

**07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX**

Red-Little Basin  
Bois D'Arc-Island Subbasin

LOCATION.--Lat 33°49'08", long 96°33'47" referenced to North American Datum of 1927, Grayson County, TX, Hydrologic Unit 11140101, on right bank 1,800 ft downstream from Denison Dam powerhouse, 0.4 mi upstream from Shawnee Creek (spillway flow return), 4.5 mi north of Denison, and at mile 725.5.

DRAINAGE AREA.--39,720 mi<sup>2</sup> of which 5,936 mi<sup>2</sup> probably is noncontributing, of which 5,936 mi<sup>2</sup> is probably noncontributing. At site used prior to October 1961 drainage area was 39,777 mi<sup>2</sup>, of which 5,936 mi<sup>2</sup> probably was noncontributing.

**SURFACE-WATER RECORDS**

PERIOD OF RECORD.--October 1923 to September 1989; December 1996 to current year. Monthly discharge only for some periods, published in WSP 1311. Prior to October 1934, published as "near Denison, TX", and October 1934 to September 1961, published as "near Colbert, OK". Gage-height records collected at various sites in this vicinity 1892-93, 1906-28, 1931-49 are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 807: 1935 (M). WSP 1211: Drainage area. WSP 1241: 1924-29, 1932-33, 1934 (M), 1935.

GAGE.--Water-stage recorder. Datum of gage is 495.00 ft above National Geodetic Vertical Datum of 1929. Oct. 9, 1923, to Sept. 24, 1934, nonrecording gage, and July 29, 1942, to Sept. 30, 1961, water-stage recorder, at county road bridge 2.5 mi downstream. Prior to Oct. 1, 1931, at datum 11.85 ft higher; Oct. 1, 1931, to Sept 24, 1934, at datum 12.07 ft higher; and July 29, 1942, to Sept. 30, 1961, at datum 2.36 ft higher; Sept. 25, 1934, to July 28, 1942, water-stage recorder at railway bridge 1.9 mi downstream at datum 12.36 ft higher. July 29, 1942 to Sept. 30, 1989, at same site and datum 5.00 ft higher.

REMARKS.--Records fair except for estimated periods which are poor. Flow regulated since October 1943 by Lake Texoma (station 07331500). U.S. Army Corps of Engineers' satellite telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 26, 1908, reached a stage of 45.5 ft (at site and datum used July 29, 1942, to Sept. 30, 1961); from record of National Weather Service.

## 07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX—Continued

**DISCHARGE, CUBIC FEET PER SECOND**  
**WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011**  
**DAILY MEAN VALUES**  
[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	612	167	1,580	1,800	3,170	879	1,720	2,190	129	1,650	1,290	1,330
2	149	170	1,760	1,820	9,000	1,660	202	2,430	129	1,640	1,950	1,380
3	119	166	1,650	1,820	10,500	1,570	1,640	2,150	1,110	1,170	1,830	1,370
4	572	157	148	1,810	3,320	1,650	1,620	2,110	1,140	1,150	2,320	1,360
5	148	157	141	1,820	3,210	1,610	196	2,070	1,140	1,170	1,300	1,330
6	564	162	1,630	3,410	3,230	1,640	149	2,090	1,140	1,160	1,270	1,310
7	164	163	1,650	1,890	3,200	3,170	146	2,100	1,150	1,170	1,270	209
8	606	163	3,070	1,760	2,280	1,630	145	2,110	1,140	1,170	1,280	173
9	180	158	1,730	1,880	2,600	1,630	151	2,150	1,600	157	1,280	174
10	154	145	1,680	3,490	3,360	235	149	2,100	1,610	119	1,270	174
11	164	146	1,540	3,430	2,230	1,590	139	2,130	1,610	1,160	1,270	176
12	148	145	1,640	3,450	1,740	246	142	2,110	1,600	1,190	1,300	1,270
13	116	136	2,210	3,970	2,220	155	144	2,050	1,610	1,080	1,310	1,300
14	116	141	1,690	1,920	2,220	1,550	150	182	1,630	1,220	1,280	1,310
15	114	145	1,590	1,800	175	1,720	123	127	1,610	1,170	1,300	219
16	118	136	1,670	1,750	e172	1,560	128	128	1,620	1,180	1,310	185
17	118	137	3,200	1,920	e170	2,580	146	133	1,640	1,180	2,350	179
18	115	136	3,210	3,380	167	2,130	2,090	138	1,630	1,190	1,840	178
19	118	148	1,710	2,420	165	203	2,140	144	1,650	1,200	1,360	173
20	131	150	1,810	1,720	164	153	2,150	361	1,660	1,180	1,300	136
21	163	150	1,640	2,420	158	2,060	215	349	1,630	1,230	1,320	138
22	163	148	1,740	1,810	160	1,620	134	161	2,440	1,190	1,310	127
23	185	142	1,770	1,710	162	2,120	135	142	1,720	1,200	1,660	108
24	173	142	1,790	1,900	155	1,640	135	174	1,660	1,220	2,490	106
25	166	140	3,330	3,290	153	1,650	143	215	1,650	1,200	1,370	591
26	158	139	3,320	1,870	156	192	133	123	1,650	1,210	1,320	633
27	161	141	3,370	1,760	157	149	121	134	1,640	1,210	1,330	143
28	165	149	3,450	1,770	148	1,540	123	134	1,660	1,260	1,880	582
29	171	145	1,860	1,760	---	2,070	134	141	1,620	1,270	1,350	642
30	174	141	1,820	1,670	---	1,670	130	137	1,720	1,300	1,350	138
31	172	---	1,790	3,340	---	1,650	---	131	---	1,250	1,310	---
<b>Total</b>	6,377	4,465	61,189	70,560	54,542	43,922	14,873	30,844	43,938	35,846	46,370	17,144
<b>Mean</b>	206	149	1,974	2,276	1,948	1,417	496	995	1,465	1,156	1,496	571
<b>Max</b>	612	170	3,450	3,970	10,500	3,170	2,150	2,430	2,440	1,650	2,490	1,380
<b>Min</b>	114	136	141	1,670	148	149	121	123	129	119	1,270	106
<b>Ac-ft</b>	12,650	8,860	121,400	140,000	108,200	87,120	29,500	61,180	87,150	71,100	91,970	34,010

**STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 2011, BY WATER YEAR (WY)**

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
<b>Mean</b>	4,278	3,536	3,285	3,655	3,574	4,434	4,826	7,154	10,290	5,663	3,848	2,692
<b>Max</b>	27,860	18,880	13,320	20,630	13,800	24,760	20,400	34,710	66,960	31,790	30,710	13,600
<b>(WY)</b>	(1987)	(1975)	(1997)	(1998)	(1987)	(1987)	(1945)	(1957)	(1957)	(2007)	(2007)	(2007)
<b>Min</b>	66.7	79.6	356	271	678	614	496	712	1,325	1,156	953	325
<b>(WY)</b>	(1957)	(1957)	(2009)	(1945)	(1945)	(1976)	(2011)	(1959)	(2005)	(2011)	(1972)	(1984)

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SUMMARY STATISTICS

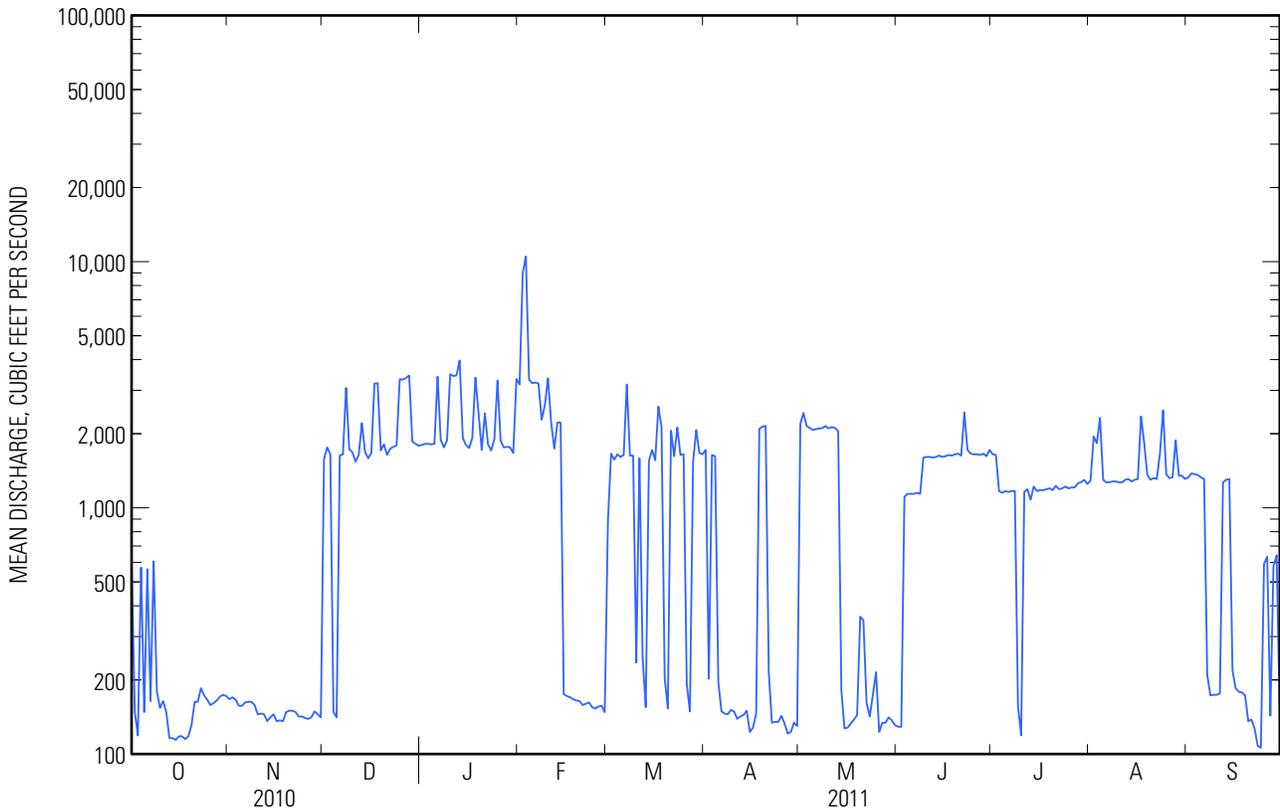
	Calendar Year 2010		Water Year 2011		Water Years 1945 - 2011	
<b>Annual total</b>	1,580,360		430,070		b4,722	
<b>Annual mean</b>	4,330		1,178		16,030	
<b>Highest annual mean</b>					1,121	1987
<b>Lowest annual mean</b>					16,200	2006
<b>Highest daily mean</b>	13,700	Feb 13 <sup>a</sup>	10,500	Feb 3	96,200	Jun 5, 1957
<b>Lowest daily mean</b>	114	Oct 15	106	Sep 24	16	Feb 16, 2003
<b>Annual seven-day minimum</b>	116	Oct 13	116	Oct 13	25	Mar 8, 2000
<b>Maximum peak flow</b>			12,600	Aug 24	c102,000	Jun 5, 1957
<b>Maximum peak stage</b>			11.18	Aug 24	d26.26	Jun 5, 1957
<b>Annual runoff (ac-ft)</b>	3,135,000		853,000		3,421,000	
<b>10 percent exceeds</b>	10,700		2,220		10,500	
<b>50 percent exceeds</b>	3,710		1,260		2,690	
<b>90 percent exceeds</b>	156		137		169	

<sup>a</sup> Also Feb 14, 16 and 17.

<sup>b</sup> Prior to regulation, water years 1924-43, 5,683 ft<sup>3</sup>/s.

<sup>c</sup> Maximum discharge for period of record, 201,000 ft<sup>3</sup>/s, May 21, 1935.

<sup>d</sup> Maximum gage height for period of record, 32.00 ft, Apr. 25, 1942, site and datum then in use.



**07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX—Continued****WATER-QUALITY RECORDS**

PERIOD OF RECORD.--May 1944 to August 1989; October 1996 to 2007; October 2009 to September 30, 2011 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: May 1944 to September 1989; February 1997 to September 2009, October 2009 to September 2011 (discontinued). Data available upon request.

WATER TEMPERATURE: October 1945 to September 1989; February 1997 to September 2009, October 2009 to September 2011 (discontinued). Data available upon request.

INSTRUMENTATION.--Water-quality monitor February 1997 to September 30, 2011 (discontinued). QW monitoring equipment consists of a 2 parameter Hydrolab Reporter collecting Temperature and Specific Conductance housed in a polyethylene tube. Datasonde is suspended horizontally within tube (equipment removed).

REMARKS.--Samples collected periodically by the U.S. Geological Survey. Specific conductance, pH, water temperature, air temperature, dissolved oxygen, and alkalinity were determined in the field.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 3,520 microsiemens Aug. 14, 1944; minimum daily, 656 microsiemens Oct. 16, 1945.

WATER TEMPERATURE: Maximum daily, 31.0°C July 17, 1969; minimum daily, 3.0°C Feb. 2-4, 7, 1966.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 1730 microsiemens Mar. 24 ; minimum, 782 microsiemens Nov. 10.

WATER TEMPERATURE: Maximum, 26.7 °C Sep. 26; minimum, 5.5 °C Jan. 29.

**WATER-QUALITY DATA**  
**WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011**

Part 1 of 8

[%, percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Barometric pressure, mm Hg (00025)	Temperature, air, °C (00020)	Discharge, instantaneous, ft <sup>3</sup> /s (00061)	Dissolved oxygen, water, unfiltered, mg/L (00300)	Dissolved oxygen, water, unfiltered, % saturation (00301)	pH, water, unfiltered, field, standard units (00400)	Specific conductance, water, unfiltered, µS/cm at 25 °C (00095)	Temperature, water, °C (00010)	Dissolved solids, water, filtered, sum of constituents, mg/L (70301)
11-03-2010	1030	750	13.2	164	9.8	108	7.4	1,650	18.9	912
01-06-2011	1300	752	14.5	926	11.8	105	8.3	1,740	9.4	996
03-14-2011	1200	753	8.5	147	12.2	112	8.3	1,790	10.6	998
05-25-2011	1400	748	38.0	143	11.3	126	8.2	1,860	19.5	583
07-21-2011	1130	751	32.7	134	5.7	67	7.7	1,870	22.6	1,070

## 07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX—Continued

## WATER-QUALITY DATA

## WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

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[%, percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Dissolved solids, water, filtered,		Hardness, water, mg/L as CaCO <sub>3</sub> (00900)	Non-carbonate hardness, water, filtered, field, mg/L as CaCO <sub>3</sub> (00904)		Suspended solids, water, unfiltered, mg/L (00530)	Calcium, water, filtered, mg/L (00915)	Magnesium, water, filtered, mg/L (00925)	Potassium, water, filtered, mg/L (00935)	Sodium adsorption ratio, water, number (00931)
		tons per acre-foot (70303)	Dissolved solids, water, tons per day (70302)		mg/L as CaCO <sub>3</sub> (00900)	mg/L as CaCO <sub>3</sub> (00904)					
11-03-2010	1030	1.24	404	333	217	54	82.8	30.6	5.32	4.35	
01-06-2011	1300	1.35	2,490	339	197	17	83.7	31.6	5.45	4.77	
03-14-2011	1200	1.36	396	368	266	< 15	91.3	33.9	5.66	4.90	
05-25-2011	1400	.79	225	237	135	86	63.7	18.8	5.08	3.18	
07-21-2011	1130	1.46	388	389	247	< 15	92.9	38.0	6.09	5.15	

## WATER-QUALITY DATA

## WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

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[%, percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Sodium fraction of cations, water, percent in equivalents of major cations (00932)	Sodium, water, filtered, mg/L (00930)	Alkalinity, water, filtered, inflection-point, incremental titration method, field, mg/L as CaCO <sub>3</sub> (39086)		Bicarbonate, water, filtered, inflection-point, incremental titration method, field, mg/L (00453)		Carbonate, water, filtered, inflection-point, incremental titration method, field, mg/L (00452)		Chloride, water, filtered, mg/L (00940)	Fluoride, water, filtered, mg/L (00950)
				mg/L as CaCO <sub>3</sub> (39086)	mg/L as CaCO <sub>3</sub> (39086)	mg/L as CaCO <sub>3</sub> (00453)	mg/L as CaCO <sub>3</sub> (00453)	mg/L as CaCO <sub>3</sub> (00452)	mg/L as CaCO <sub>3</sub> (00452)		
11-03-2010	1030	54	182	116	141	9.1	< 1	313	.30		
01-06-2011	1300	56	202	144	173	1.4	< 1	344	.28		
03-14-2011	1200	56	216	102	124	1.0	< 1	346	.29		
05-25-2011	1400	50	112	102	124	1.2	< 1	175	.18		
07-21-2011	1130	56	234	143	173	5.7	< 1.0	353	.30		

## 07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX—Continued

**WATER-QUALITY DATA**  
**WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011**

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[% , percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Silica, water, filtered, mg/L as SiO <sub>2</sub> (00955)	Sulfate, water, filtered, mg/L (00945)	Ammonia		Ammonia, water, filtered, mg/L as NH <sub>4</sub> (00608)	Nitrate		Nitrate, water, filtered, mg/L as N (00618)	Nitrite, water, filtered, mg/L (00625)
				Ammonia, water, filtered, mg/L as N (00625)	Ammonia, water, filtered, mg/L as N (00608)		Nitrate, water, filtered, mg/L as N (00631)	Nitrate, water, filtered, mg/L as N (00618)		
11-03-2010	1030	5.1	222	.62	.075	.058	.22	.961	.217	.013
01-06-2011	1300	.8	242	.41	.055	.043	.10	.439	.099	.016
03-14-2011	1200	1.8	241	.54	.068	.053	.07	.285	.064	.012
05-25-2011	1400	4.5	142	.98	.077	.060	.18	.698	.158	.063
07-21-2011	1130	4.4	255	.79	.584	.453	.03	.111	.025	.003

**WATER-QUALITY DATA**  
**WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011**

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[% , percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Nitrite, water, filtered, mg/L as N (00613)	Organic nitrogen, water, unfiltered, mg/L (00605)	Orthophosphate, water, filtered, mg/L (00660)	Orthophosphate, water, filtered, mg/L as P (00671)	Phosphorus, water, filtered, mg/L as P (00666)	Phosphorus, water, unfiltered, mg/L as P (00665)	Total nitrogen, water, unfiltered, mg/L (00600)	Barium, water, filtered, µg/L (01005)
01-06-2011	1300	.005	.37	.031	.010	< .02	< .02	.52	145
03-14-2011	1200	.004	.48	.021	.007	< .02	.05	.60	144
05-25-2011	1400	.019	.92	.036	.012	< .02	.14	1.2	94
07-21-2011	1130	.001	.33	.939	.306	.28	.31	.81	155

**WATER-QUALITY DATA**  
**WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011**

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[% , percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Barium, water, unfiltered, recoverable, µg/L (01007)	Cadmium, water, filtered, µg/L (01025)	Cadmium, water, unfiltered, µg/L (01027)	Chromium, water, filtered, µg/L (01030)	Chromium, water, unfiltered, recoverable, µg/L (01034)	Copper, water, filtered, µg/L (01040)	Copper, water, unfiltered, recoverable, µg/L (01042)	Iron, water, filtered, µg/L (01046)	Iron, water, unfiltered, recoverable, µg/L (01045)
01-06-2011	1300	140	< .02	< .05	.07	.89	1.7	< .70	4	55
03-14-2011	1200	149	< .02	< .05	< .06	.23	1.5	< .70	4	21
05-25-2011	1400	114	< .02	< .05	.10	1.8	1.2	2.4	65	1,490
07-21-2011	1130	158	< .02	< .05	< .06	.83	< .50	< .70	7	58

## 07331600 RED RIVER AT DENISON DAM NEAR DENISON, TX—Continued

## WATER-QUALITY DATA

## WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

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[%, percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Lead, water, filtered, µg/L (01049)	Lead, water, unfiltered, recoverable, µg/L (01051)	Manganese, water, filtered, µg/L (01056)	Manganese, water, unfiltered, recoverable, µg/L (01055)	Mercury, water, filtered, µg/L (71890)	Mercury, water, unfiltered, recoverable, µg/L (71900)	Nickel, water, filtered, µg/L (01065)	Nickel, water, unfiltered, recoverable, µg/L (01067)	Silver, water, filtered, µg/L (01075)
11-03-2010	1030	.08	1.83	8.3	494	< .005	< .005	1.0	3.0	< .01
01-06-2011	1300	.17	.38	3.8	21.8	< .005	< .005	1.1	1.4	< .01
03-14-2011	1200	.25	.06	16.7	30.1	< .005	< .005	1.2	1.2	< .01
05-25-2011	1400	.20	1.90	49.9	162	< .005	.009	1.7	3.1	< .01
07-21-2011	1130	.08	.09	626	615	< .005	< .005	.97	.91	< .01

## WATER-QUALITY DATA

## WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

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[%, percent; CaCO<sub>3</sub>, calcium carbonate; N, nitrogen; P, phosphorus; SiO<sub>2</sub>, silicon dioxide; ft<sup>3</sup>/s, cubic feet per second; mg/L, milligrams per liter; mm Hg, millimeters of mercury; °C, degrees Celsius; µS/cm, microsiemens per centimeter; µg/L, micrograms per liter; <, less than]

Date	Sample start time	Silver, water, unfiltered, recoverable, µg/L (01077)	Zinc, water, filtered, µg/L (01090)	Zinc, water, unfiltered, recoverable, µg/L (01092)	Arsenic, water, filtered, µg/L (01000)	Arsenic, water, unfiltered, µg/L (01002)
11-03-2010	1030	< .01	< 1.4	6.7	2.2	5.4
01-06-2011	1300	< .01	1.8	2.5	1.8	4.0
03-14-2011	1200	< .01	2.7	< 2.4	1.5	3.3
05-25-2011	1400	< .01	1.6	8.9	1.4	2.9
07-21-2011	1130	< .01	< 1.4	< 2.4	4.2	4.2