

Stream Monitoring

The Elm Creek watershed contains several large depressions and drainageways. Water is generally directed from the south and west to the northeast via four main drainageways – Rush Creek, North Fork Rush Creek, Diamond Creek, and Elm Creek. These drainageways converge in the Elm Creek Park Reserve and enter Hayden Lake. Water is eventually discharged to the Mississippi River near the Mill Pond in Champlin.

The monitoring station in Champlin, located at the Elm Creek Road crossing in the Elm Creek Park Reserve, is operated in cooperation with the United States Geological Survey (USGS). The Commission shares the costs of operating the station, which collects continuous flow data and periodic event and base water quality data. The watershed area above the gauging station is 86 square miles, or 81% of the hydrologic watershed.

Both grab samples and storm runoff samples are collected and analyzed for various parameters. Analyses of the streamflow and water quality monitoring data for Elm Creek and its tributaries are summarized below. Real time data from the monitoring station in Champlin may be viewed on the Internet at http://waterdata.usgs.gov/mn/nwis/uv/?site_no=05287890&PARAMeter_cd=00065,00060.

Flow Monitoring

Storm event samples are collected using an automatic sampler. Routine manual sampling occurs approximately monthly. The average daily discharge for the 2011 WY, October 1, 2010 through September 30, 2011, was 86.4 cubic feet per second (cfs) or 13.63 inches. During the same period, the minimum and maximum observed average daily discharge values were 2.7 cfs and 723 cfs, respectively. The long-term average daily discharge at the station is 39.2 cfs or 6.19 inches (years 1979-2011). A spreadsheet of the data received in 2011 water year (WY), including daily discharge and summary information, long-term flow volumes (calendar and water years), the flow hydrograph and the annual instantaneous peak discharge values at the gauging station for the period of record are also found in this appendix.

Elm Creek Annual Instantaneous Peak Discharge Rates					
Date	Peak Flow (cfs)	Date	Peak Flow (cfs)	Date	Peak Flow (cfs)
4/4/79	307	8/1/90	225	4/25/01	875**
3/25/80	199	6/1/91	371	5/11/02	554
6/15/81	44	3/8/92	380	6/28/03	695
4/3/82	471*	6/22/93	315	6/03/04	350
3/9/83	408	4/30/94	669*	10/30/04	118
2/25/84	341	3/17/95	237	10/09/05	295
3/18/85	579*	3/19/96	407	3/17/07	223
3/27/86	812*	4/1/97	511*	5/4/08	205
8/1/87	185	4/5/98	306	3/27/09	119
3/27/88	39	5/15/99	538*	3/17/10	369
3/31/89	159	7/13/00	112	3/24/11	803

*These values have been revised based on the 2001 rating curve.

**All-time instantaneous peak discharge. 100-year flood discharge at this site is 2290 cfs.

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES
Station No 05287890 Elm Creek Nr Champlin, MN SourceAgencyUSGSState 27 County 053
WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011
Daily Mean Values Discharge, cubic feet per second[e, estimated]

<u>DAY</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>
1	130	48	e22	e31	e19	e47	294	171	271	84	55	16
2	117	47	e21	e28	e20	e45	295	178	235	74	57	14
3	104	45	e21	e29	e20	e43	296	176	202	62	56	16
4	91	42	e21	e26	e19	e39	308	169	174	54	53	16
5	81	38	e21	e25	e19	e36	311	165	148	50	50	15
6	71	35	e20	e25	e18	e34	301	158	127	48	47	13
7	62	33	e20	e26	e18	e32	276	146	109	44	44	12
8	55	30	e19	e24	e18	e31	250	132	93	39	39	10
9	50	27	e19	e23	e19	e29	223	126	79	37	35	9.1
10	45	25	e19	e23	e19	28	220	123	67	34	30	8.0
11	41	23	e19	e22	e21	27	214	117	59	38	26	7.3
12	37	22	e19	e22	e25	27	197	123	51	36	22	6.9
13	33	23	e19	e21	e29	29	179	143	45	33	20	6.0
14	29	26	e18	e21	e33	32	163	146	40	31	19	5.3
15	26	29	e17	e21	e37	25	145	144	46	39	16	4.7
16	23	30	e17	e21	e42	27	131	138	55	113	17	4.2
17	21	29	e16	e20	e49	41	118	129	53	200	56	3.9
18	18	29	e17	e20	e57	80	107	118	51	231	83	3.7
19	16	29	e16	e20	e62	122	97	106	50	268	81	3.5
20	14	27	e15	e19	e67	200	90	97	48	276	81	3.2
21	13	28	e15	e19	e67	341	85	133	60	248	78	3.3
22	11	27	e15	e19	e68	476	80	435	81	203	70	3.0
23	10	29	e15	e19	e67	622	77	666	96	176	61	2.8
24	11	29	e16	e19	e66	646	73	723	110	163	53	2.8
25	12	27	e16	e18	e64	525	69	644	130	143	44	2.7
26	24	27	e16	e18	e59	478	82	563	147	120	37	2.7
27	41	25	e17	e17	e55	431	108	485	152	107	31	2.7
28	46	24	e18	e16	e51	396	116	425	141	96	26	2.7
29	47	24	e20	e16	---	356	126	376	120	82	23	2.7
30	48	e23	e26	e17	---	322	145	339	99	70	19	3.0
31	48	---	e35	e19	---	293	---	308	---	60	17	---

Statistics for Water Year October 2010 to September 2011

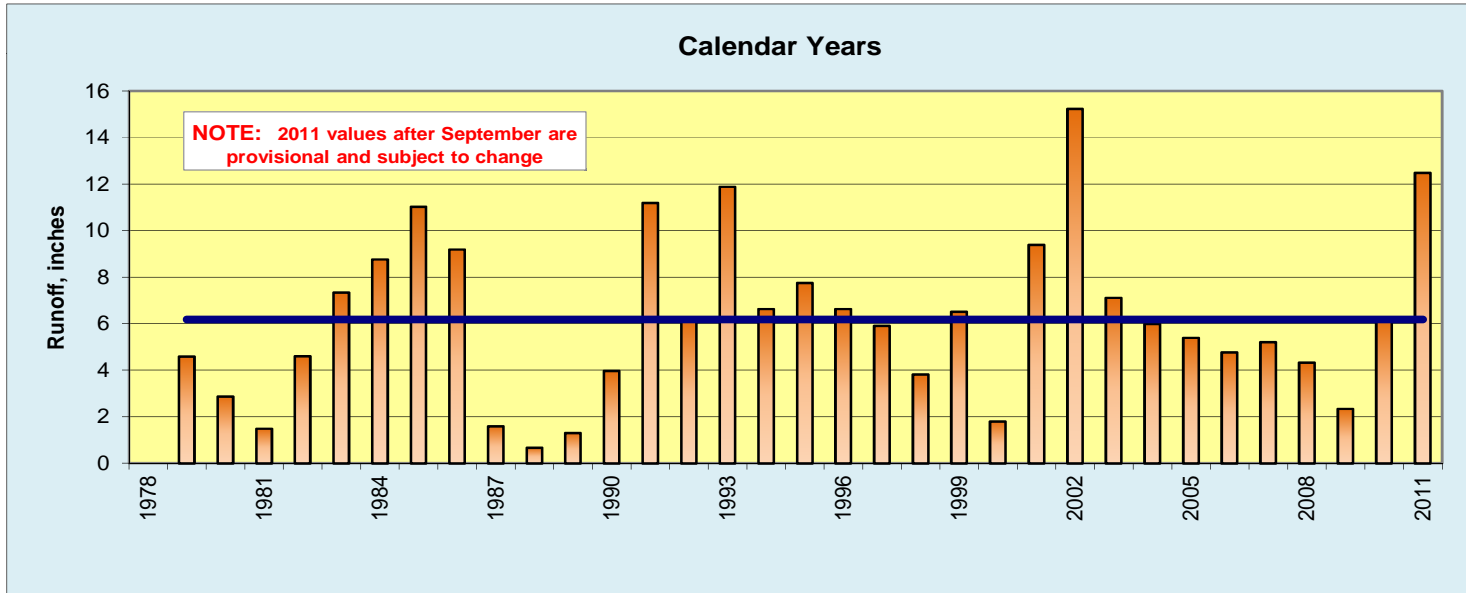
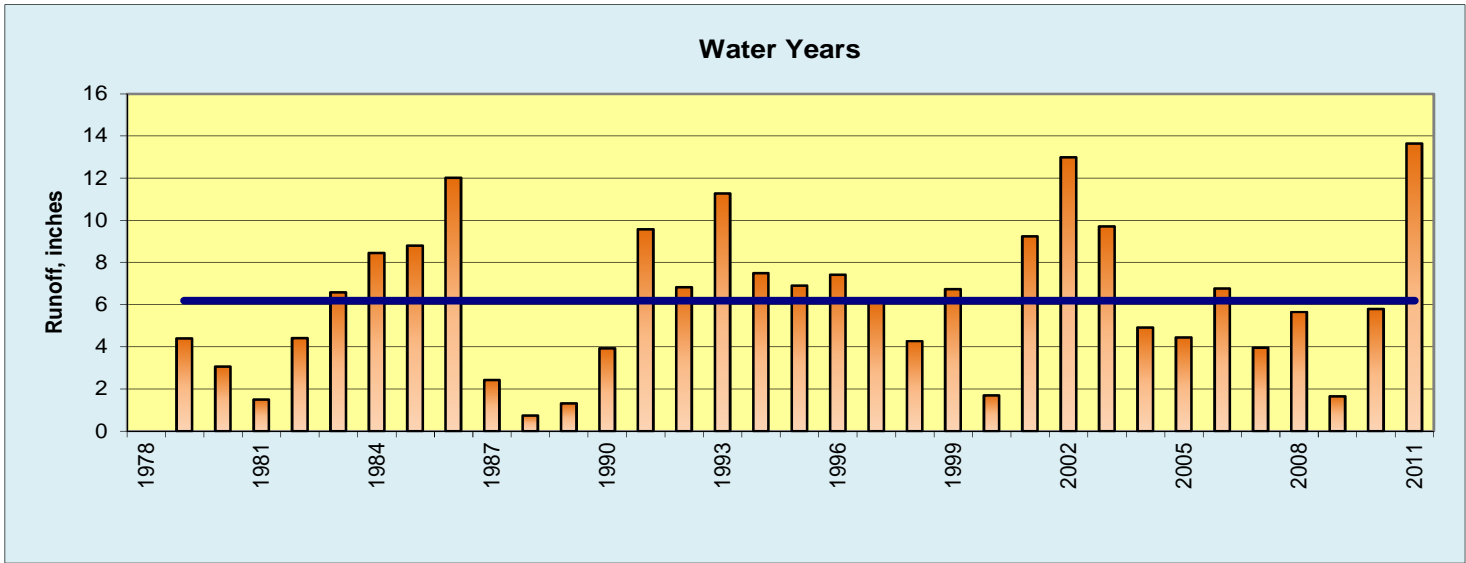
Total	1,375	900	585	664	1,108	5,860	5,176	7,902	3,139	3,259	1,346	206.2
Mean	44.4	30.0	18.9	21.4	39.6	189	173	255	105	105	43.4	6.87
Max	130	48	35	31	68	646	311	723	271	276	83	16
Min	10	22	15	16	18	25	69	97	40	31	16	2.7
Ac-ft	2,730	1,790	1,160	1,320	2,200	11,620	10,270	15,670	6,230	6,460	2,670	409
Cfsm	0.52	0.35	0.22	0.25	0.46	2.20	2.01	2.96	1.22	1.22	0.50	0.08
Inches	0.59	0.39	0.25	0.29	0.48	2.53	2.24	3.42	1.36	1.41	0.58	0.09

Statistics of monthly mean data for 1979-2011, by Water Year (WY)

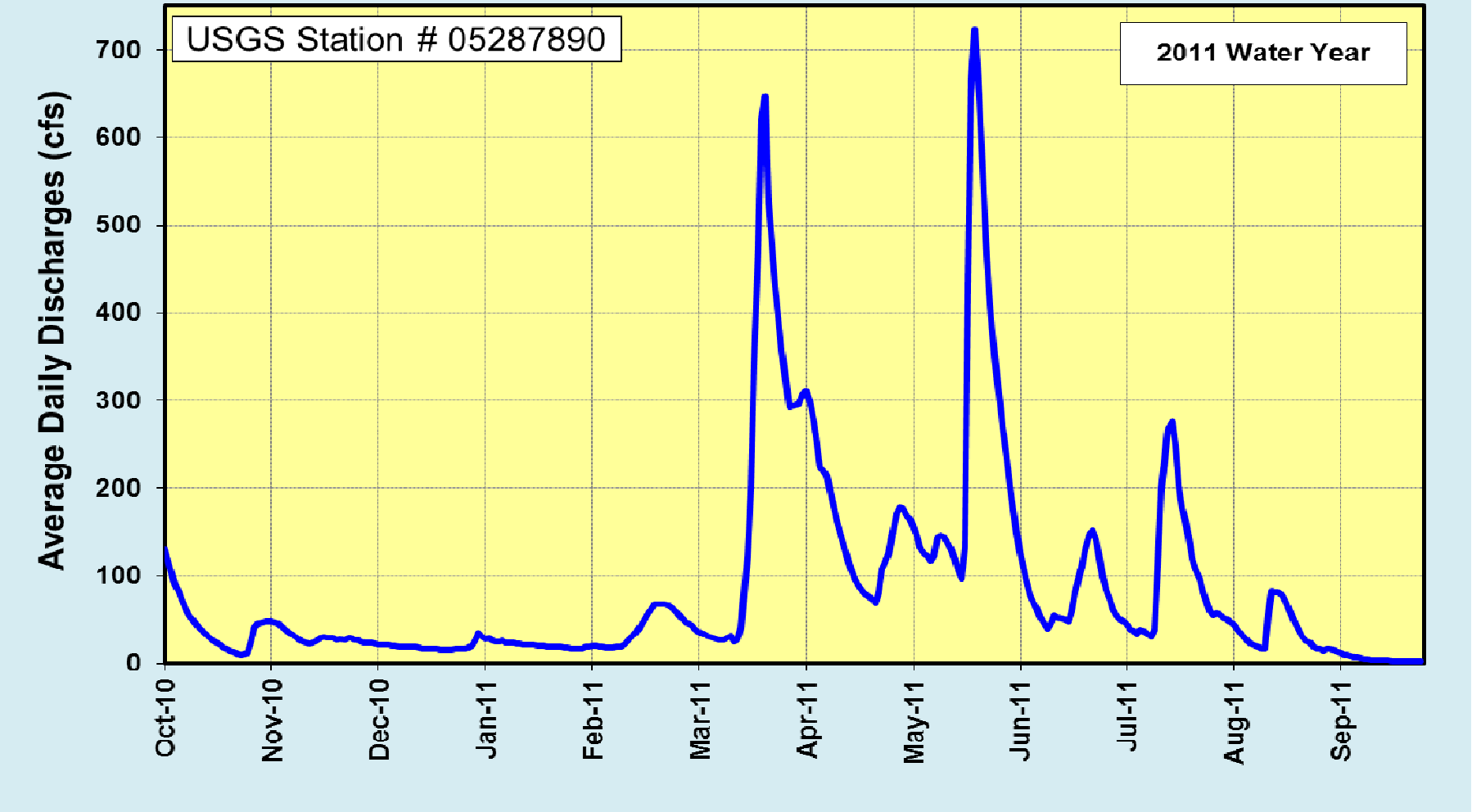
Mean	33.6	21.3	10.4	5.70	9.49	65.2	103	74.5	51.7	39.5	28.1	26.6
Max	240	67.4	41.3	22.0	99.1	189	414	255	196	157	151	170
(WY)	(1986)	(1994)	(1992)	(1992)	(1984)	(2011)	(2001)	(2011)	(2004)	(1993)	(2002)	(1991)
Min	1.13	1.03	0.92	0.74	0.91	3.86	5.31	3.54	1.34	0.76	1.37	1.08
(WY)	(1990)	(1990)	(1990)	(1991)	(1990)	(2001)	(1987)	(2000)	(1988)	(1988)	(2008)	(1988)

Summary Statistics

	<u>Calendar Year 2010</u>	<u>Water Year 2011</u>	<u>Water Years 1979 - 2011</u>
Annual total	14,462.49	31,520.2	
Annual mean	39.6	86.4	39.2
Highest annual mean			86.4 2011
Lowest annual mean			4.54 1988
Highest daily mean	357 Mar 17	723 May 24	815 Apr 25, 2001
Lowest daily mean	0.94 Jun 3	a2.7 Sep 25	0.31 Jun 30, 1988
Annual seven-day minimum	0.98 Feb 28	2.7 Sep 23	0.35 Jun 26, 1988
Maximum peak flow		803 Mar 24	875 Apr 25, 2001
Maximum peak stage		9.81 Mar 24	10.02 Apr 25, 2001
Instantaneous low flow		2.6 Sep 28	0.29 Jul 9, 1989
Annual runoff (ac-ft)	28,690	62,520	28,390
Annual runoff (cfs)	0.461	1.00	0.456
Annual runoff (inches)	6.26	13.63	6.19
10 percent exceeds	99	221	110
50 percent exceeds	24	39	12
90 percent exceeds	1.8	15	1.6



Elm Creek near Champlin Average Daily Discharges



Elm Creek Near Champlin (USGS Station 05287890)

Manual Water Quality Samples for Water Year 2011

(Selected Parameters)

USGS Parameter #		P00010	P00020	P00025	P00061	P00095	P00300	P00301	P00340	P00400
DATE	Sample Start Time	Water Temp. °C	Air Temp. °C	Barom Press mm Hg	Disch Inst cfs	Sp cond mS/cm	DO mg/L	DO % Satur	COD mg/L	pH
26-Oct-10	14:20	11.4	7.0	704	32.0	528	8.6	85	30	6.6
19-Nov-10	10:00	2.0	2.9	743	29.0	569	11.6	86	40	7.4
8-Dec-10	10:20	0.0	-5.0	745	E 20	695	9.6	67	30	6.9
28-Jan-11	14:10	0.0	-1.0	736	16.0	814	8.7	62	40	6.7
25-Feb-11	14:30	0.0	-11.0	746	E 100	860	6.6	46	50	6.8
14-Mar-11	13:25	0.4		747	44.0	926	6.4	45	50	6.8
15-Apr-11	13:20	7.8	2.0	739	150.0	559	E 9.9	E 86	30	7.2
24-May-11	14:40	17.7		734	796.0	454	6.6	72	30	7.6
6-Jun-11	14:00	23.7	33.3	733	128.0	494	E 6.2	E 77	40	7.7
20-Jul-11	8:40	27.2	33.3	730	273.0	485	1.4	18	40	7.4
23-Aug-11	10:20	22.1	24.0	734	67.0	463	4.4	53	40	7.5
8-Sep-11	11:30	16.5	27.6	746	14.0	518	6.6	69	40	7.6

USGS Parameter #		P00530	P00535	P00608	P00613	P00625	P00631	P00665	P00666	P00940
DATE	Sample Start Time	TSS mg/L	Volatile Residue mg/L	Ammonia mg/L	Nitrite mg/L	Total Nitrogen mg/L	Dissolved NO ₂ +NO ₃ mg/L	Total P mg/L	Dissolved P mg/L	Dissolved Chloride mg/L
26-Oct-10	14:20	< 15	< 10	0.069	0.021	1.10	0.21	0.15	0.09	53.1
19-Nov-10	10:00	< 15	< 10	0.023	0.002	0.90	0.04	0.07	0.03	61.9
8-Dec-10	10:20	< 15	< 10	0.076	0.004	1.10	0.12	0.07	0.04	76.7
28-Jan-11	14:10	63	46	0.278	0.003	1.30	0.09	0.34	0.03	84.2
25-Feb-11	14:30	< 30	< 20	0.409	0.004	1.60	0.11	0.49	0.08	108.0
14-Mar-11	13:25	< 30	< 20	0.392	0.004	1.60	0.07	0.64	0.02	114.0
15-Apr-11	13:20	< 30	20	0.011	0.003	0.92	< 0.02	0.11	0.10	65.1
24-May-11	14:40	15	< 10	0.032	0.018	0.84	0.17	0.17	0.10	53.0
6-Jun-11	14:00	< 30	< 20	0.047	0.004	1.10	0.04	0.32	0.23	45.9
20-Jul-11	8:40	< 30	< 20	0.282	0.007	1.50	0.03	0.48	0.27	45.7
23-Aug-11	10:20	< 30	< 20	0.033	0.002	1.00	0.05	0.28	0.17	41.7
8-Sep-11	11:30	< 30	< 20	0.1	0.038	1.20	0.23	0.20	0.13	42.0

Data are provisional and are subject to change

E = Estimated

Automatic Event Samples for Water Year 2011

(Selected parameters)

USGS Parameter #			P00095	P00340	P00400	P00530	P00608	P00613	P00625	P00631	P00665	P00666	P00940
DATE & TIME			Sp Cond μS/cm	COD mg/L	pH	TSS mg/L	Ammonia mg/L	Nitrite mg/L	Total N mg/L	Dissolved NO ₂ +NO ₃ mg/L	Total P mg/L	Dissolved P mg/L	Dissolved Chloride mg/L
26-Oct-10	01:26	to	548	40	7.3	< 15	0.04	0.012	1.2	0.25	0.19	0.1	57.3
28-Oct-10	10:27												
21-Mar-11	15:56	to	548	30	7.3	26	0.216	0.052	1.3	1.21	0.29	0.08	65
23-Mar-11	18:56												
26-Apr-11	09:29	to	618	40	7.3	30	0.017	0.002	1.1	0.08	0.2	0.06	78.7
27-Apr-11	09:29												
21-Jun-11	17:28	to	505	40	8	21	0.06	0.022	1.3	0.3	0.3	0.17	48.9
24-Jun-11	08:28												
24-Jun-11	11:22	to	527	40	8.1	< 15	0.04	0.009	1.1	0.1	0.23	0.17	53.8
27-Jun-11	08:22												
15-Jul-11	13:32	to	429	40	7.7	< 30	0.067	0.017	1.3	0.15	0.37	0.19	41.8
18-Jul-11	10:33												
16-Aug-11	18:58	to	421	50	8	48	0.027	0.012	1.5	0.16	0.37	0.13	35.1
18-Aug-11	06:58												

USGS Parameters

- # P00010 - Temperature, water, degrees Celsius
- # P00020 - Temperature, air, degrees Celsius
- # P00025 - Barometric pressure, millimeters of mercury
- # P00061 - Discharge, instantaneous, cubic feet per second
- # P00095 - Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius
- # P00300 - Dissolved oxygen, water, unfiltered, milligrams per liter
- # P00301 - Dissolved oxygen, water, unfiltered, percent of saturation
- # P00340 - Chemical oxygen demand, high level, water, unfiltered, milligrams per liter
- # P00400 - pH, water, unfiltered, field, standard units
- # P00530 - Residue, total nonfilterable, milligrams per liter
- # P00535 - Loss on ignition, from nonfilterable residue, milligrams per liter
- # P00608 - Ammonia, water, filtered, milligrams per liter as nitrogen
- # P00613 - Nitrite, water, filtered, milligrams per liter as nitrogen
- # P00625 - Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen
- # P00631 - Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen
- # P00665 - Phosphorus, water, unfiltered, milligrams per liter
- # P00666 - Phosphorus, water, filtered, milligrams per liter
- # P00940 - Chloride, water, filtered, milligrams per liter