176.10	748.81
1945	238.00	352.80	324.50	737.90	509.40	524.30	1,208.00	1,860.00	1,031.00	362.80	169.40	121.80	619.99
1946	138.60	99.40	272.00	463.70	420.20	862.00	1,669.00	2,536.00	1,384.00	561.20	231.50	174.00	734.30
1947	347.10	363.10	253.80	593.40	586.50	1,147.00	1,793.00	966.70	552.80	219.80	88.50	64.40	581.34
1948	92.50	304.80	369.00	304.30	798.90	577.40	1,597.00	2,625.00	1,568.00	547.70	239.00	196.90	768.38
1949	209.00	151.70	279.90	175.90	341.40	344.10	1,239.00	1,897.00	954.80	251.70	115.90	95.50	504.66
1950	91.90	88.40	136.00	238.80	115.00	725.60	1,476.00	2,219.00	911.80	255.70	141.50	123.00	543.56
1951	155.70	192.00	186.30	312.10	293.90	398.60	1,314.00	1,299.00	632.30	155.70	110.00	110.90	430.04
1952	179.60	214.50	293.90	282.50	734.50	627.50	1,646.00	1,703.00	890.60	366.60	222.40	192.40	612.79
1953	137.40	163.50	210.60	328.10	730.60	1,020.00	1,763.00	1,890.00	1,203.00	511.70	296.30	272.20	710.53
1954	215.00	296.40	328.90	500.20	648.40	1,108.00	2,066.00	2,052.00	1,243.00	502.70	266.70	314.00	795.11
1955	284.00	257.60	427.30	762.30	409.10	589.30	917.60	1,236.00	557.00	214.40	120.20	106.40	490.10
1956	133.20	100.50	208.90	445.30	550.30	748.10	1,119.00	2,060.00	1,021.00	395.10	272.70	243.70	608.15
1957	184.00	156.00	182.00	174.00	181.00	1,020.00	1,050.00	1,520.00	1,060.00	346.00	239.00	216.00	527.33
1958	211.00	185.20	394.70	417.90	402.30	568.80	1,016.00	1,162.00	727.40	193.00	151.00	122.00	462.61
1959	137.10	97.20	204.00	180.20	186.50	185.30	698.90	1,002.00	619.90	205.40	141.70	125.50	315.31
1960	124.60	106.90	85.60	487.00	235.20	524.90	1,201.00	1,652.00	753.10	261.60	217.30	176.30	485.46
1961	143.70	130.30	113.60	284.50	311.60	236.00	342.50	888.30	264.70	106.20	77.40	67.40	247.18
1962	56.10	97.90	248.70	409.50	434.00	655.30	1,005.00	921.70	517.60	165.50	145.00	96.30	396.05
1963	92.40	70.00	204.30	371.20	612.60	815.10	1,230.00	1,764.00	1,219.00	609.40	298.90	247.70	627.88
1964	331.10	326.10	241.50	244.00	259.40	727.20	1,707.00	896.70	638.50	232.20	157.40	114.50	489.63
1965	123.10	90.80	280.60	302.10	276.00	460.00	1,209.00	1,594.00	684.10	294.80	237.10	159.70	475.94
1966	148.90	180.00	346.10	650.90	1,340.00	1,197.00	1,515.00	1,883.00	1,005.00	381.30	299.80	245.30	766.03
1967	237.60	168.10	331.90	747.70	591.70	604.90	1,222.00	2,283.00	1,231.00	568.60	386.50	327.70	725.06
1968	346.20	603.60	765.40	972.80	892.80	1,246.00	2,082.00	2,567.00	1,692.00	677.20	517.70	493.00	1,071.31
1969	376.40	333.70	908.40	1,209.00	1,252.00	1,247.00	2,645.00	3,382.00	1,820.00	826.10	665.20	602.80	1,272.30
1970	560.30	477.50	467.70	723.50	795.80	996.90	1,114.00	773.80	480.20	272.00	198.50	205.60	588.82

**Table 113.** Monthly and annual mean discharge at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.—Continued

[Discharge measured in cubic meters per second; —, no data available]

<b>Water year</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Annual</b>
1971	164.00	92.20	312.00	160.40	162.50	195.00	1,611.00	1,640.00	847.30	349.60	248.40	224.40	500.57
1972	162.60	71.90	221.00	248.30	152.40	471.60	545.60	1,961.00	1,108.00	337.00	247.60	256.80	481.98
1973	171.20	140.60	188.20	127.70	125.70	204.60	176.60	521.80	404.80	179.30	134.20	138.80	209.46
1974	125.60	38.30	83.40	43.40	50.00	48.20	128.00	1,42.40	163.10	147.10	103.00	113.70	98.85
1975	138.40	96.70	90.90	92.10	58.00	63.80	97.10	112.50	145.70	170.50	158.70	146.40	114.23
1976	127.30	98.60	96.00	72.50	55.10	69.50	173.60	638.60	1,043.00	813.00	480.80	493.20	346.77
1977	447.30	411.00	586.00	834.60	723.80	664.80	639.30	996.70	1,199.00	645.50	589.80	513.20	687.58
1978	425.90	344.70	506.60	309.40	344.90	492.30	393.70	1,013.00	1,146.00	740.40	562.90	618.80	574.88
1979	506.70	353.80	511.30	554.60	491.90	524.40	446.10	779.40	957.40	759.10	699.80	685.10	605.80
1980	507.00	262.10	402.70	383.10	349.20	302.00	764.30	923.70	1,033.00	860.00	789.50	827.90	617.04
1981	682.30	333.50	397.20	349.60	388.40	500.10	594.20	508.40	1,060.00	892.50	780.50	742.90	602.47
1982	692.30	485.70	605.10	842.30	840.60	789.70	502.10	458.50	1,093.00	937.90	1,013.00	916.80	764.75
1983	905.40	472.30	778.90	913.60	715.60	708.00	439.20	654.60	1,184.00	598.80	676.90	688.90	728.02
1984	533.30	304.70	459.80	406.00	336.40	280.20	242.80	185.60	505.10	449.20	372.10	367.40	370.22
1985	353.00	400.80	494.90	372.00	439.10	370.30	432.10	413.00	927.50	519.70	543.20	514.60	481.68
1986	472.20	334.50	386.00	273.80	224.90	167.70	1,43.70	160.00	537.80	470.90	388.40	385.90	328.82
1987	—	—	—	—	—	—	—	—	—	—	—	—	—
1988	392.50	262.60	318.50	830.50	730.80	951.30	1,610.00	1,442.00	1,413.00	1,002.00	710.60	997.70	888.46
1989	1,016.00	1,073.00	1,494.00	1,598.00	1,175.00	565.50	225.00	181.90	376.10	383.20	285.50	274.30	720.63
1990	—	—	—	—	—	—	—	—	—	—	—	—	—
1991	232.10	171.80	160.50	343.80	390.90	152.10	145.30	162.30	302.20	355.80	265.10	247.90	244.15
1992	295.90	188.30	164.30	168.60	182.00	144.50	174.80	177.40	376.70	510.30	380.60	347.20	259.22
1993	281.00	108.20	108.20	129.60	136.50	165.70	141.00	252.10	503.70	517.70	425.70	395.90	263.78
1994	320.90	298.00	326.10	306.60	239.50	204.00	173.20	191.10	432.00	518.00	382.10	423.90	317.95
1995	379.70	430.20	459.20	438.50	447.00	440.00	490.90	459.50	624.00	538.00	446.50	422.10	464.63
1996	440.70	296.30	353.60	318.40	378.90	338.10	358.50	308.10	479.60	538.50	445.40	437.10	391.10
1997	411.30	312.20	313.70	308.20	409.40	332.30	283.70	304.80	446.90	548.00	448.80	417.40	378.06
1998	393.60	296.60	314.00	423.10	597.90	669.20	424.00	379.70	531.50	601.00	531.90	487.80	470.86
1999	431.50	295.20	246.80	157.70	144.50	174.20	140.00	102.70	382.30	380.00	280.00	261.70	249.72



**Figure 70.** Annual flow duration at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

**Table 114.** Monthly and annual flow duration at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

[Flow duration measured in cubic meters per second; —, no data available]

Percentage of days discharge equaled or exceeded	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Annual
95	24.70	28.20	39.40	71.90	53.90	70.30	107.30	116.80	211.00	56.00	26.00	21.90	39.00
90	36.40	39.40	75.40	127.00	94.30	117.30	156.50	182.40	347.10	109.20	39.50	30.20	76.60
85	49.00	52.60	107.10	158.80	136.10	160.30	206.60	260.00	414.60	171.60	65.60	38.20	120.00
80	82.20	83.80	136.10	191.70	184.10	215.80	276.40	337.30	462.50	220.00	97.50	59.80	159.30
75	122.80	113.90	169.60	221.90	227.30	273.80	341.70	416.10	507.20	263.90	131.50	88.60	198.90
70	144.80	139.80	194.40	250.60	260.60	321.00	414.70	573.60	551.90	299.30	161.60	117.70	235.50
65	169.10	161.90	215.30	277.70	291.00	370.50	489.90	838.10	605.30	329.30	195.30	150.00	269.10
60	199.60	185.30	238.40	303.90	321.50	422.30	603.30	978.80	673.10	364.90	223.50	182.50	304.50
55	225.20	209.00	264.60	329.40	352.10	485.10	708.80	1,095.60	749.00	404.20	248.70	216.00	340.40
50	247.10	231.80	292.20	358.40	392.30	536.00	819.90	1,234.60	819.00	443.50	275.30	245.30	382.80
45	268.40	252.80	319.40	389.50	437.90	585.10	989.70	1,403.50	877.40	473.10	306.20	266.30	425.80
40	289.60	273.90	348.90	432.00	489.40	633.60	1,141.70	1,577.60	932.40	502.60	338.70	291.40	484.10
35	314.40	295.20	382.20	484.10	555.50	690.70	1,288.20	1,732.40	991.60	531.10	371.80	332.70	548.30
30	341.00	317.80	420.80	545.70	619.80	751.00	1,453.90	1,864.20	1,056.10	559.60	405.60	371.70	629.60
25	378.20	342.10	464.40	626.50	681.60	819.50	1,636.20	1,985.90	1,125.30	596.90	444.00	411.40	734.10
20	424.70	371.90	538.00	728.10	739.70	906.80	1,834.50	2,120.70	1,218.70	643.30	486.00	460.00	863.50
15	477.80	414.70	611.70	814.00	827.50	1,020.10	2,025.80	2,276.00	1,326.80	706.30	553.20	526.10	1,030.70
10	573.30	477.20	704.70	910.20	972.90	1,190.40	2,218.50	2,453.80	1,463.20	794.90	641.30	658.00	1,300.70
5	805.60	613.10	958.30	1,079.10	1,201.80	1,476.00	2,504.70	2,677.20	1,669.70	935.50	858.30	877.40	1,827.60

**Table 115.** Exceedance probability of maximum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

Exceedance probability	Recurrence interval (years)	Maximum mean discharge, in cubic meters per second			
		Number of consecutive days			
		3	7	15	30
0.80	1.25	1,033.40	962.45	886.17	815.13
0.50	2	1,727.00	1,649.30	1,586.20	1,480.50
0.20	5	2,570.20	2,502.40	2,421.10	2,269.70
0.10	10	3,033.80	2,977.30	2,855.10	2,674.20
0.05	20	3,410.60	3,365.70	3,188.70	2,980.80
0.02	50	3,814.50	3,784.20	3,522.80	3,282.70
0.01	100	4,065.90	4,045.50	3,716.20	3,454.40

**Table 116.** Non-exceedance probability of minimum mean discharge for selected numbers of consecutive days at streamflow-gaging station IRQ\_E3, Euphrates River downstream of Hindiya Barrage, Iraq, water years 1930–99.

Non-exceedance probability	Recurrence interval (years)	Minimum mean discharge, in cubic meters per second						
		Number of consecutive days						
		3	7	15	30	60	90	183
0.5	2	54.87	78.09	114.09	138.87	163.07	181.31	242.91
0.2	5	24.16	35.70	64.51	82.11	97.49	107.57	149.33
0.1	10	15.71	23.19	47.68	62.41	75.11	82.54	115.91
0.05	20	11.01	16.05	37.07	49.77	60.81	66.60	94.06
0.02	50	7.37	10.46	27.86	38.58	48.17	52.54	74.40
0.01	100	5.63	7.81	23.00	32.56	41.34	44.97	63.65

## Data Considerations

The reliability of statistical data is related to the length of record for a stream. The Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982) recommends that at least 10 years of the records be used for computing flood frequency estimates. Ordinarily, the length of record criterion for inclusion of a streamflow-gaging station is at least 10 years. However, the record length for streamflow-gaging stations in Iraq can vary substantially. The 10-year requirement was not applied to all streamflow-gaging stations, so that statistics could be computed for those stations not meeting the 10-year requirement for length of record.

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أعد بالتعاون مع وزارة الموارد المائية ووزارة الزراعة والموارد المائية تحت رعاية وزارة الدفاع الأمريكية، وفرقة العمل المعنية بالأعمال التجارية وعمليات تحقيق الاستقرار

## الصفات المميزة لعدادات التدفق المائي واحصائيات الجريان النهري لمحطات على حوضي نهر دجلة ونهر الفرات، العراق.



سلسلة بيانات 540

وزارة الداخلية في الولايات المتحدة  
دائرة المسح الجيولوجي في الولايات المتحدة