

**Basin Watershed Monitoring
Data Summary Report
2016–2020**



Crystal Mine Adit, 2009

prepared by

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Data Summary Report
2016–2020

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Table of Contents

1.0 Introduction.....	5
2.0 Purpose and Objectives.....	5
3.0 Background and Site Description	6
4.0 Summary of Adit Discharge Flow Monitoring.....	8
5.0 Summary of Adit Discharge <i>in situ</i> Physical Parameter Monitoring	14
5.1 Bullion Mine	15
5.2 Crystal Mine.....	17
6.0 Water-Quality Sampling	17
7.0 Data Quality	21
8.0 Summary of Bullion Mine Well—Water-Level Monitoring.....	21
9.0 Summary	22
10.0 References.....	24
Appendix 1: Bullion Mine-Upper and Lower Flumes—Yearly Physical Parameter Graphs.....	25
Appendix 2: Crystal Mine—Yearly Physical Parameter Graphs	44
Appendix 3: Water-Quality Results.....	50

List of Figures

Figure 1. Site location map	7
Figure 2. Upper Bullion (top) and Lower Bullion (bottom) flumes.	9
Figure 3. Crystal Mine flume.....	10
Figure 4. Upper Bullion flume filled with sediment after summer rain event.....	11
Figure 5. Transducers showing various levels of fouling	11
Figure 6. Winter conditions at lower Bullion Mine flume.....	12
Figure 7. Upper Bullion Mine flow hydrograph.....	12
Figure 8. Lower Bullion Mine flow hydrograph.....	13
Figure 9. Crystal Mine flow hydrograph.	13
Figure 10. Example of probe fouling due to encrustation.....	14
Figure 11. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Upper Bullion Mine sampling location mine from 2016 to 2020.	19
Figure 12. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Lower Bullion Mine sampling location mine from 2016 to 2020.	20
Figure 13. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Crystal Mine from 2016 to 2020.	20
Figure 14. Bullion Mine water-level and temperature graph, 2016–2020.	22

List of Tables

Table 1. Basin drainage flume locations and size.....	8
Table 2. Bullion and Crystal Mine flow statistics (2016–2020), gallons per minute.	14
Table 3. Upper Bullion <i>in situ</i> monitoring summary.....	15
Table 4. Lower Bullion <i>in situ</i> monitoring summary.....	16
Table 5. Crystal Mine <i>in situ</i> monitoring summary.....	17
Table 6. Statistics for the Contaminants of Concern for the Bullion and Crystal Mine sites including both dissolved and total recoverable concentrations.....	18
Table 7. Human health (surface water) and aquatic life exceedances, DEQ-7 standard shown in µg/L. ...	18
Table 8. COC concentrations for four duplicate samples collected from the upper Bullion Mine site with relative percent difference (RPD) calculations.	21

1.0 Introduction

The Bullion and Crystal mines lie within the Basin Watershed Operable Unit (OU2) of the Basin Mining Area National Priorities List (also known as Superfund) Site. Interim Records of Decision (RODs) were issued by the Environmental Protection Agency (EPA), with State of Montana and U.S. Forest Service concurrence, for remediation and adit discharge treatment at the Bullion and Crystal sites in April 2015 (EPA, 2015a,b). During the fall of 2015, EPA Removal Action Team successfully opened the Bullion Mine adit, establishing a free-flowing drain system. Initial testing following the adit opening indicated that both water chemistry and water quantity changed from previous monitoring.

EPA installed a pumping well into the mine adit as part of the adit-opening, which serves as a monitoring point to measure the water level inside the mine.

EPA and Montana Department of Environmental Quality (DEQ) are developing plans for passive water treatment and contracted with the Montana Bureau of Mines and Geology (MBMG) to perform specific site-monitoring activities to better characterize site conditions, including measurement of discharge from flumes installed downgradient of the adits, and geochemical sampling of adit water. Work performed by the MBMG was conducted under DEQ Contract 415008, following the project Quality Assurance Project Plan (QAPP, MBMG, 2018). All water samples collected were analyzed in the MBMG analytical laboratory, following EPA procedures listed in the QAPP. No monitoring or sampling activities took place during 2019 due to a late renewal of the DEQ contract and an early snow that prevented site access; however, transducers left in-place from 2018 continued to collect data at the three flumes. Due to the large amount of data collected, data from the fall of 2018 to the spring of 2019 was overwritten. Data from May 2019 to July 2020 were recovered and were comparable to previous data collected by the MBMG from 2016 to 2018.

2.0 Purpose and Objectives

The purpose of the MBMG's monitoring and sampling activities was to provide technical assistance and updated flow and chemistry data to DEQ and EPA to assist with ongoing treatment design within the Boulder River Operable Unit (Bullion and Crystal mine sites).

The MBMG was tasked to:

1. Reinstall the pressure transducers and the two fiberglass flumes in the Bullion Mine discharge; one flume is located near the discharge point from the adit and the other just above the site discharge to Jack Creek.
2. Reinstall the fiberglass flume and install a pressure transducer in the Crystal Mine discharge.
3. Monitor the water level in the Bullion Mine pumping well and any additional wells as requested by DEQ. A pressure transducer was installed in the well for continuous water-level monitoring.
4. Collect quarterly inorganic samples for major ions and trace metals from the Bullion Mine and Crystal Mine discharge for both dissolved and total recoverable fractions.
5. Periodically install *in situ* monitors for collection of pH, specific conductance (SC), temperature, dissolved oxygen (DO), and oxidization-reduction potential (ORP) of the discharge water.

3.0 Background and Site Description

The Basin Mining District consists of approximately 300 abandoned hard-rock mine sites within its 77-mi² watershed (fig. 1; EPA, 2013). The Bullion Mine and Crystal Mine are the two major threats to surface-water quality in the district. EPA listed the Basin Mining Area to the Superfund National Priorities List in October 1999. Remedial Investigations and Feasibility Studies were completed followed by the issuance of Interim RODs for both sites in April 2015.

The Bullion Mine is the largest and most productive abandoned/inactive mine in the Basin Mining District, operating periodically from 1897 to 1974. The mine development consisted of three levels, connected by stopes and inclines, with about 4,500 ft of total workings (Metesh and others, 1994). The mine produced approximately 30,000 tons of ore containing gold, silver, copper, lead, and zinc (Metesh and others, 1994). Acid mine drainage from the lower adit is the main source of metal impacts to Jack Creek, a tributary to Basin Creek. EPA identified aluminum, arsenic, antimony, cadmium, copper, iron, lead, silver, and zinc as contaminants of concern (COC).

The Crystal Mine operation consists of both underground workings and open pits, operating periodically from 1883 to 1984. Total ore production was reported to have been approximately 22,500 tons, consisting of gold, silver, copper, lead, and zinc (Metesh and others,

1995). Underground workings consist of two adits with total workings of 6,000 ft over 200–300 vertical ft. Acid mine drainage from the adit contains elevated concentrations of several COCs and drains to Uncle Sam Gulch, a tributary to Cataract Creek.

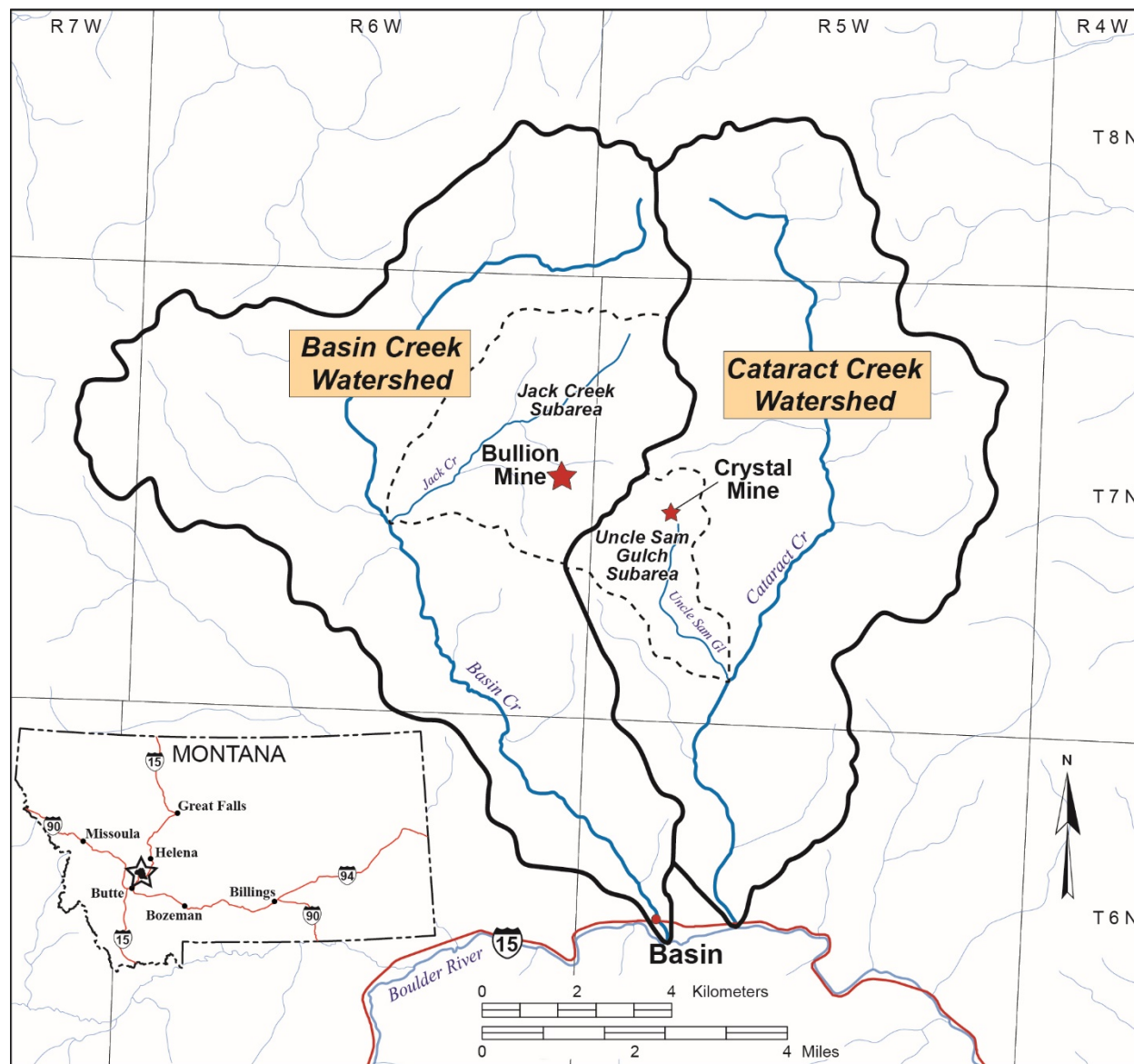


Figure 1. Site location map.

4.0 Summary of Adit Discharge Flow Monitoring

Flumes for monitoring discharge from the Bullion and Crystal mines were installed along with pressure transducers to measure discharge from the mine adits. Two flumes were installed at the Bullion site, one near the mine adit (upper Bullion) and the other above the confluence of the adit discharge with Jack Creek (lower Bullion). Table 1 contains information on the flume sizes, and figures 2 and 3 show the flume installations. The Crystal Mine flume is located a short distance below the adit discharge. All three transducers were programmed to collect data every 15 min.

Table 1. Basin drainage flume locations, GWIC ID, and size.

Flume Location	GWIC ID	Flume Size
Upper Bullion Mine, near Adit	128469	0.4HS
Lower Bullion Mine	285107	0.5H
Crystal Mine, near Adit	257068	0.5H



Figure 2. Upper Bullion (top) and lower Bullion (bottom) flumes.



Figure 3. Crystal Mine flume located approximately 20 yards downgradient of the adit.

Due to harsh site conditions, i.e., low pH water, high iron concentrations, and sedimentation problems, transducers become encrusted and flumes can become clogged with sediment, affecting data quality. This is especially true at the upper Bullion site, which is adjacent to the access road and receives large amounts of sediment following storm events and spring snowmelt (fig. 4). The discharge data from the upper Bullion site likely overestimates flow due to sedimentation during storm events, in addition to fouling issues. The lower Bullion site also has problems with probe fouling. Figure 5 shows site transducers following deployment from late fall through winter. To reduce fouling issues, new transducers are installed at the beginning of each field season and again in the late fall. Snow and cold temperatures also affect data collection (fig. 6). As a result of the harsh site conditions, there are large periods of questionable flow data from late fall to mid-spring. Obvious periods of bad or questionable data have been removed from the site hydrographs for the upper and lower Bullion sites. Fewer periods of questionable data were noted at the Crystal site, which is less impacted by both chemical fouling and sedimentation. Figures 7–9 are the long-term flow hydrographs for each site, while table 2 presents flow statistics. Appendix 1 contains yearly hydrographs for each site.



Figure 4. Upper Bullion flume filled with sediment after summer rain event.



Figure 5. Transducers showing various levels of fouling, from left to right: lower Bullion, upper Bullion, and Crystal.



Figure 6. Winter conditions at lower Bullion Mine flume.

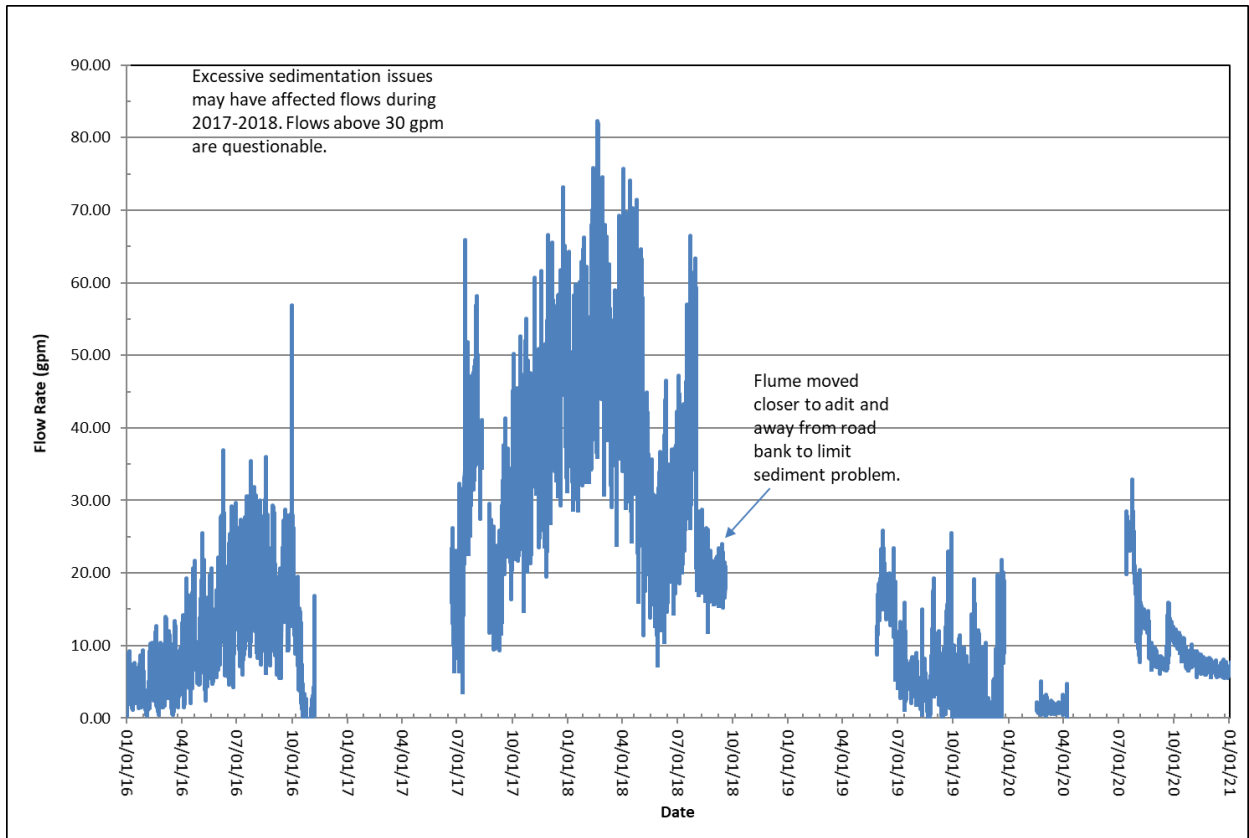


Figure 7. Upper Bullion Mine flow hydrograph.

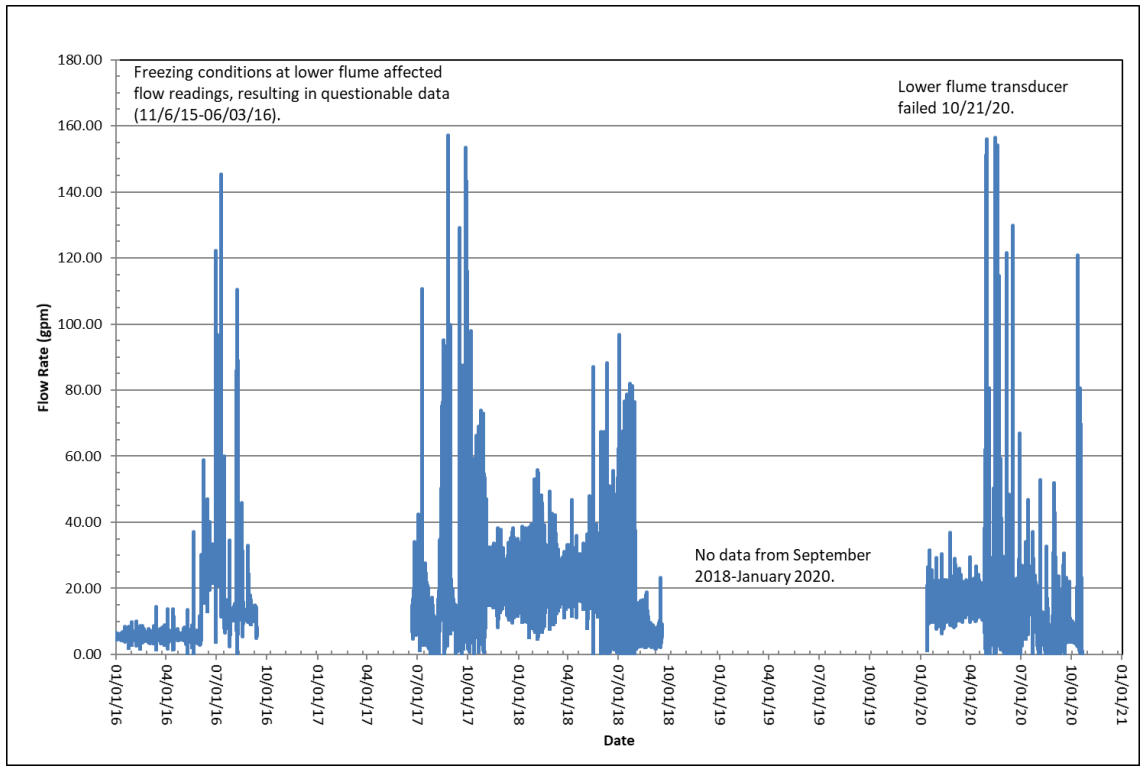


Figure 8. Lower Bullion Mine flow hydrograph.

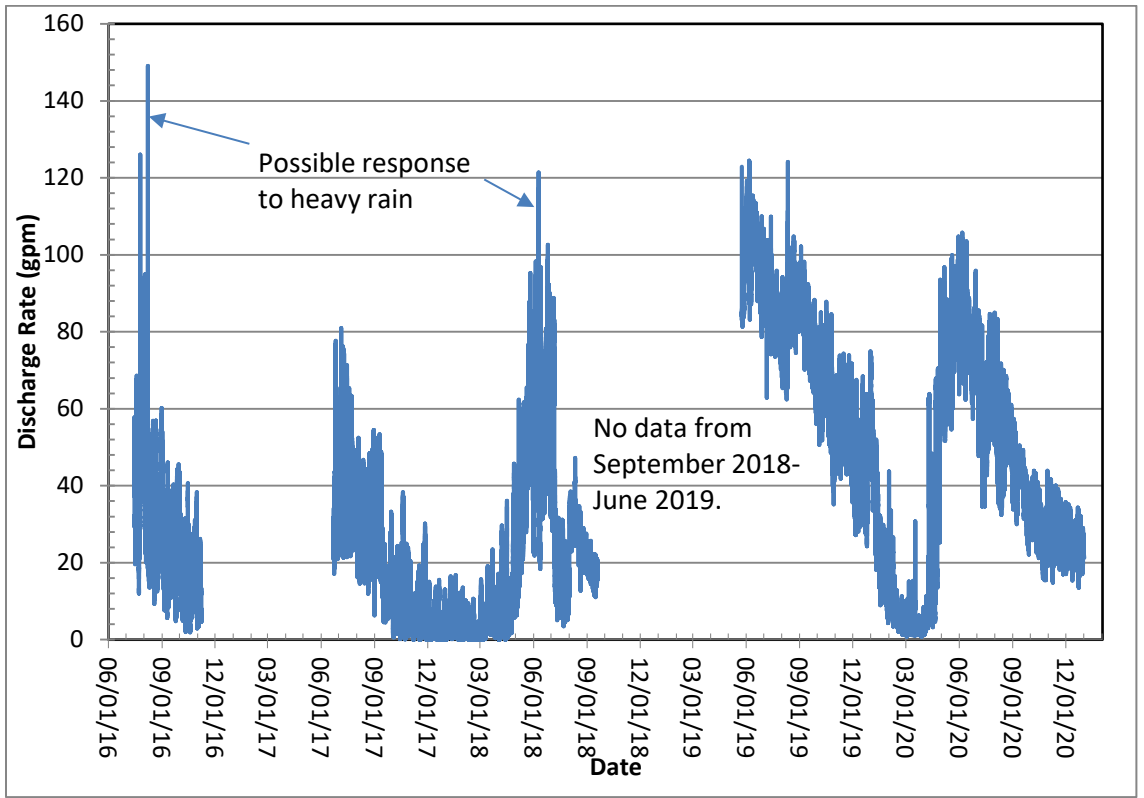


Figure 9. Crystal Mine flow hydrograph.

Table 2. Bullion and Crystal Mine flow statistics (2016-2020), gallons per minute.

Flow Rate (gpm)	Upper Bullion	Lower Bullion	Crystal
Mean	19.0	16.6	32.8
Minimum	0.02	1.0	0.01
Maximum	82.3	157	149
Std Dev.	16.8	11.7	26.5
Number of Readings	107,414	89,054	87,835

5.0 Summary of Adit Discharge *in situ* Physical Parameter Monitoring

Hydrolab Data Sondes were used for the *in situ* monitoring, which consisted of pH, SC, temperature (temp), luminescent dissolved oxygen (LDO), and ORP, reported as Eh. Sondes were calibrated prior to deployment following manufacturer's specifications. Certified standards were used for calibration of pH, SC, and Eh. Sondes were cleaned and probes inspected after deployment and repaired as necessary. Measurements were taken on time intervals that varied from 60 to 120 min. Monitoring intervals were increased from 60 to 120 min to increase battery life and deployment time. Due to harsh site conditions, i.e., low pH water, high iron concentrations, and sedimentation problems, several probes failed (broke or encrusted with iron oxides) throughout the period of monitoring (fig. 10).



Figure 10. Example of probe fouling due to encrustation.

5.1 Bullion Mine

Physical parameter monitoring was performed above the upper flume and just below the lower flume in the discharge water from the Bullion Mine Adit during 2016, 2017, and 2018. Monitoring in 2020 was limited to one site, located just below the lower flume (fig. 2). Tables 3 and 4 show the statistics for the various parameters monitored by location and year. Appendix 2 contains graphs of physical parameter monitoring at the upper and lower monitoring sites for each year.

Table 3. Upper Bullion *in situ* monitoring summary.

2016 (7/15–9/26/16)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	2.47	1461	5.03	4.87	507
Min	1.83	1345	4.88	2.36	472
Max	2.92	1590	5.28	6.77	553
Std Dev	0.38	84.32	0.08	1.02	19.31
Number	998	989	998	442	998
2017 (8/30–11/3/17)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	2.45	1305	4.79	1.57	756
Min	2.37	1204	3.79	0.58	680
Max	2.65	1404	5.80	5.89	805
Std Dev	0.05	53.93	0.28	1.41	39.06
Number	778	778	778	778	778
2018 (8/1–10/31/18)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	2.80	1450	5.01	3.89	708
Min	2.08	1332	4.94	0.29	666
Max	2.87	1624	5.11	7.27	752
Std Dev	0.14	77.76	0.05	1.88	27.10
Number	1129	2,033	2,033	1,915	2,033

Note. No 2019 or 2020 monitoring data.

Table 4. Lower Bullion *in situ* monitoring summary.

2016 (7/15–9/26/16)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	2.56	1,408	8.29	7.58	526
Min	2.28	610	1.16	5.60	457
Max	3.05	1,566	20.37	9.47	580
Std Dev	0.17	95.63	4.44	0.83	29.28
Number	1,199	962	1,197	1,143	1,199

2017 (8/30–11/3/17)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	3.57	1,241	3.30	2.63	698
Min	3.22	1,051	-0.07	1.35	668
Max	3.79	1,521	17.64	9.06	724
Std Dev	0.14	120.61	4.00	1.30	11.77
Number	778	778	778	778	778

2018 (8/1–9/12/18)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	2.91	1,058	8.79	7.08	724
Min	2.76	626	2.23	5.06	676
Max	3.06	1330	20.04	9.81	768
Std Dev	0.06	195.88	4.13	1.04	33.44
Number	1,009	1,009	1,009	973	1,009

Note. No 2019 monitoring data.

2020 (8/6/20–11/31/20)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	3.02	1178	4.12	7.87	675
Min	2.59	602	-0.06	5.70	634
Max	3.44	1,510	18.67	11.0	794
Std Dev	0.29	90	4.60	0.87	39
Number	1,201	789	1,201	862	1,201

5.2 Crystal Mine

Physical parameter monitoring was performed in the discharge water from the Crystal Mine Adit during 2018 and 2020. Due to harsh site conditions, i.e., low pH water, high iron concentrations, and sedimentation problems, several probes failed (broke or encrusted with iron oxides) throughout the period of monitoring. Statistics for the various parameters monitored by year are shown in table 5. Graphs of physical parameters measured for each year are contained in appendix 3.

Table 5. Crystal Mine *in situ* monitoring summary.

2018 (9/18/18–11/2/18)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	4.75	768	4.85	7.90	461
Min	4.38	697	3.36	7.70	451
Max	4.81	796	6.07	8.10	476
Std Dev	0.03	18	0.35	0.07	5.64
Number	1,066	1,066	1,066	972	1,066

2020 (9/22/20–11/03/20)	pH (units)	SC (μ S/cm)	Temp ($^{\circ}$ C)	LDO (mg/L)	ORP (mV)
Mean	4.27	671	4.79	7.85	478
Min	3.41	643	2.39	7.59	460
Max	4.86	691	6.42	8.09	499
Std Dev	0.51	13	0.55	2.87	12
Number	499	499	499	499	499

6.0 Water-Quality Sampling

Dissolved and total recoverable water-quality samples were collected once or twice a year from 2016 to 2020 (except 2019) from the upper and lower Bullion Mine monitoring sites, while samples were collected in 2018 and 2020 from the Crystal Mine discharge. Due to limited site access, all the water-quality samples were collected in the summer through late fall/early winter. Sample collection and analysis procedures are contained in the project QAPP. COC concentrations vary for some analytes, while remaining consistent for others. Table 6 contains statistics for the 9 COCs (includes both dissolved, as measured using a 0.45- μ m filter, and total recoverable, as most of the metals are in the dissolved fraction). One or more of the samples collected at each of the three sites exceeded the DEQ-7 human health (surface water) and aquatic life standards (table 7; DEQ, 2019). Appendix 4 contains results of all samples collected.

The dissolved concentrations of arsenic, cadmium, zinc, and iron for the upper and lower Bullion Mine show the variability of these elements over time (figs. 11, 12). Generally, the

lower concentrations were observed in samples collected later in the sampling season for a given year. Comparing the concentrations in figures 11 and 12 shows the decrease in concentrations between the upper and lower sites. The average decrease in iron concentrations from the upper to the lower Bullion sampling site was about 20 percent for the samples collected from 2016 to 2020. Similar average concentration decreases were observed for aluminum (6 percent), arsenic (21 percent), cadmium (8 percent), copper (9 percent), lead (8 percent), antimony (35 percent), and zinc (7 percent). Only four samples at both sites had measurable silver concentrations.

Concentrations of most analytes at the Crystal Mine were lower in 2020 than in 2018, based on collection of three samples (fig. 13).

Table 6. Statistics for the Contaminants of Concern for the Bullion and Crystal Mine sites including both dissolved and total recoverable concentrations.

	Al (µg/L)	As (µg/L)	Ag* (µg/L)	Cd (µg/L)	Cu (µg/L)	Fe (µg/L)	Pb (µg/L)	Sb (µg/L)	Zn (µg/L)
Upper Bullion									
Mean	9,832	2,375	0.6	243	8,903	116,000	245	15	27,446
Min	8,214	556	0.5	188	5,616	76,000	171	2.6	22,298
Max	11,853	5,556	0.7	312	11,556	181,000	354	42	31,255
Number	18	18	2	18	18	18	18	18	18
Lower Bullion									
Mean	9,653	2,015	1.39	234	8,322	102,290	235	11	26,085
Min	6,593	420	1.39	176	4,300	64,200	154	3.4	18,885
Max	11,550	4,364	1.39	308	10,645	150,280	324	26	31,030
Number	12	12	1	12	12	12	12	12	12
Crystal									
Mean	9,402	346	0.25	542	9,904	49,800	119	5.7	42,013
Min	4,140	107	0.25	368	6,007	40,700	70	2.2	37,042
Max	13,814	807	0.25	684	13,817	66,500	184	11.4	51,420
Number	6	6	1	6	6	6	6	6	6

*Most Ag concentrations were below detection and not considered in the statistical analysis. All other COC concentrations were above detection limits.

Table 7. Human health (surface water) and aquatic life exceedances, DEQ-7 standard (shown in µg/L).

COC (HH, A, C)	Al (NA, 750, 87)	As (10, 340, 150)	*Ag (100, 0.374, NA)	*Cd (5, 0.49, 0.25)	*Cu (1,300, 3.79, 2.85)	Fe (NA, NA, 1,000)	*Pb (15, 13.98, 0.545)	Sb (5.6, NA, NA)	*Zn (7,400, 37, 37)
Upper Bullion	A, C	HH, A, C	A	HH, A, C	HH, A, C	C	HH, A, C	HH	HH, A, C
Lower Bullion	A, C	HH, A, C	A	HH, A, C	HH, A, C	C	HH, A, C	HH	HH, A, C
Crystal	A, C	HH, A, C	—	HH, A, C	HH, A, C	C	HH, A, C	HH	HH, A, C

Note. NA, no applicable standard; HH, human health; A, acute aquatic; C, chronic aquatic

*Aquatic standard based on hardness @ 25 mg/L.

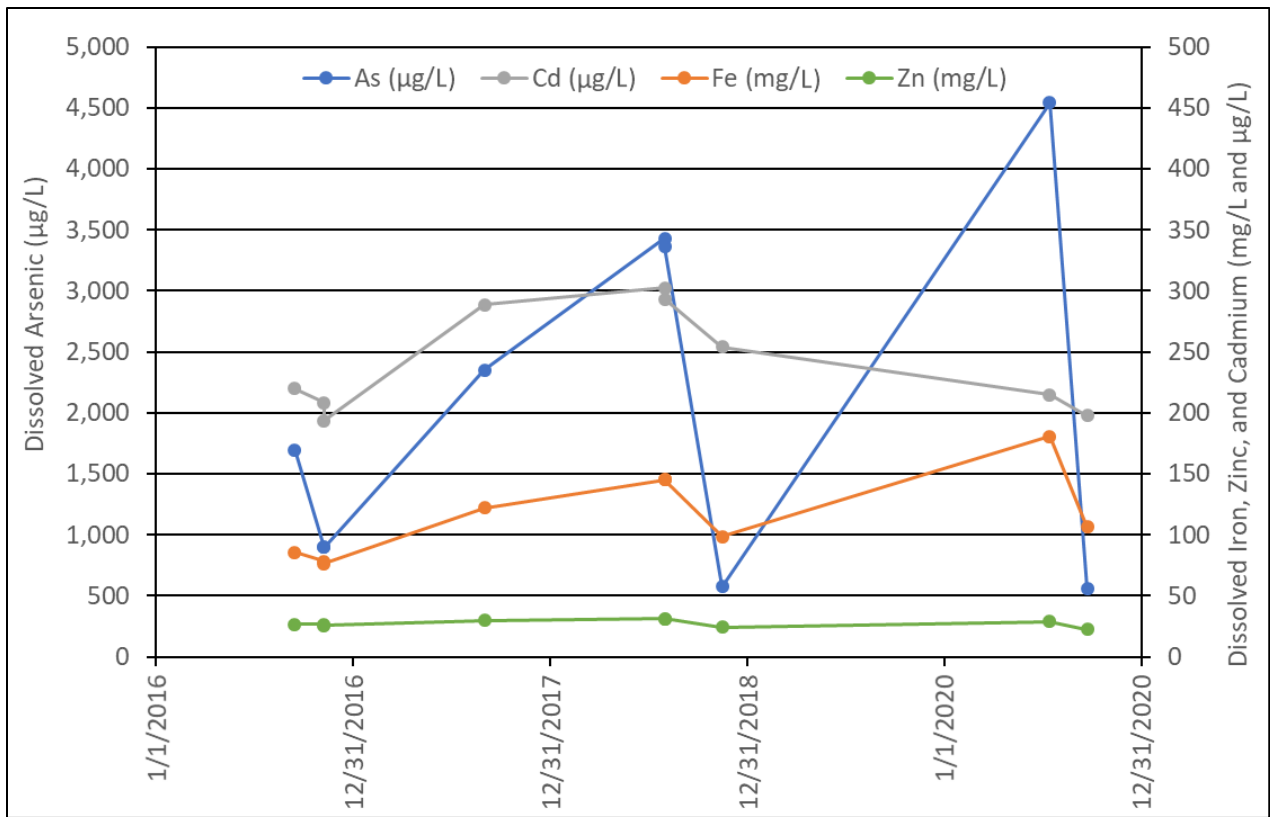


Figure 11. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Upper Bullion Mine sampling location from 2016 to 2020.

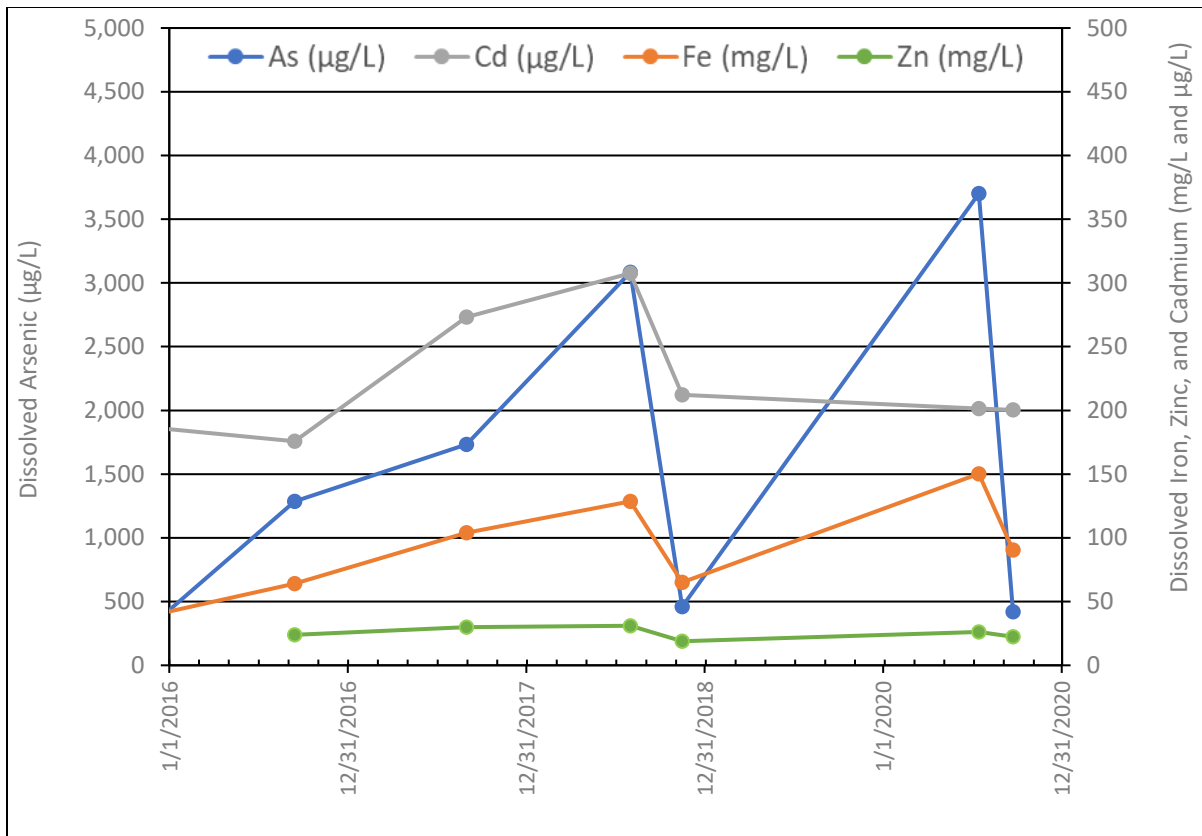


Figure 12. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Lower Bullion Mine sampling location Mine from 2016 to 2020.

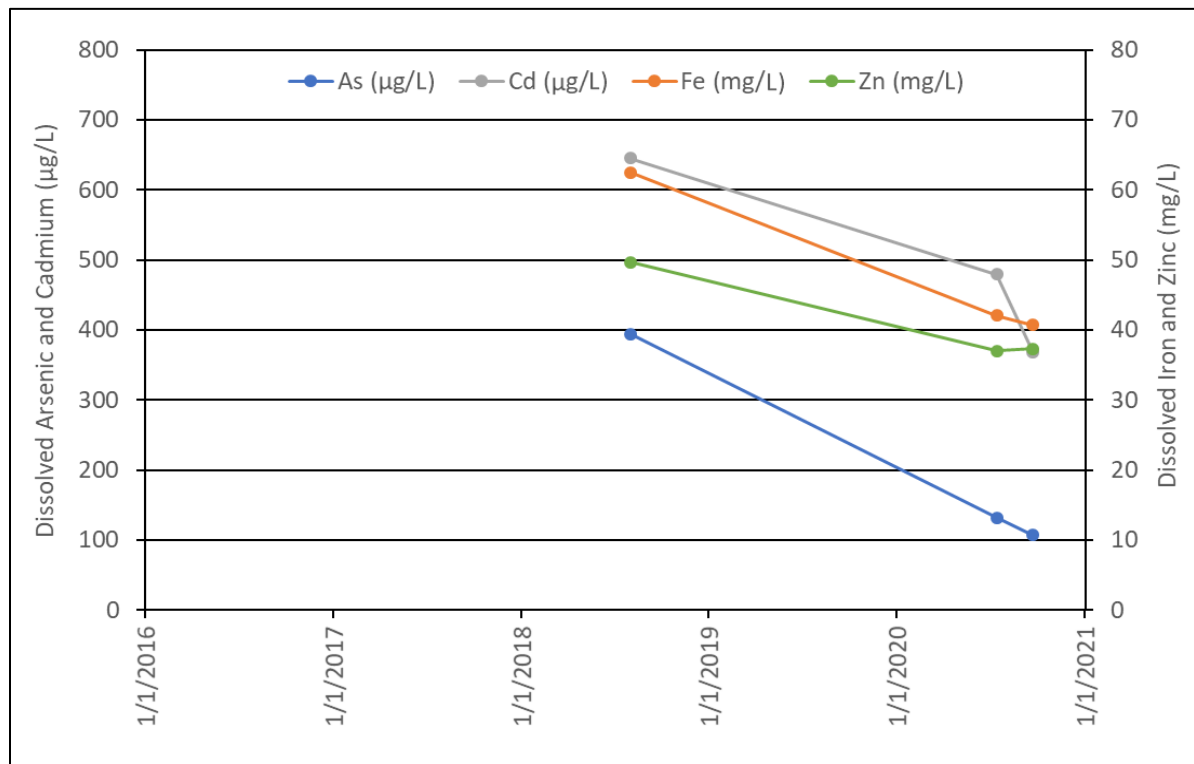


Figure 13. Dissolved concentrations of arsenic, cadmium, zinc, and iron from the Crystal Mine from 2016 to 2020.

7.0 Chemical Data Quality

Four duplicate samples (two dissolved and two total recoverable) were collected from the upper Bullion Mine site to evaluate data reproducibility (table 8). All of the relative percent differences between duplicate elemental sets were below 10 percent and most were below 5 percent.

Table 8. COC concentrations for four duplicate samples collected from the upper Bullion Mine site with relative percent difference (RPD) calculations.

Date	Ag (µg/L)	Al (µg/L)	As (µg/L)	Cd (µg/L)	Cu (µg/L)	Fe (mg/L)	Pb (µg/L)	Sb (µg/L)	Zn (µg/L)
11/7/2016	<0.25U	8638.5	896.64	208.26	8185.5	78.38	185.68	2.8	26535
11/7/2016	<0.25U	8405.5	896.23	193.59	7823.5	76.41	170.63	2.64	25545
RPD		2.70	0.05	7.04	4.42	2.51	8.11	5.71	3.73
8/1/2018	<0.25U	11600	3428.22	302.46	10800	145.4	324.97	26.52	31255
8/1/2018	<0.25U	11580	3359.38	293.31	10740	145.05	320.06	29.15	31165
RPD		0.17	2.01	3.03	0.56	0.24	1.51	9.92	0.29
11/7/2016*		8607.25	1326.44	207.81	8099.67	77.09	192.49	4.17	26450
11/7/2016*		8582.75	1345.13	188.35	8077.83	78.055	195.97	4.37	26440
RPD		0.28	1.41	9.36	0.27	1.25	1.81	4.80	0.04
8/1/2018*		11402.5	4290	306.4	10730	146.225	350.88	29.25	31165
8/1/2018*		11325	4217	311.94	10640	145.65	353.78	29.6	31010
RPD		0.68	1.70	1.81	0.84	0.39	0.83	1.20	0.50

*Total recoverable analytical data

8.0 Summary of Bullion Mine Well—Water-Level Monitoring

As part of the 2015 site activities, EPA installed a pumping well that intercepted the Bullion Mine adit and installed casing to make it a permanent monitoring well. The MBMG installed a transducer and direct read cable in September 2016; the transducer was programmed to collect data hourly. Figure 11 shows water levels and temperature from September 2016 through December 2020. During much of 2017 and early 2018 the water level increased in the adit, followed by an almost instantaneous decrease in mid-May 2018. Minor temperature changes occurred with the mid-May water-level decline. These changes may be related to some minor blockage of the adit discharge.

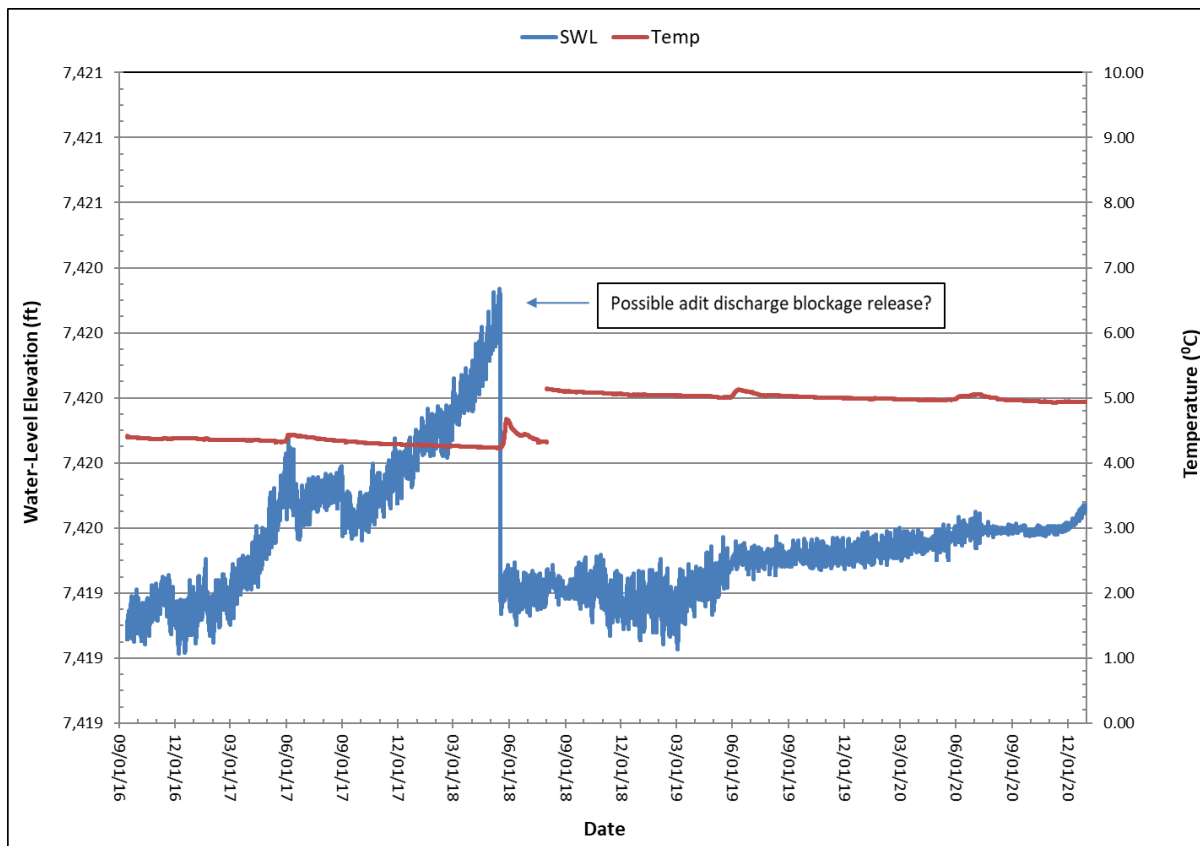


Figure 14. Bullion Mine water-level and temperature graph, 2016–2020.

9.0 Summary

Seasonal monitoring of quantity and quality of water discharging from the Bullion Mine has been conducted since 2016, with the exception of 2019, when only limited flow data were collected. Crystal Mine monitoring consisted of adit discharge flow monitoring during the same time period, with monitoring of quality and physical parameter monitoring occurring in 2018 and 2020. Monitoring typically begins in mid- to late June, continuing to late October. The remote location of the sites and high metal concentrations present unique challenges.

Average discharge from the Bullion adit over the period of monitoring was 19 gpm. Snowmelt and runoff from precipitation impacted flows and caused sedimentation issues, especially at the upper flume. The upper flume was relocated closer to the adit in late 2018, improving data collection; however, sedimentation issues continued. Iron oxide build-up was an issue that caused probe fouling during long periods of deployment, i.e., during winter and spring months (November–May).

The average discharge at the lower Bullion Mine flume was slightly less than the upper flume, at approximately 16 gpm. Sedimentation issues were less at this site; however, storm runoff was noted to have possibly increased flows following summer storm events. Occurrence of increased flows were checked against precipitation records for Butte and Helena.

The average discharge from the Crystal Mine was almost 33 gpm, with discharge rates increasing in the spring and following summer rain events. Sedimentation was not as significant a problem at this site, nor was probe fouling.

Physical parameter monitoring proved to be a challenge due to some of the same constraints noted with flow monitoring, specifically sedimentation and probe fouling issues at both Bullion sites and a number of probe failures. Fewer problems were encountered at the Crystal Mine site.

Bullion Mine seasonal average pH values were similar between the upper and lower flumes in 2016 and 2018, ranging from 2.47 to 2.91. During the 2017 monitoring period, pH values showed a marked increase at the downgradient location, 2.45 vs. 3.57.

Seasonal average SC and temperature values were more consistent throughout the monitoring period, averaging between 1,300 and 1,500 $\mu\text{mhos/cm}$ at the upper flume location and between 1,000 and 1,400 $\mu\text{mhos/cm}$ at the lower site. Temperature values were consistently colder at the upper flume site, ranging from 4.7°C to 5.0°C. Temperatures were higher at the lower site, ranging from 3.3°C to 8.3°C. Diurnal temperature variations occurred at the lower site throughout the period of monitoring, reflecting daily ambient temperature changes.

Dissolved oxygen seasonal average concentrations varied between 1.5 mg/L and 4.87 mg/L at the upper flume and between 2.6 mg/L and 7.58 mg/L at the lower flume.

Seasonal average ORP values (measured as Eh) varied between 500 mV and 725 mV at both the upper and lower flume sites.

Physical parameter seasonal average data were much more consistent at the Crystal Mine site, with pH values ranging from 4.27 to 4.75 and SC from 670 $\mu\text{mhos/cm}$ to 770 $\mu\text{mhos/cm}$, while temperature varied from 4.7°C to 4.9°C. Seasonal average LDO and ORP were about 7.9 mg/L and 470 mV, respectively.

Water-level monitoring in the Bullion Mine pumping well showed minor increases during the winter and spring time period, possibly from ice or snow blockage. Maximum water-level changes occurred during the spring of 2018.

Water-quality data indicate that most of the metal concentrations for the nine COCs are in the dissolved form and exceed the DEQ-7 standards for human health and aquatic life some or all of the time at both the Bullion and Crystal Mine sites. Concentrations of arsenic, cadmium, copper, iron, lead, and zinc are very high, ranging from 5 to greater than 10 times the DEQ-7 standards.

There appears to be a seasonal trend in concentrations from the Bullion Mine, with higher concentrations observed earlier in the sampling season. Additionally, there was a reduction in average concentration of COCs between the upper and lower Bullion Mine monitoring sites.

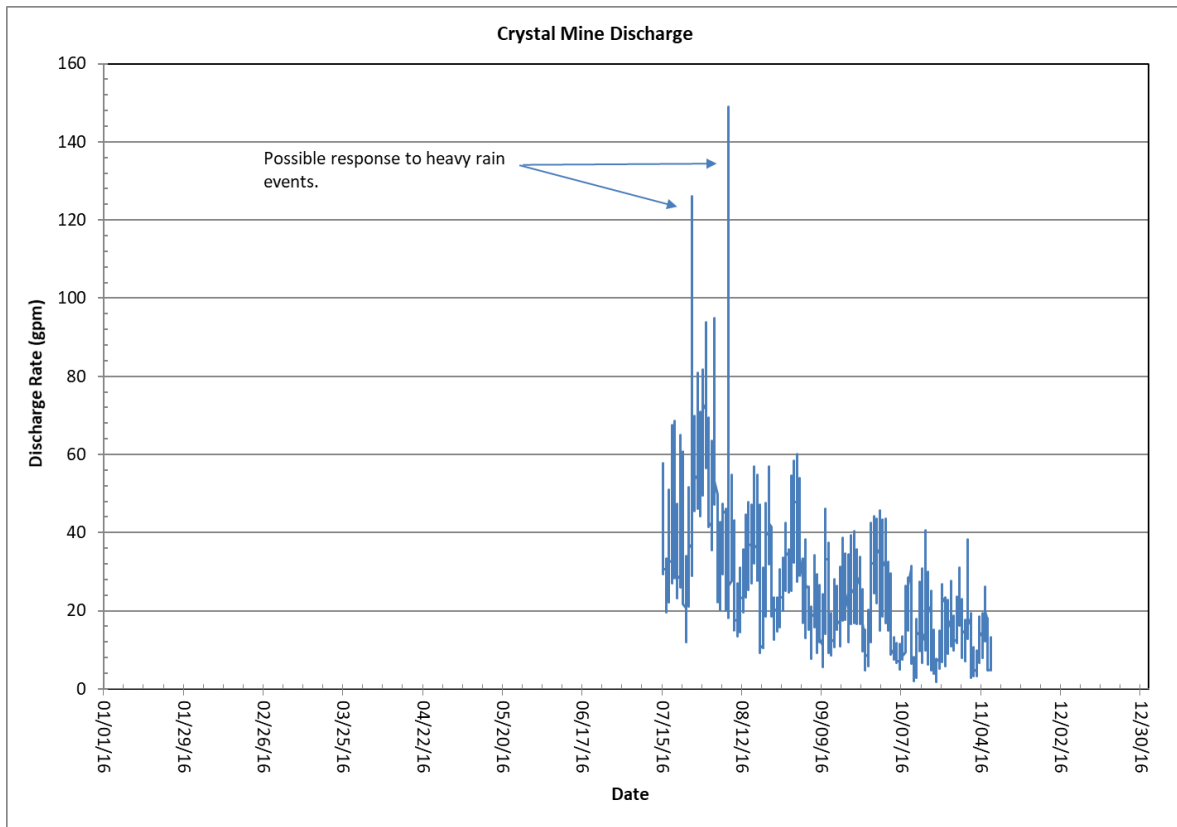
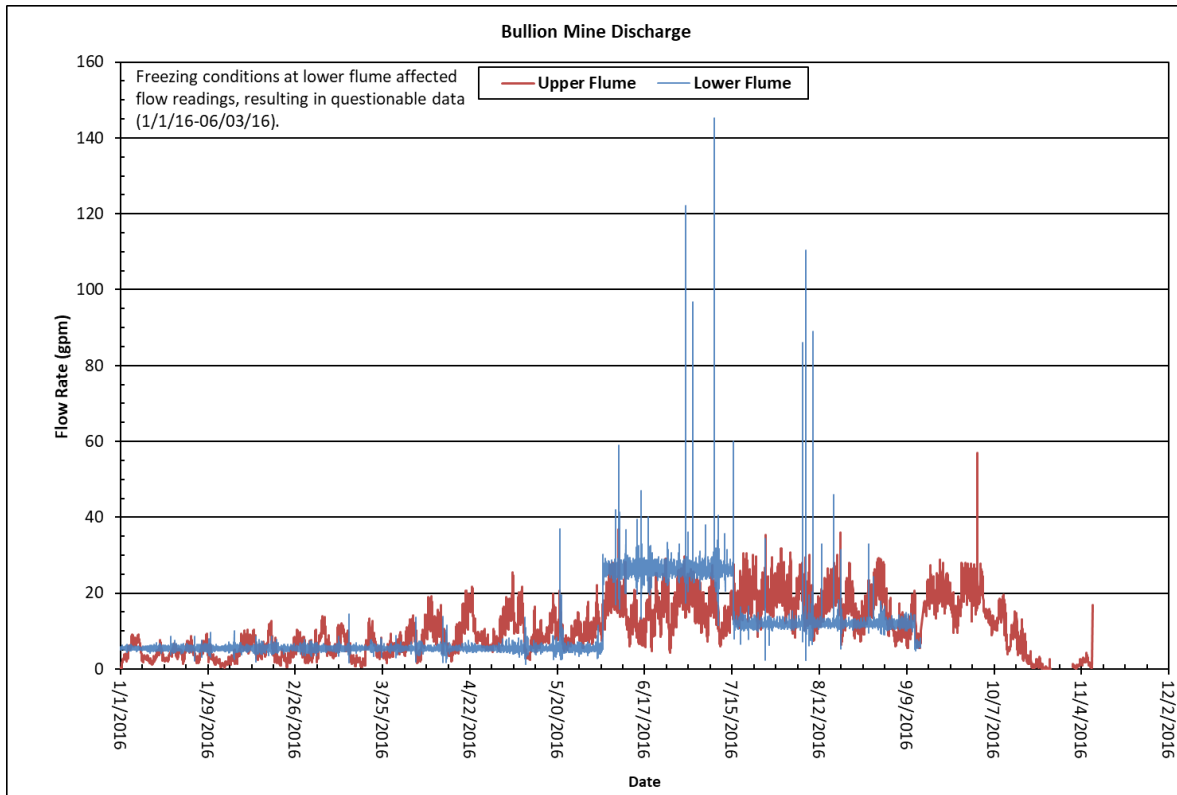
Concentrations of most analytes at the Crystal Mine were lower in 2020 than in 2018, based on collection of three samples.

10.0 References

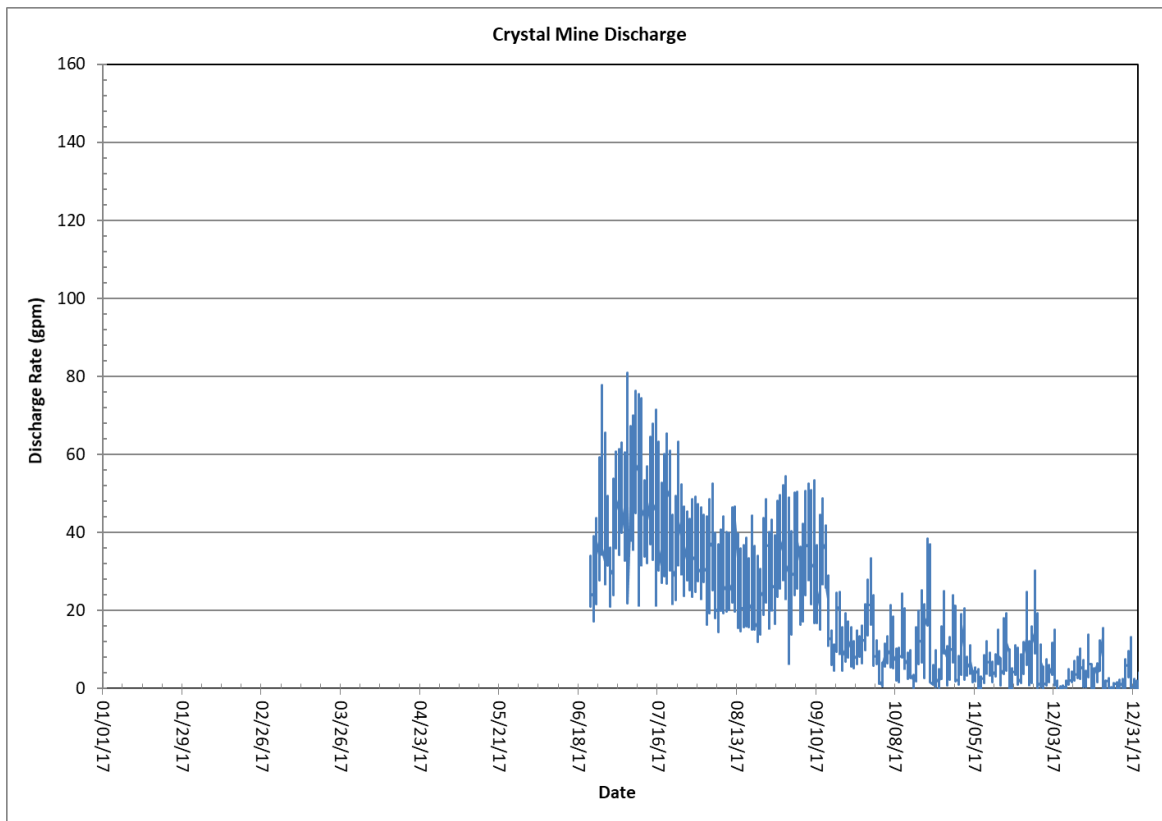
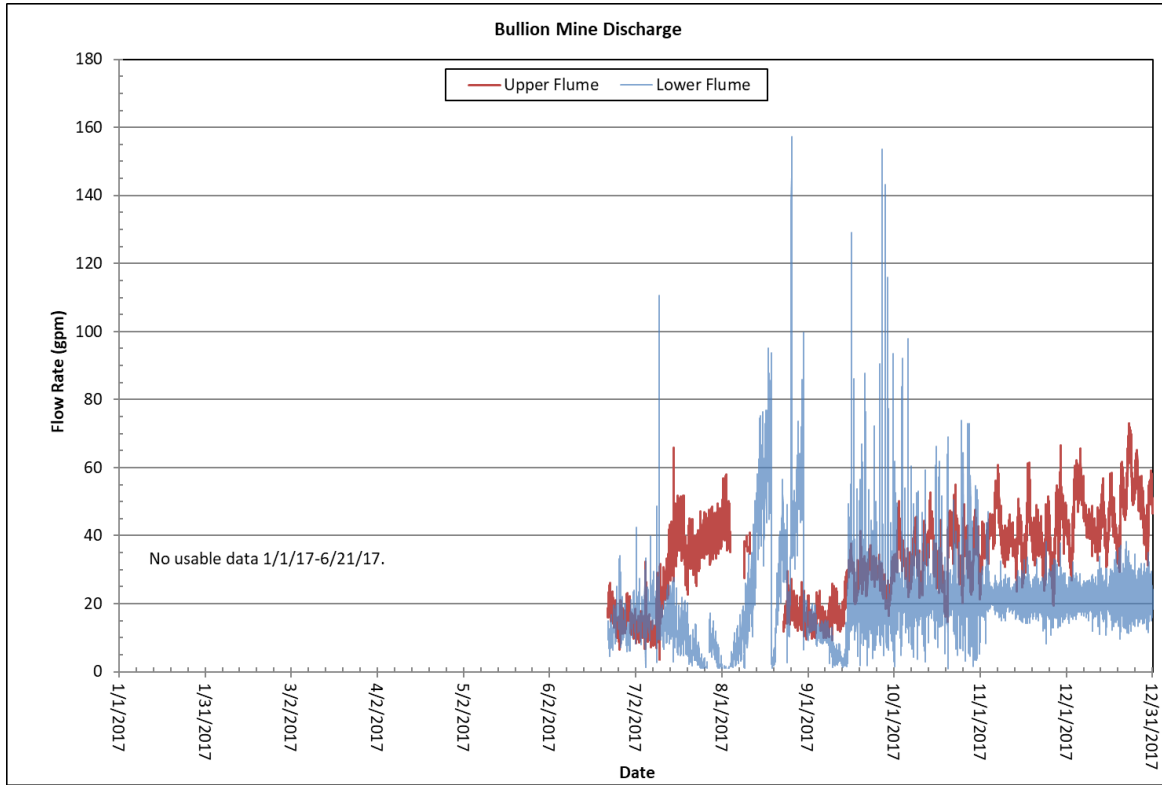
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- EPA, 2015a, Crystal Mine Operable Unit 05, of the Basin Mining Area Superfund Site, Jefferson County, Montana, Final Interim Record of Decision, U.S. Environmental Protection Agency Region 8, April 2015.
- EPA, 2015b, Bullion Mine Operable Unit 06, of the Basin Mining Area Superfund Site, Jefferson County, Montana, Final Interim Record of Decision, U.S. Environmental Protection Agency Region 8, April 2015.
- Metesh, J.J., Lonn, J., Duaine, T.E, and Wintergerst, R., 1994, Abandoned-inactive mines program report, Deerlodge National Forest, Basin Creek drainage, volume I: Montana Bureau of Mines and Geology Open-File Report 321, 131 p.
- Metesh, J.J., Lonn, J., Duaine, T., Marvin, R.K., and Wintergerst, R., 1995, Abandoned-inactive mines program, Deerlodge National Forest, volume II: Cataract Creek Drainage: Montana Bureau of Mines and Geology Open-File Report 344, 201 p.
- Montana Bureau of Mines and Geology (MBMG), 2018, Draft final Bullion and Crystal Mines, mine adit discharge monitoring program, quality assurance project plan/sampling and analysis plan, June 27, 2018.
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Appendix 1: Bullion and Crystal Mines—Yearly Discharge Graphs

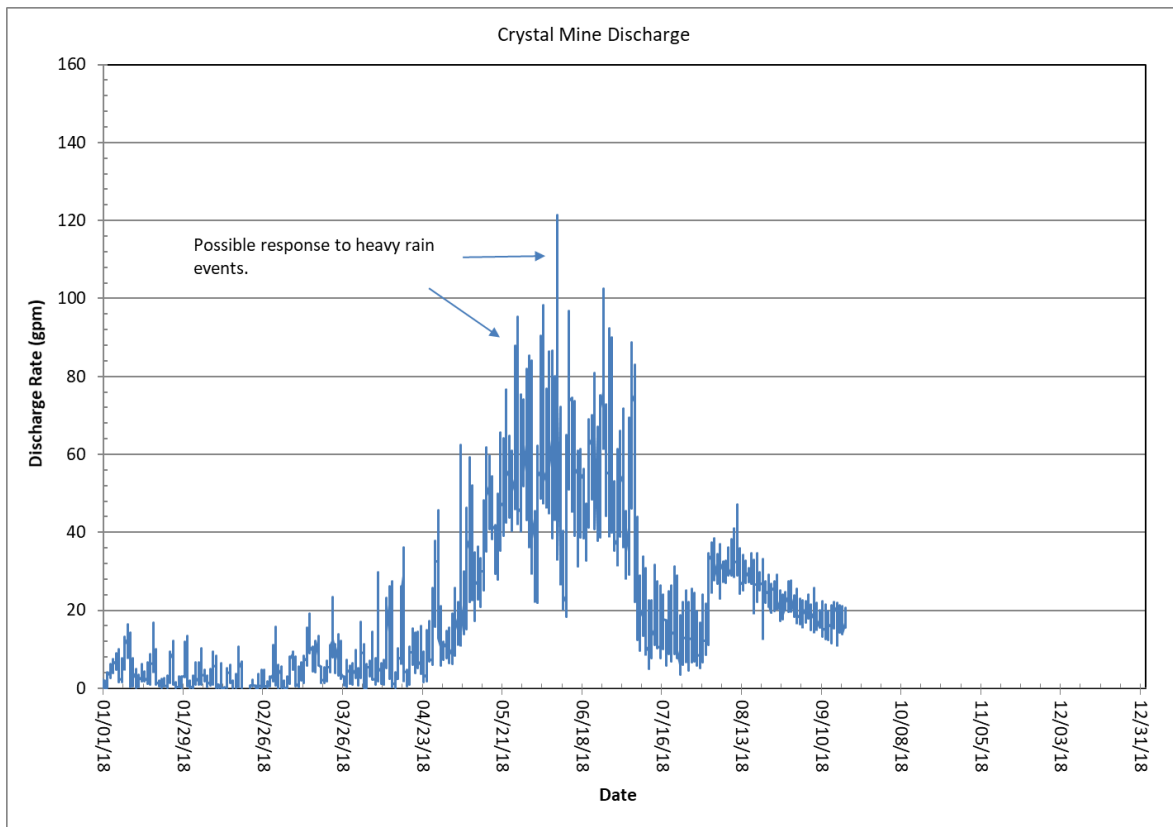
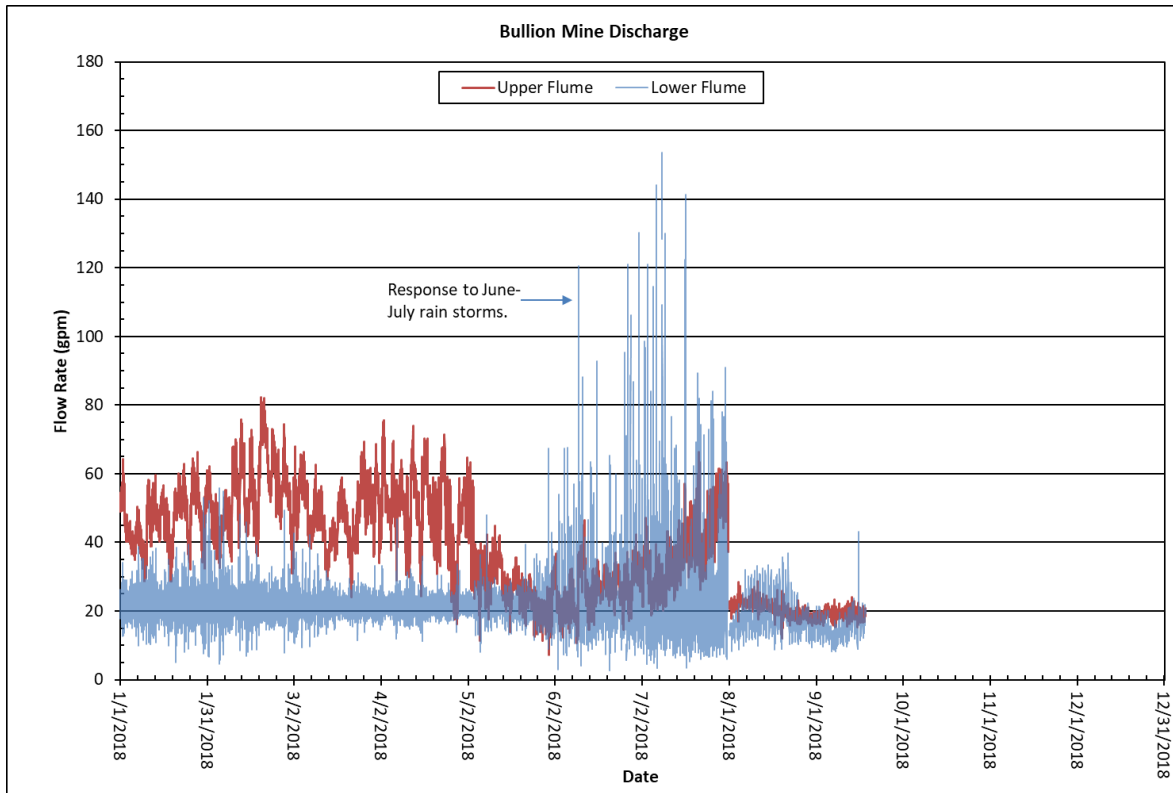
2016 Discharge Hydrographs



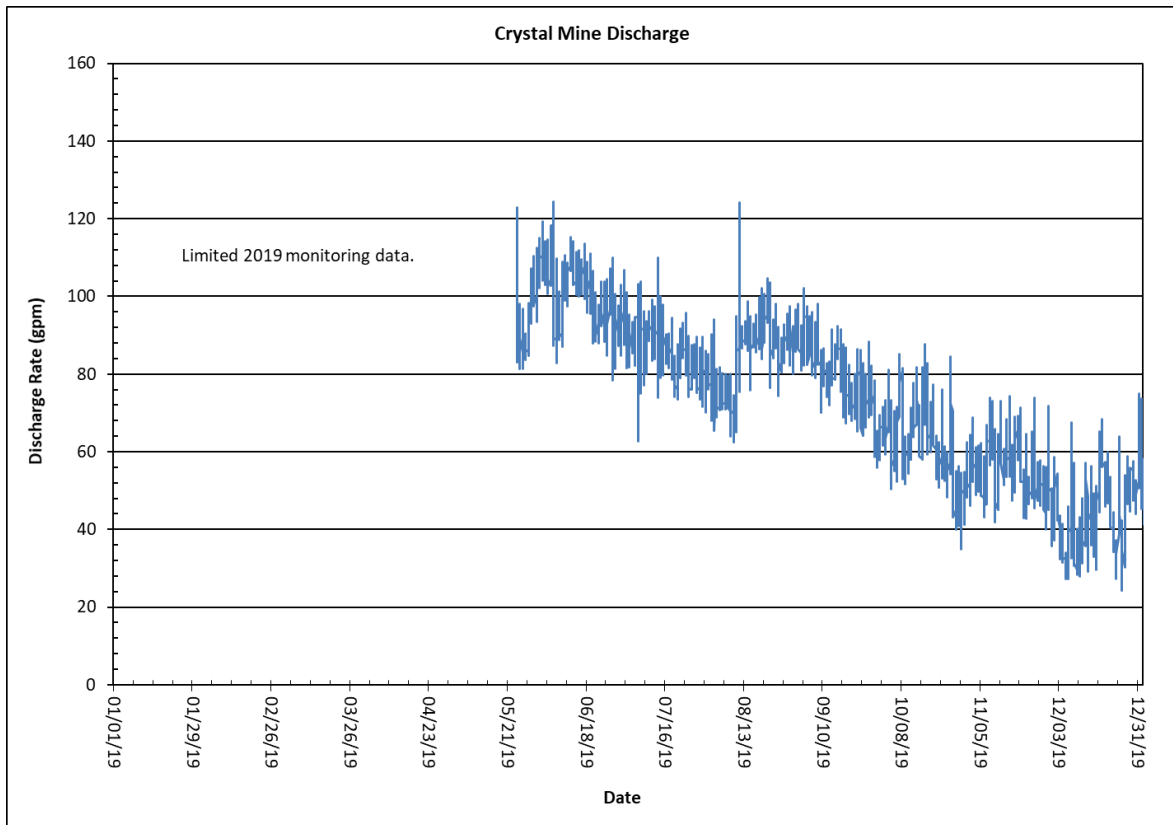
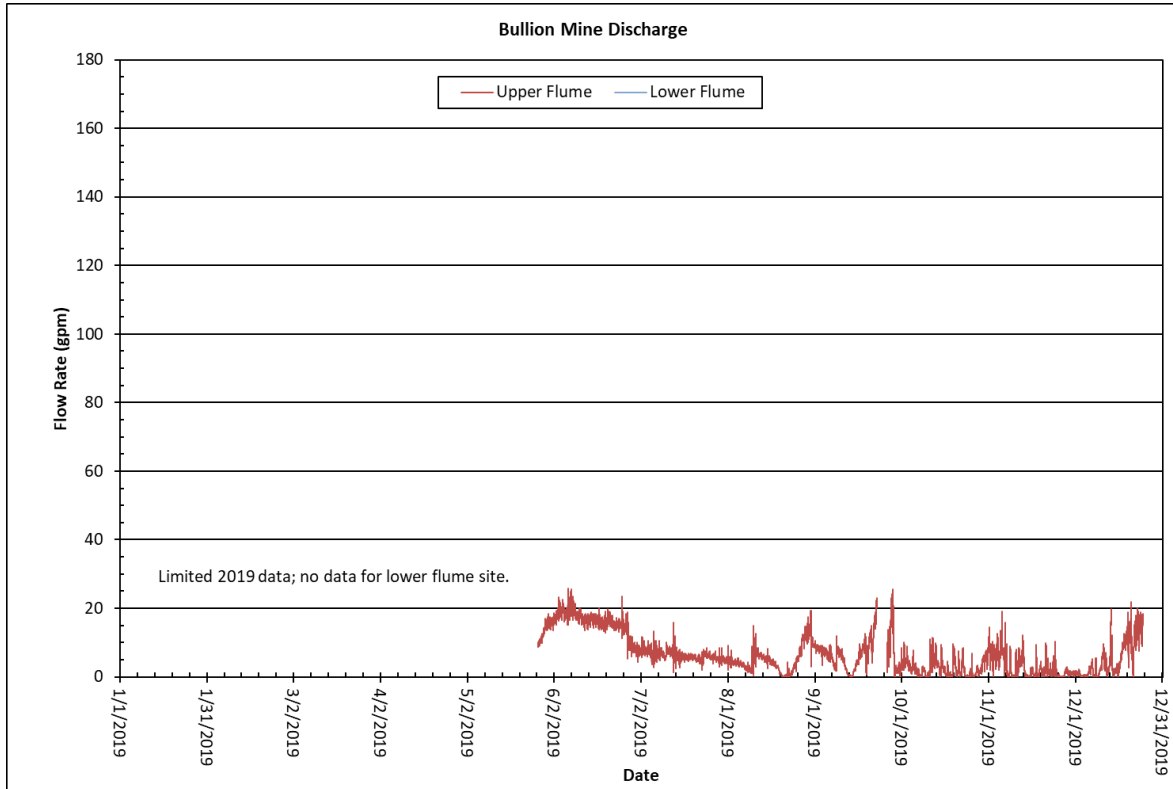
2017 Discharge Hydrographs



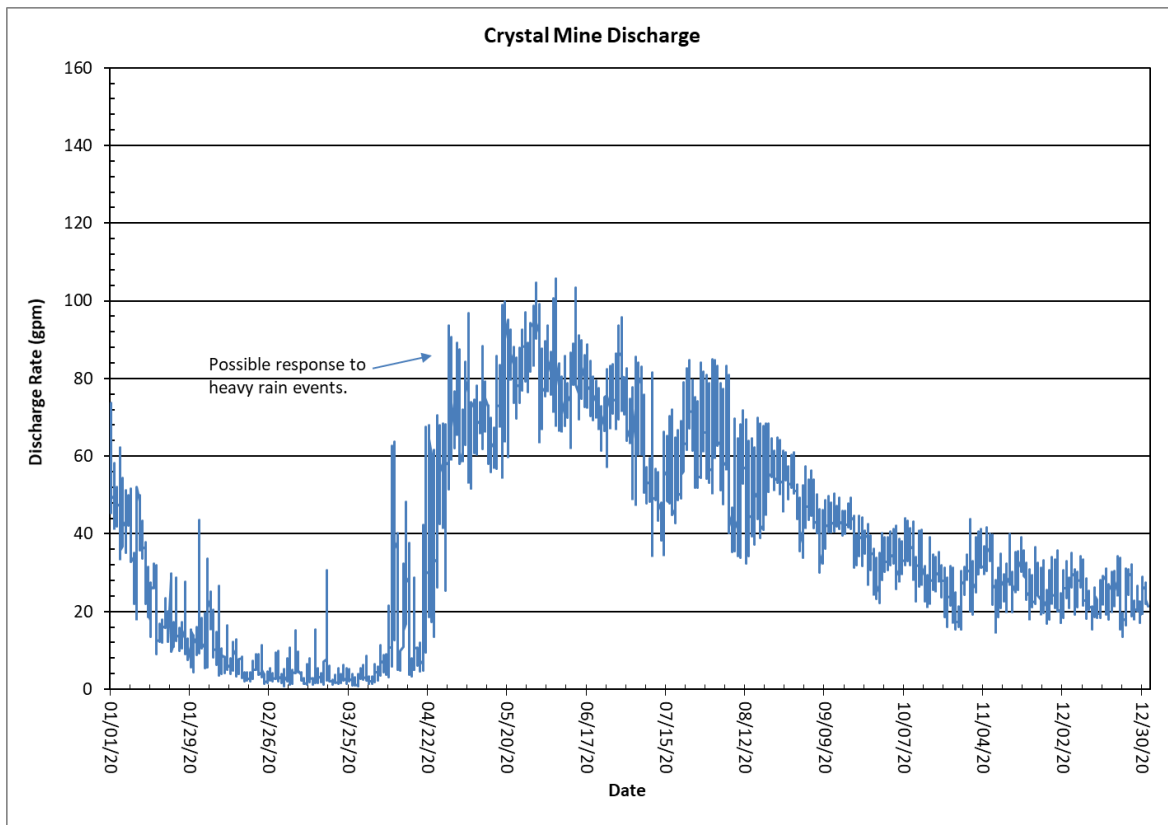
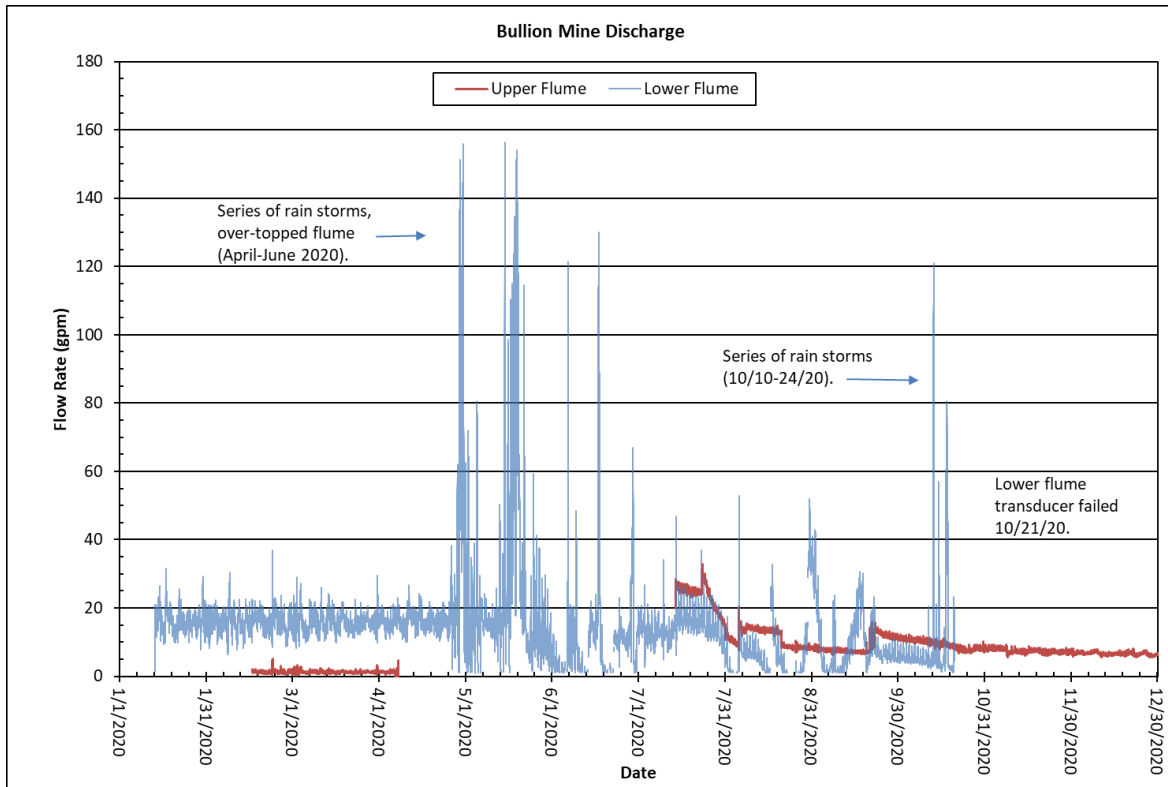
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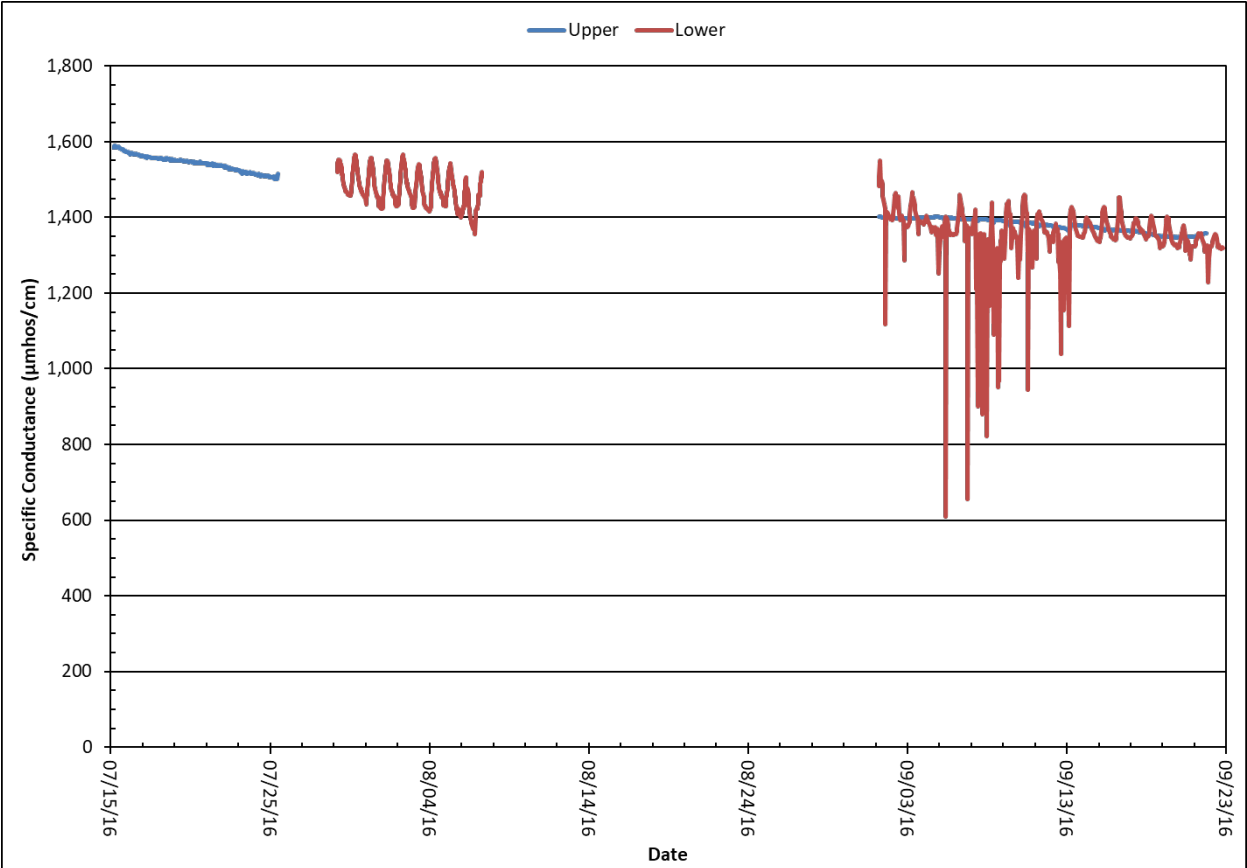
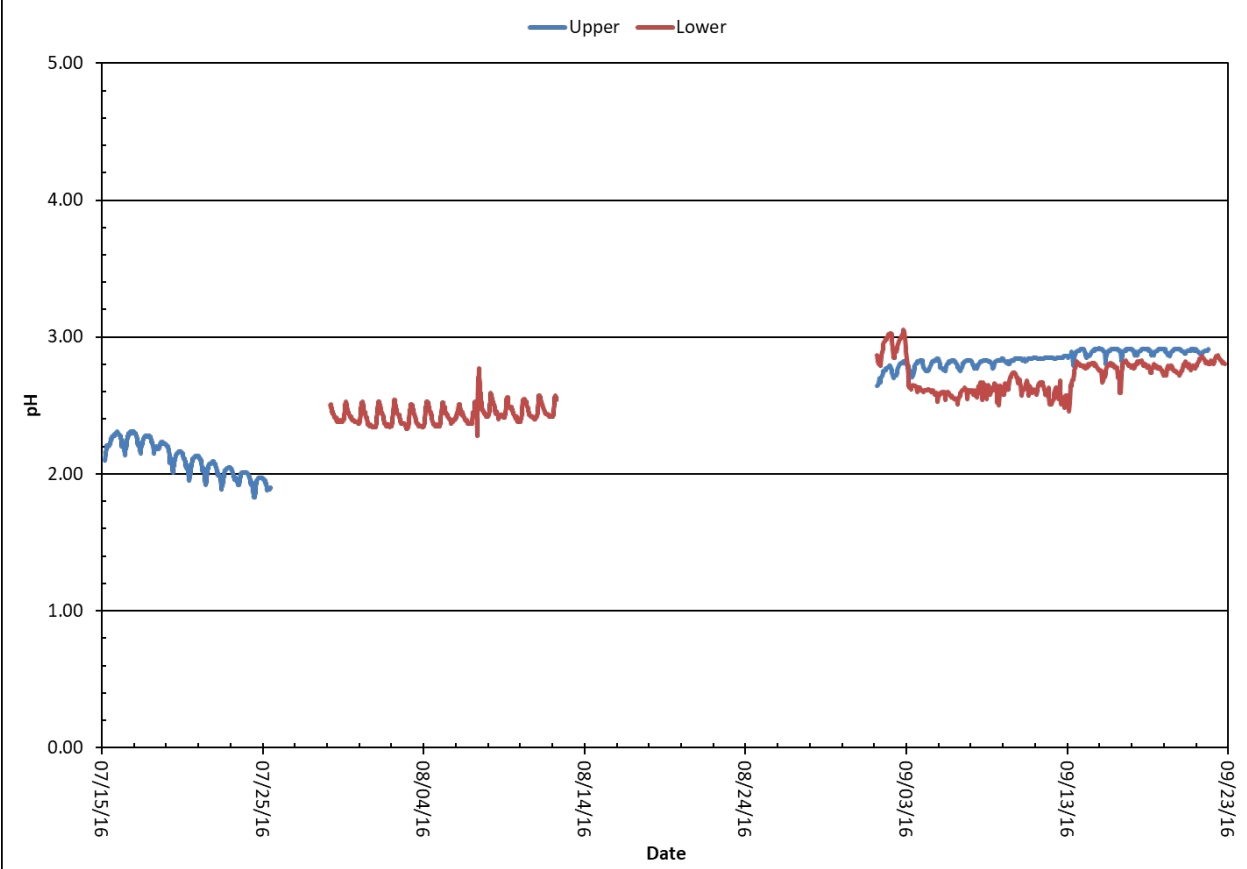
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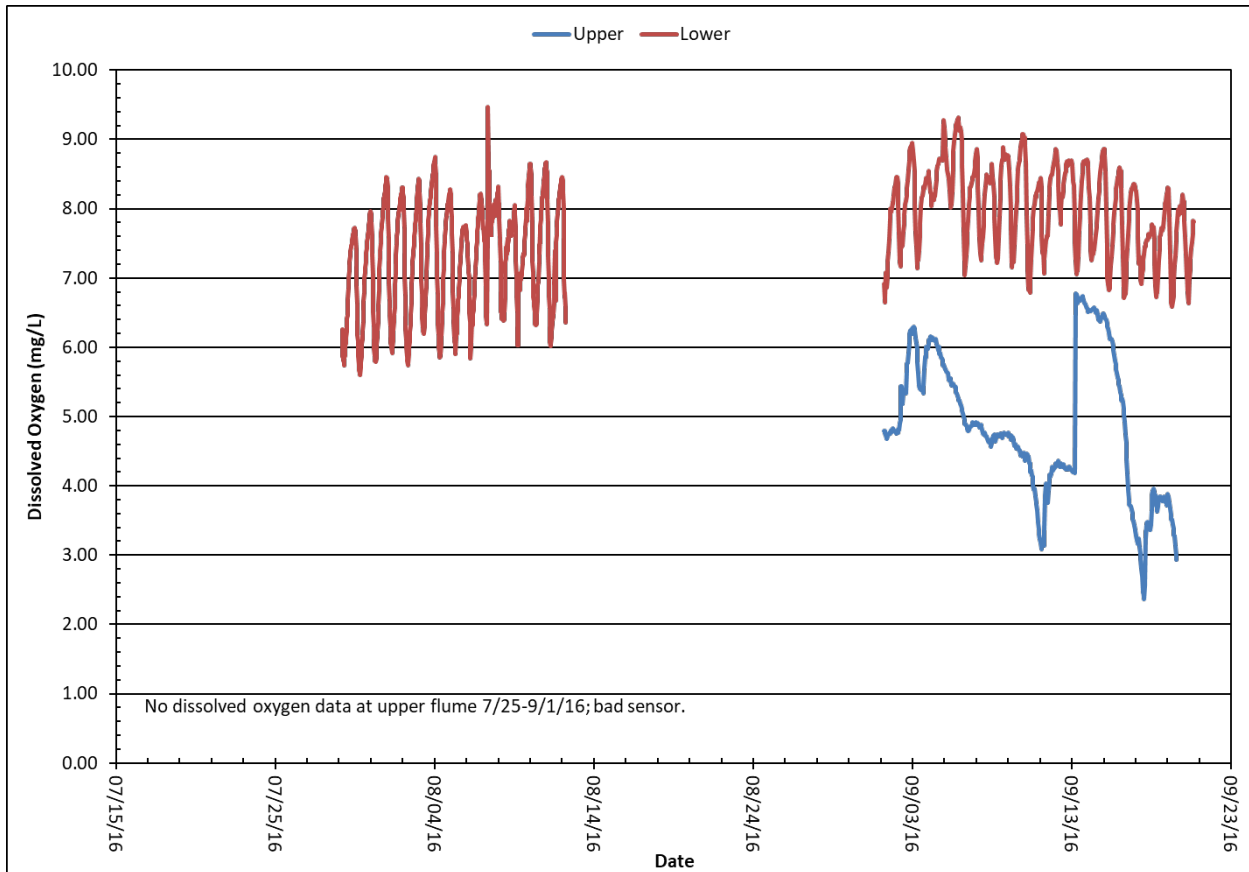
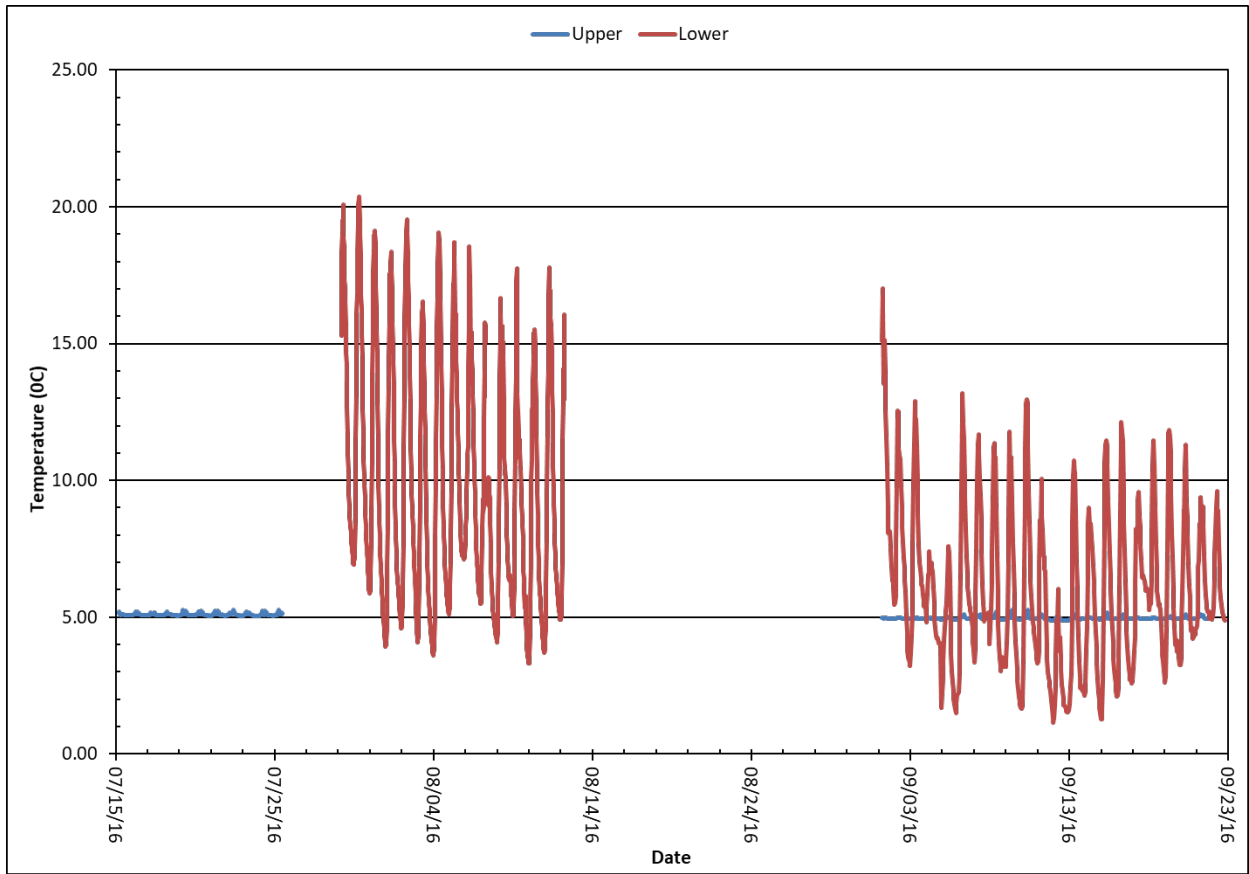


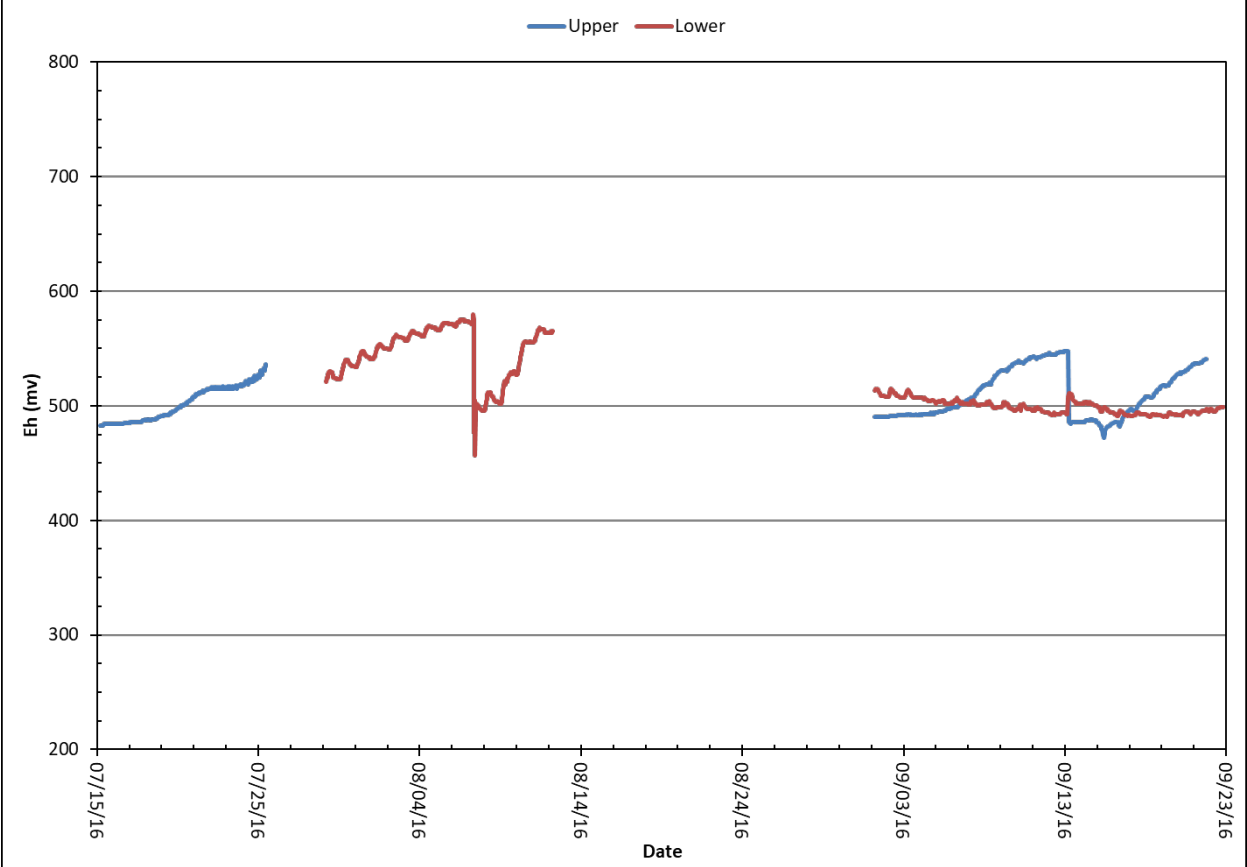
2020 Discharge Hydrographs

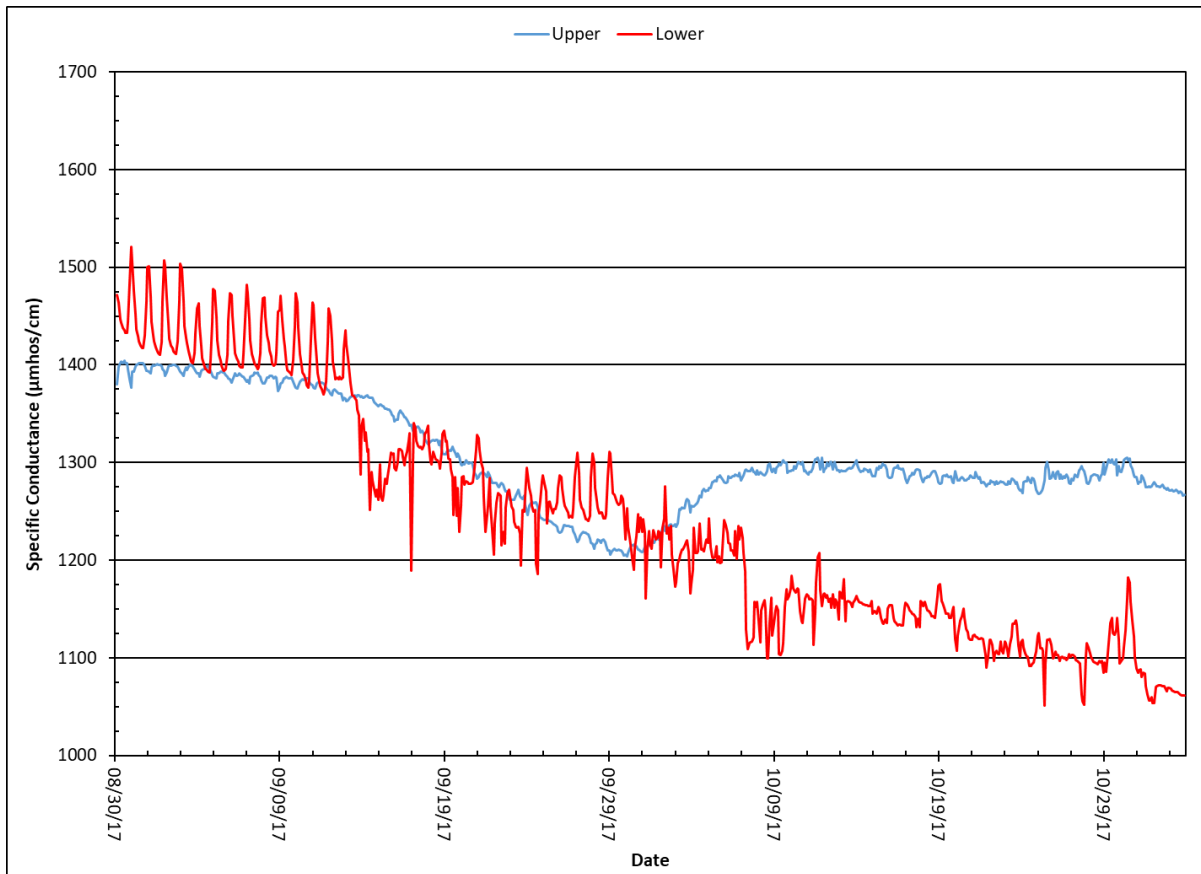
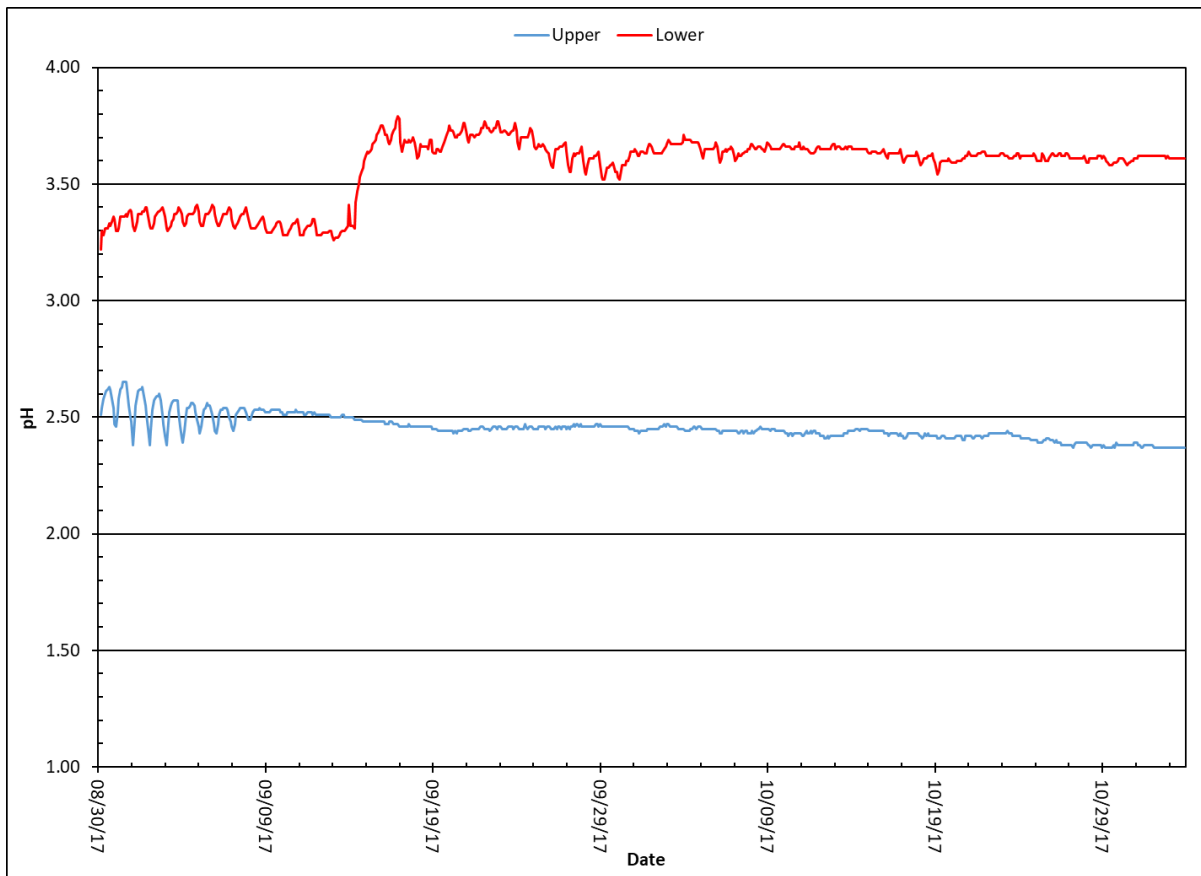


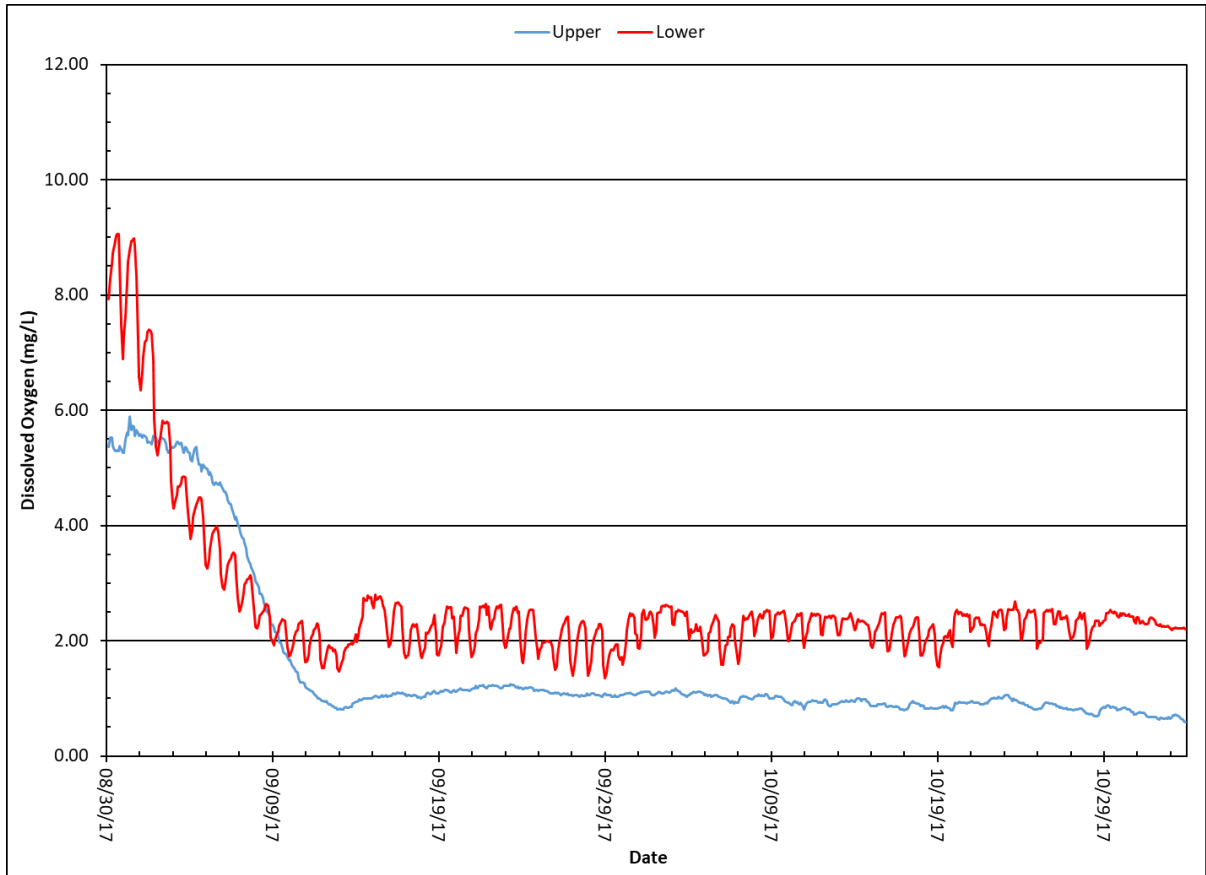
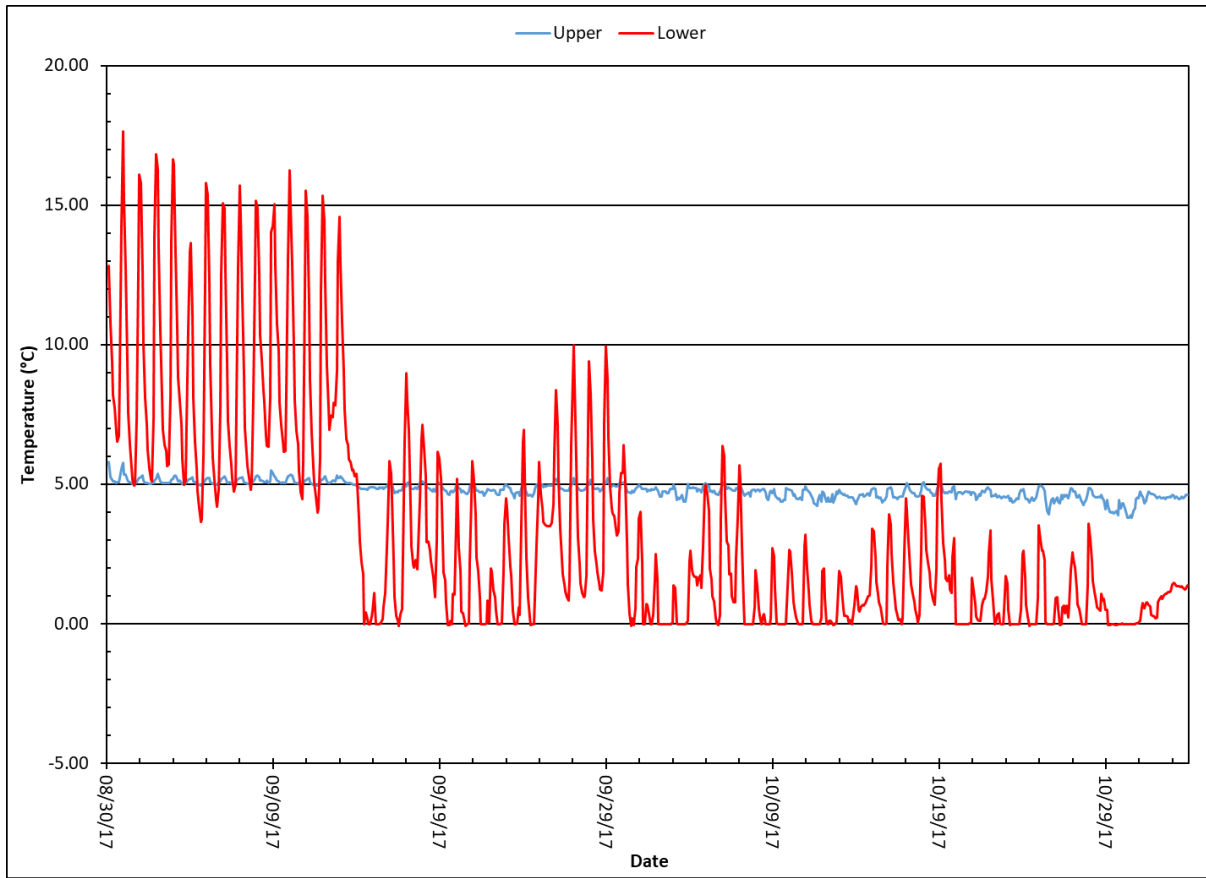
**Appendix 2: Bullion Mine, Upper and Lower Flumes—Yearly Physical
Parameter Graphs**

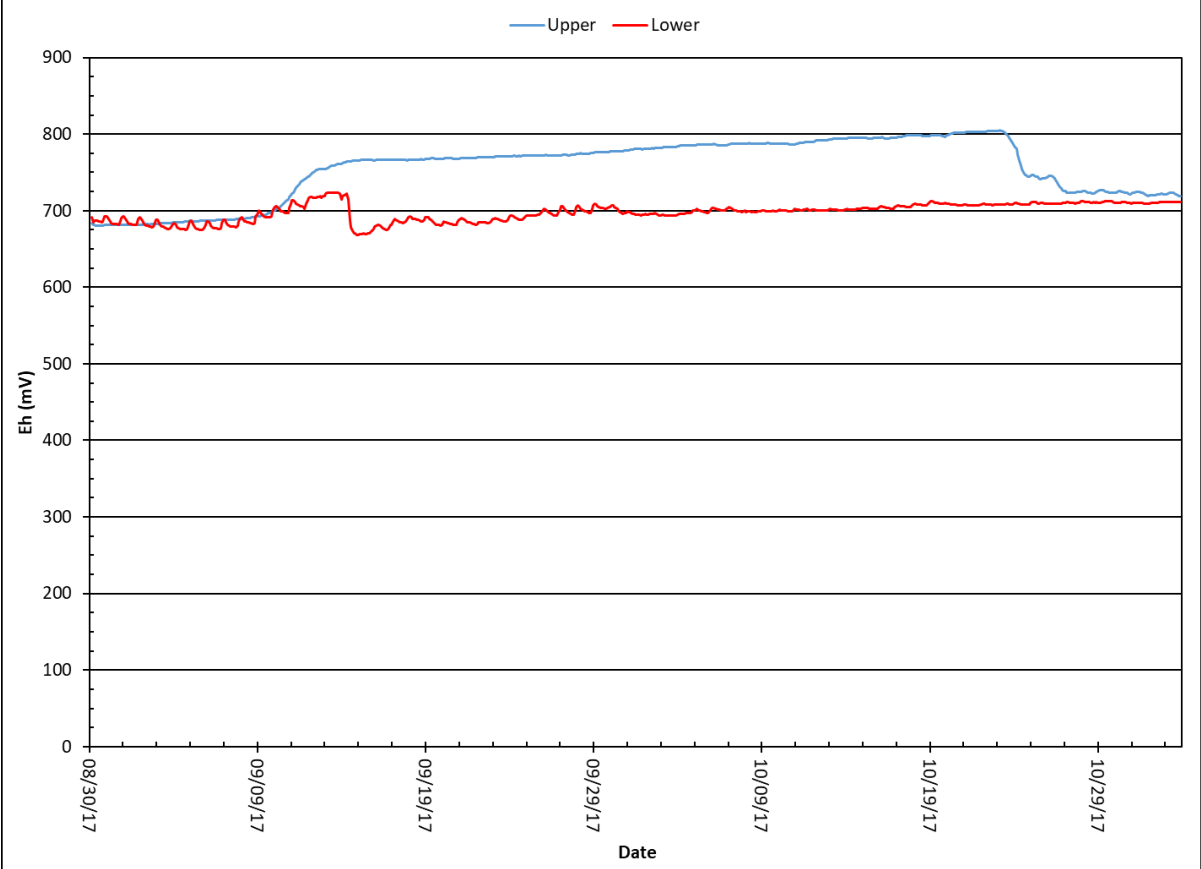


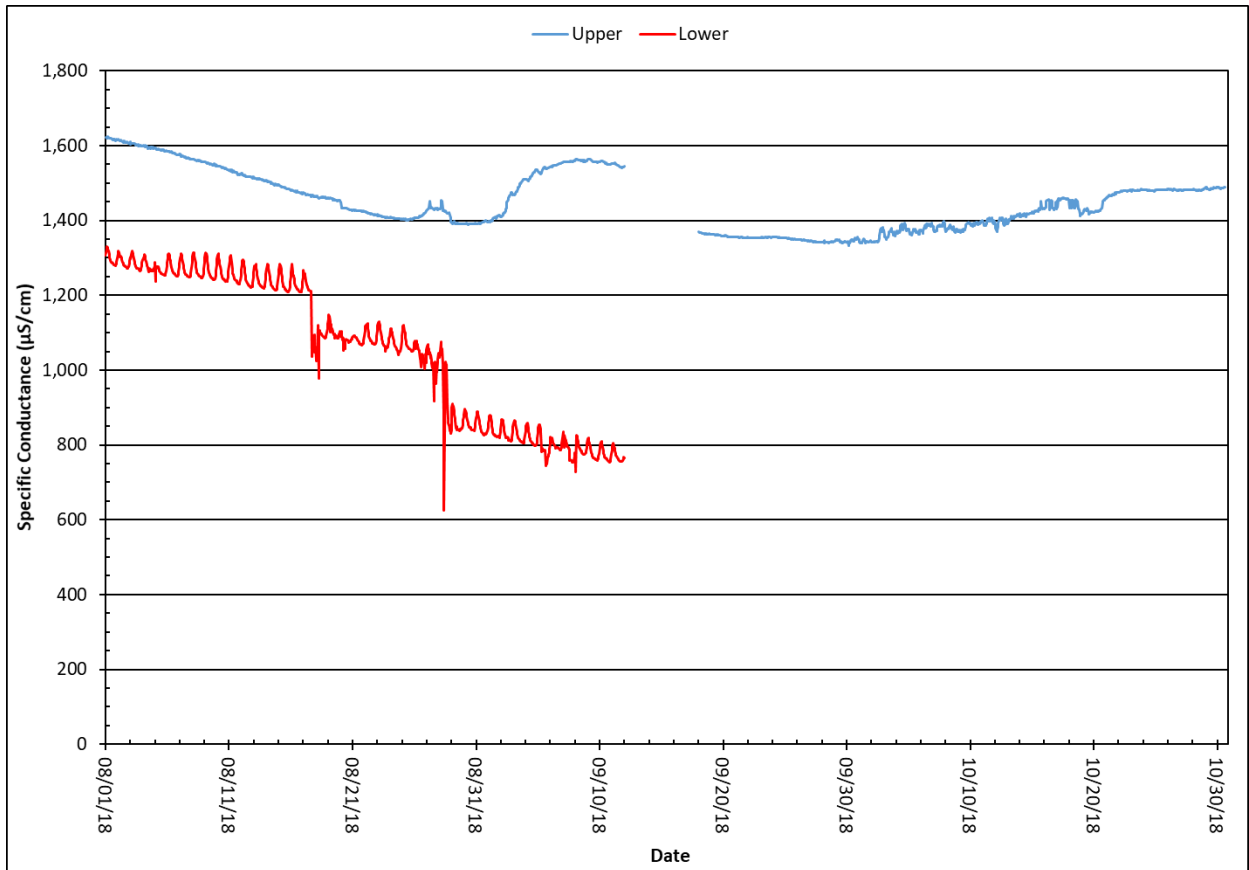
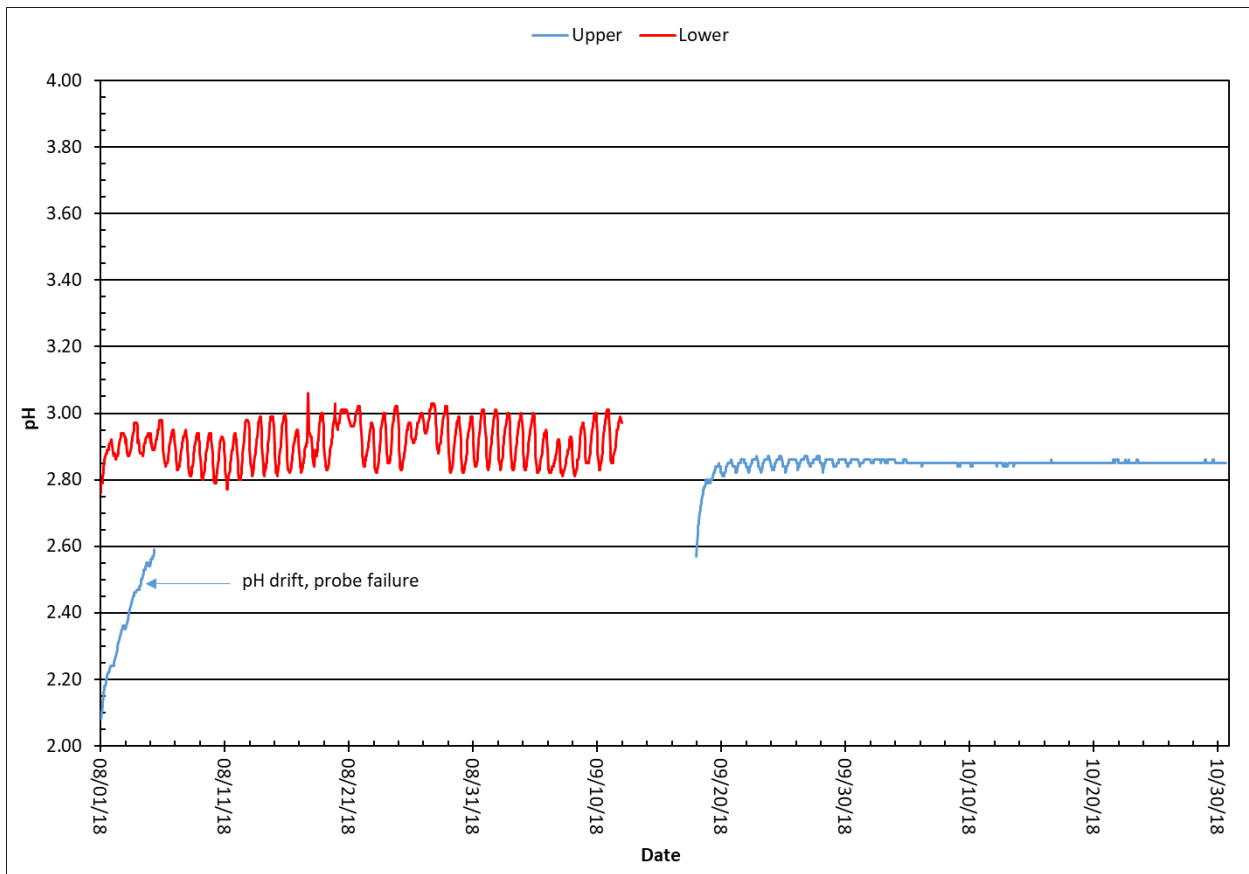


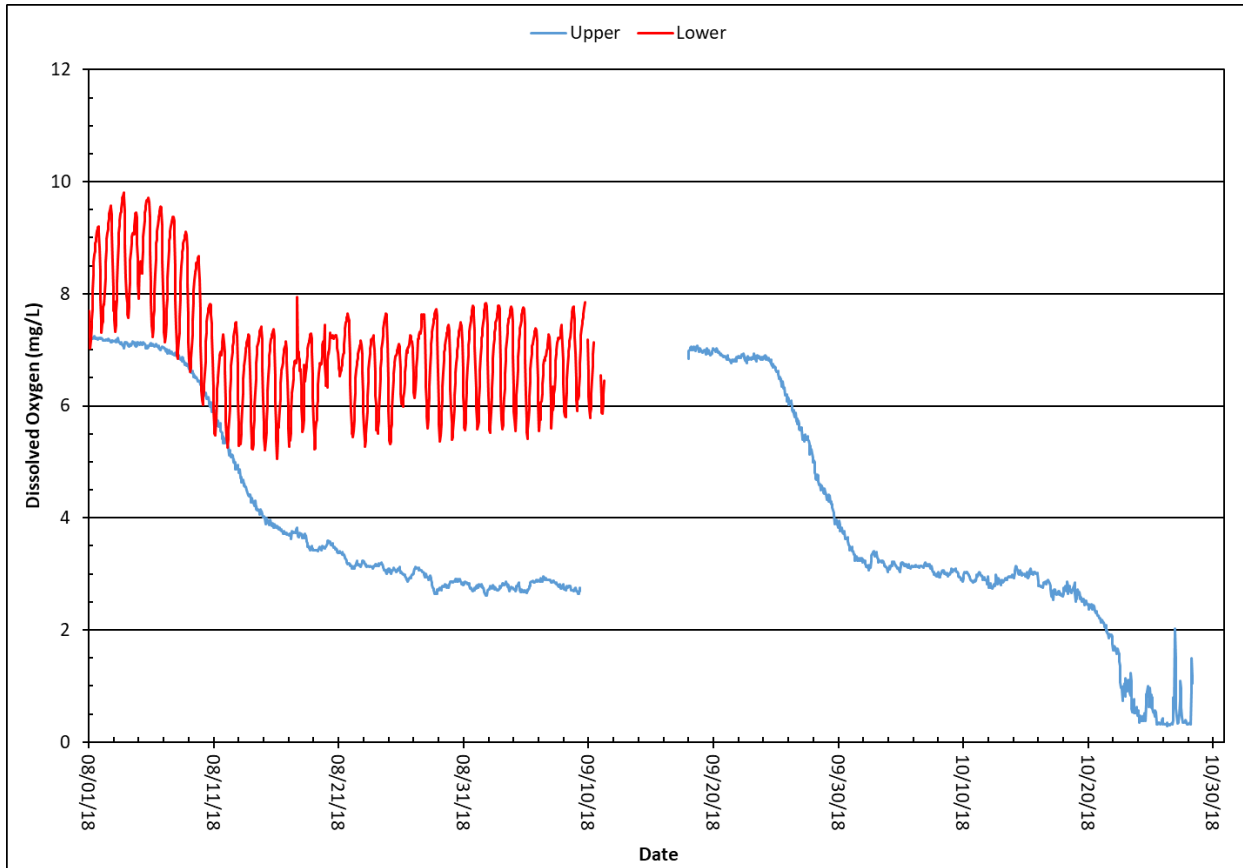
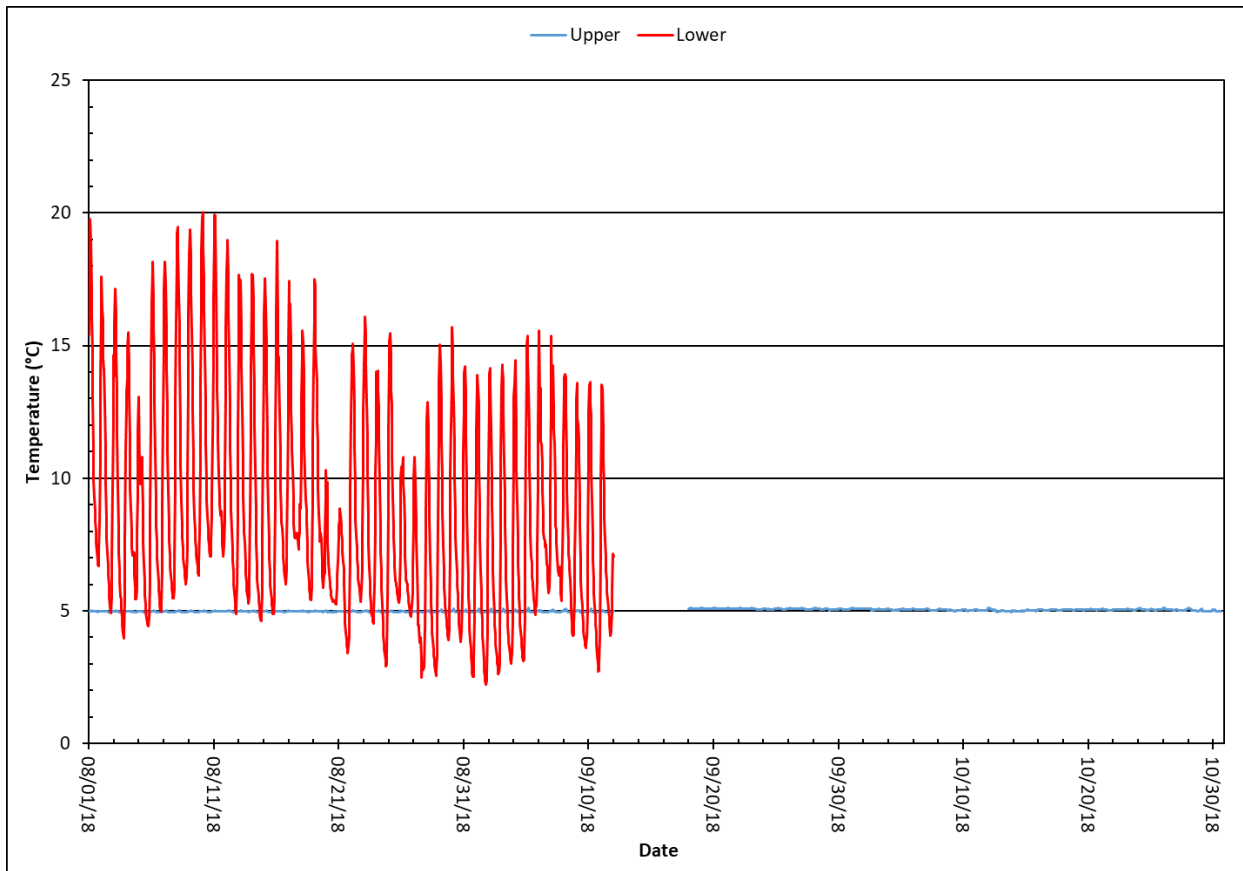


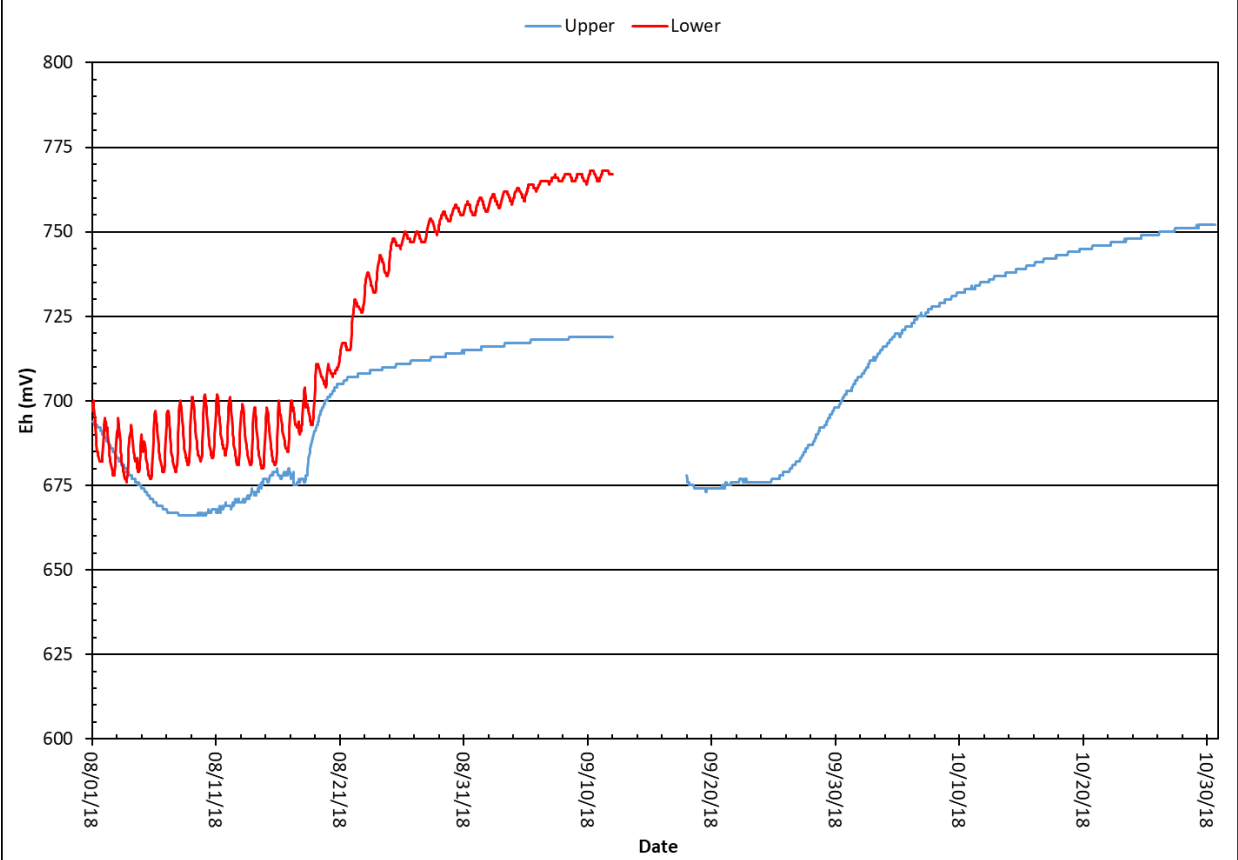


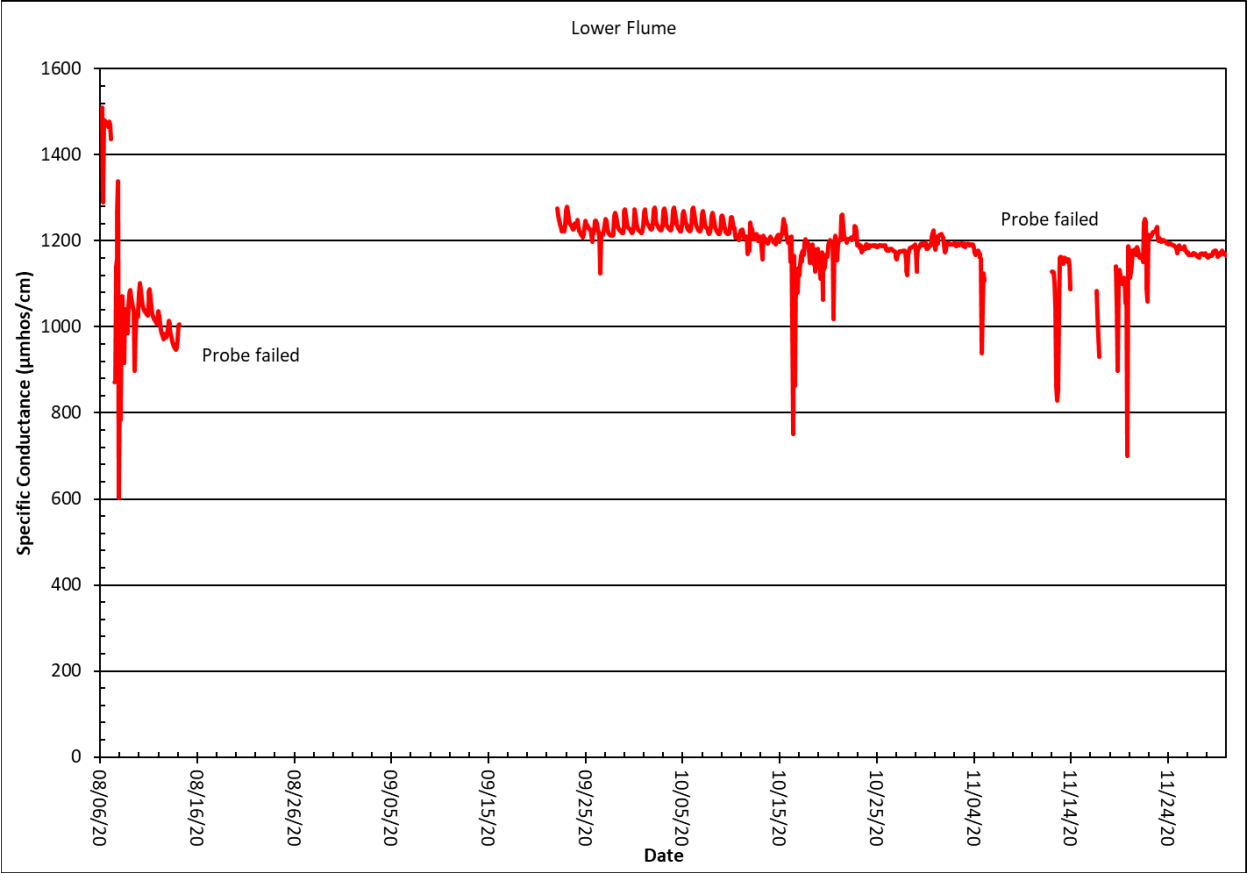
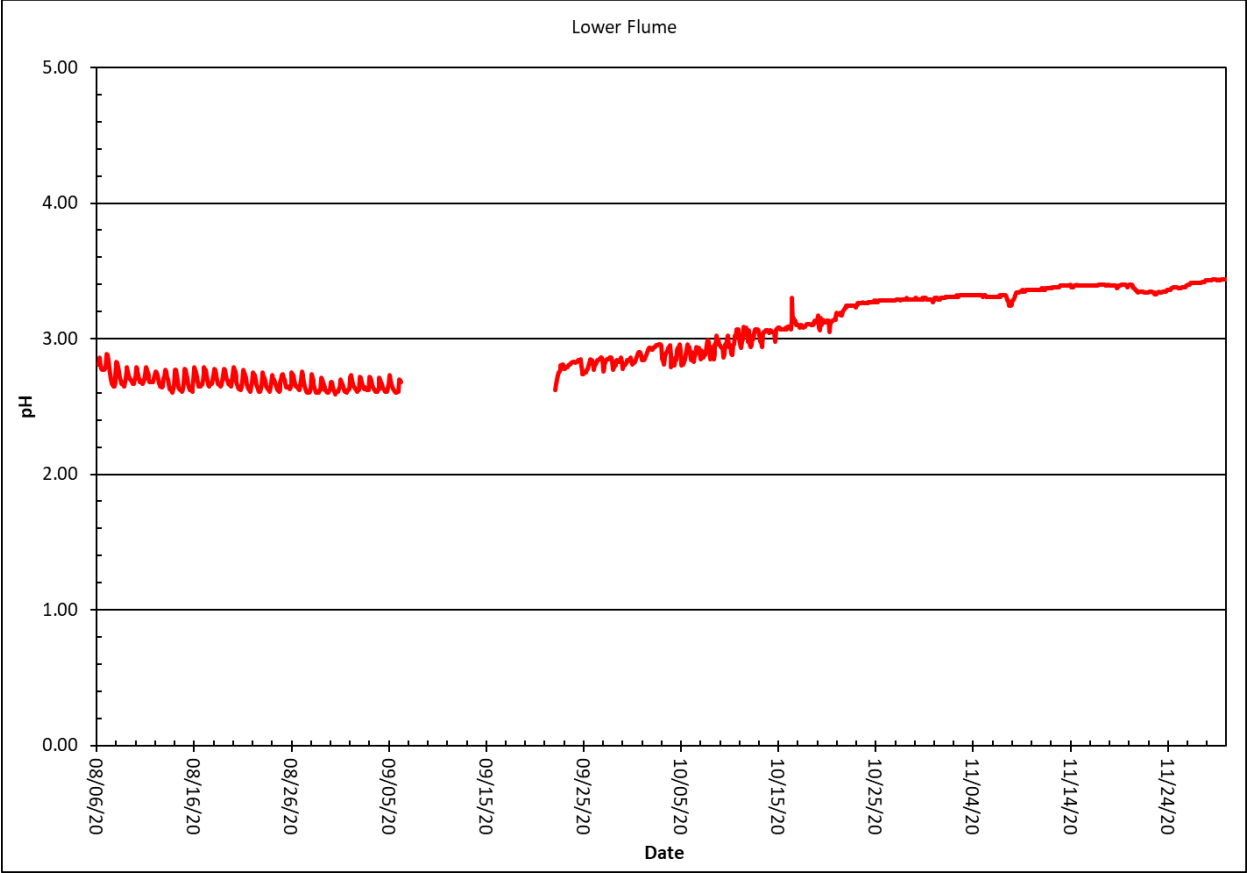


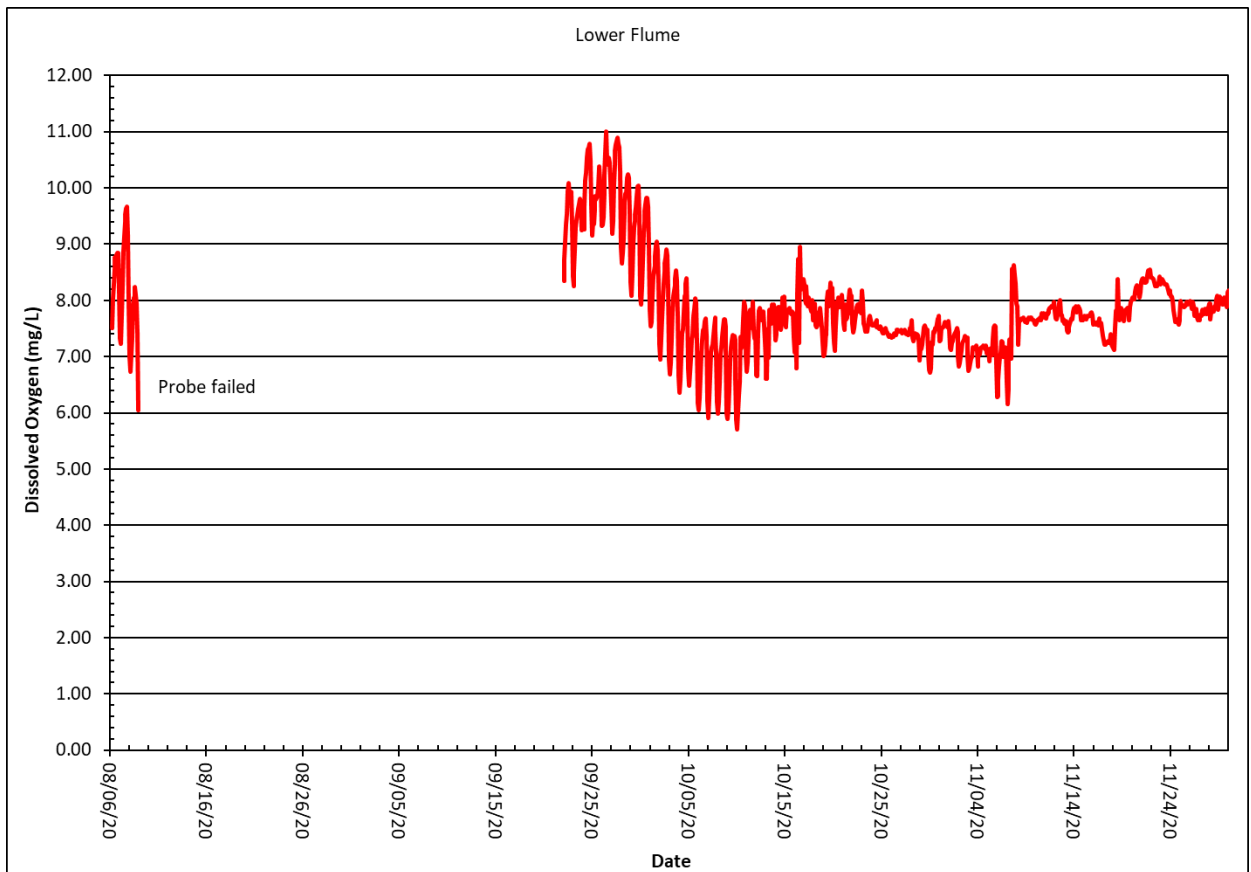
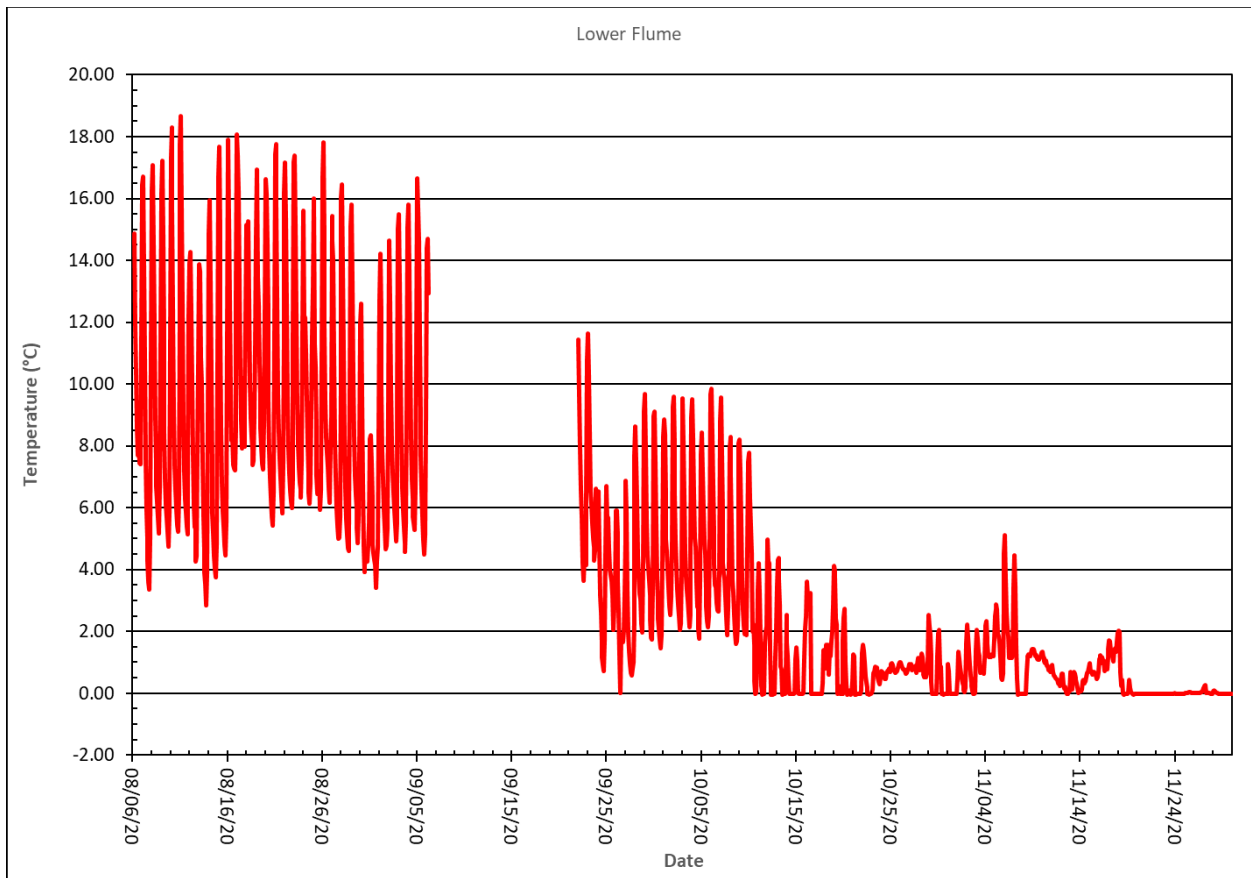


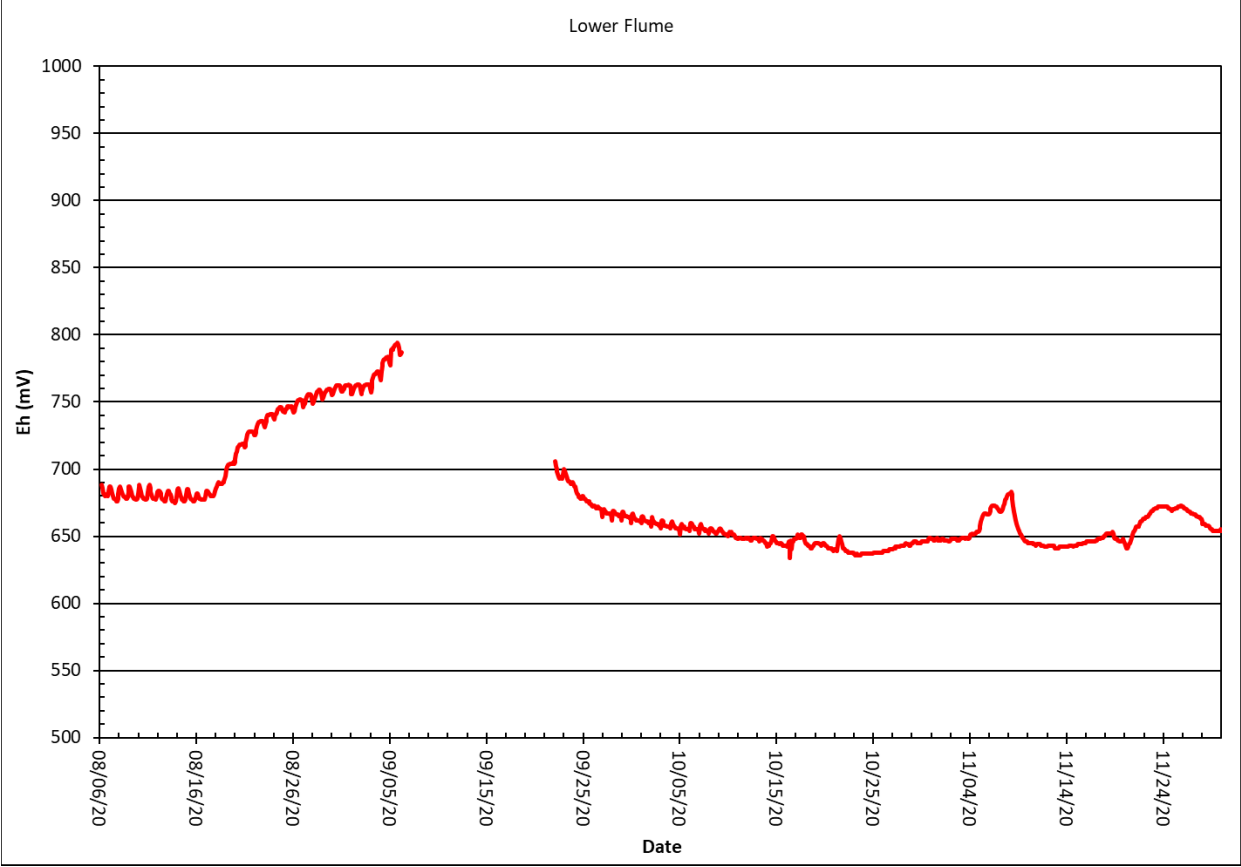






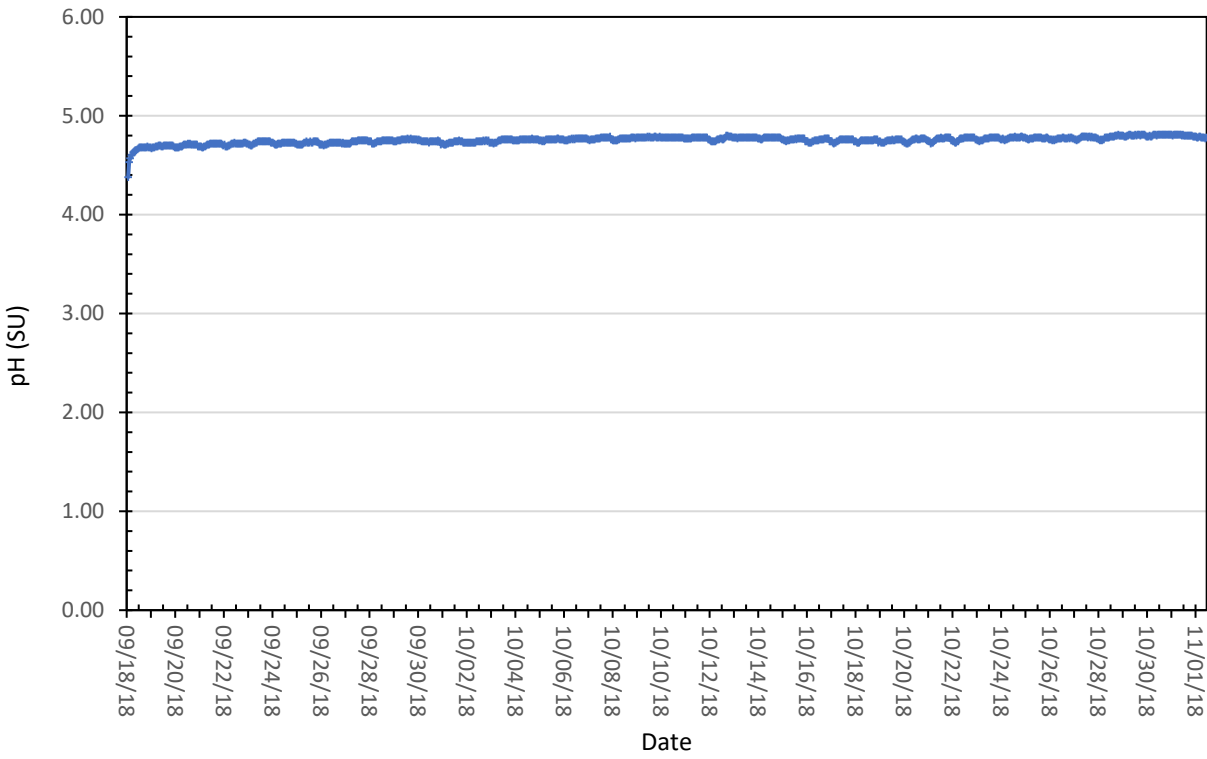




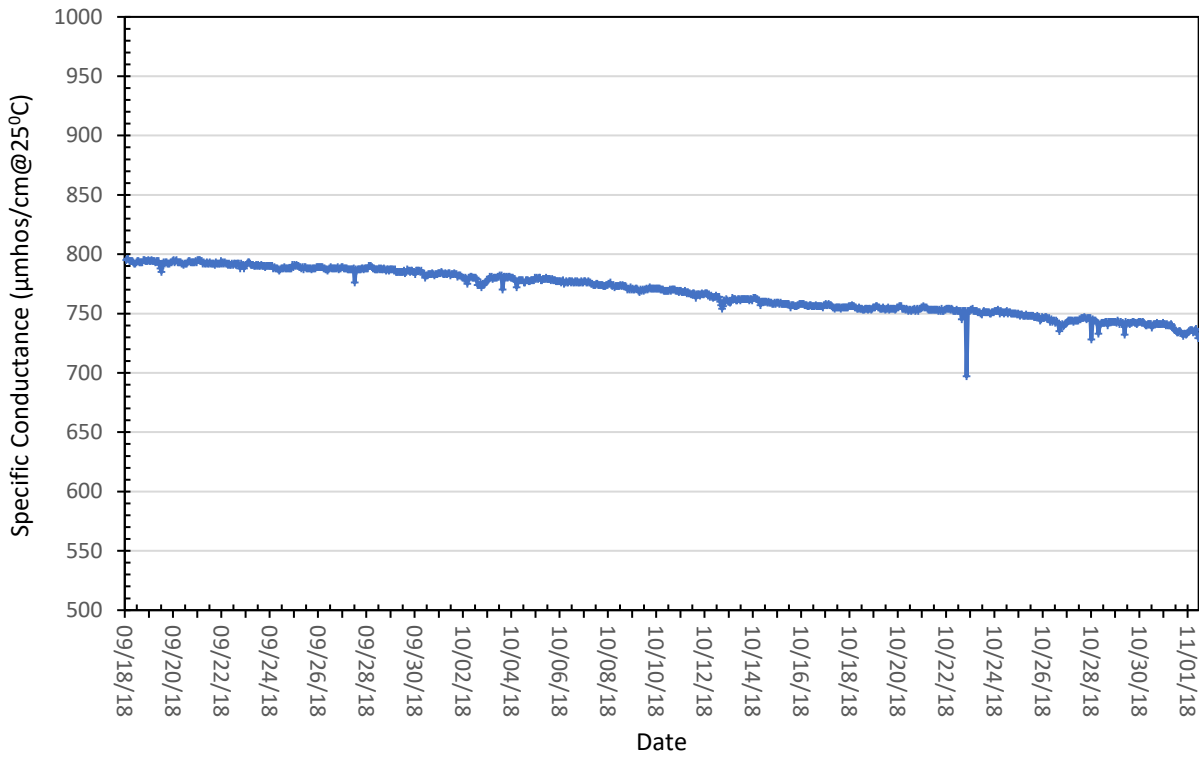


Appendix 3: Crystal Mine—Yearly Physical Parameter Graphs

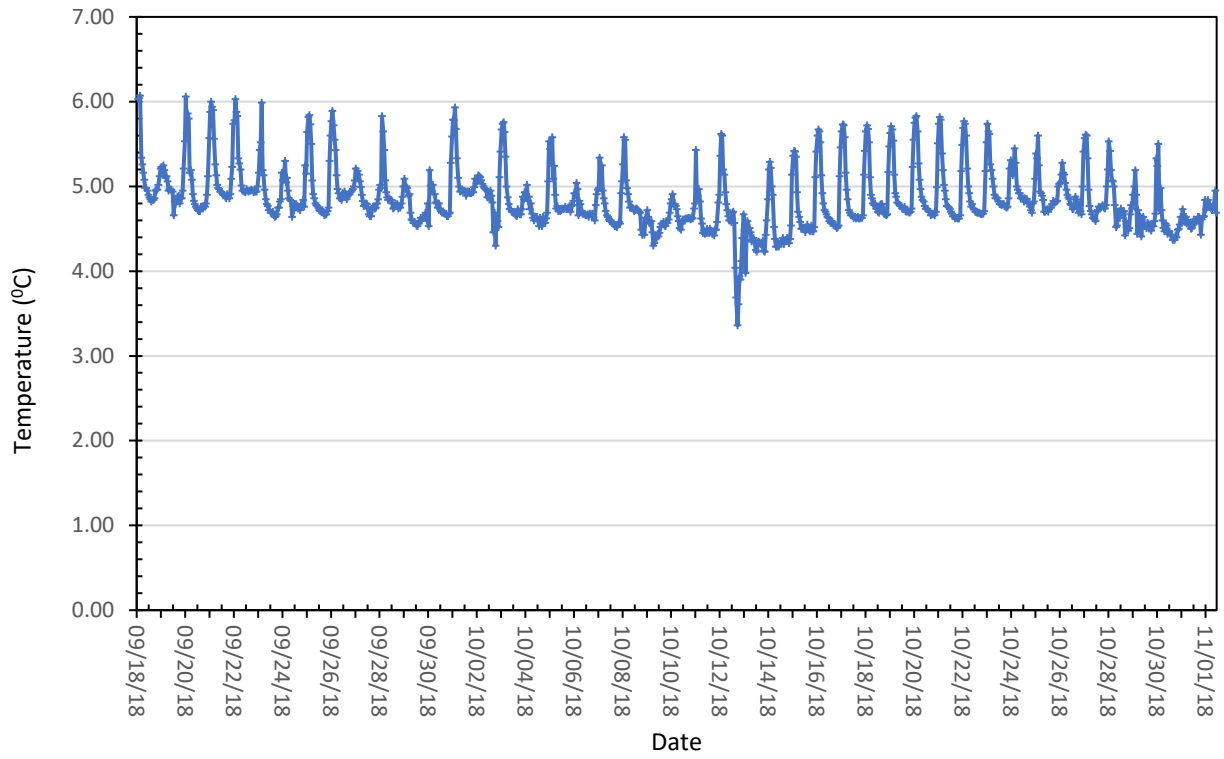
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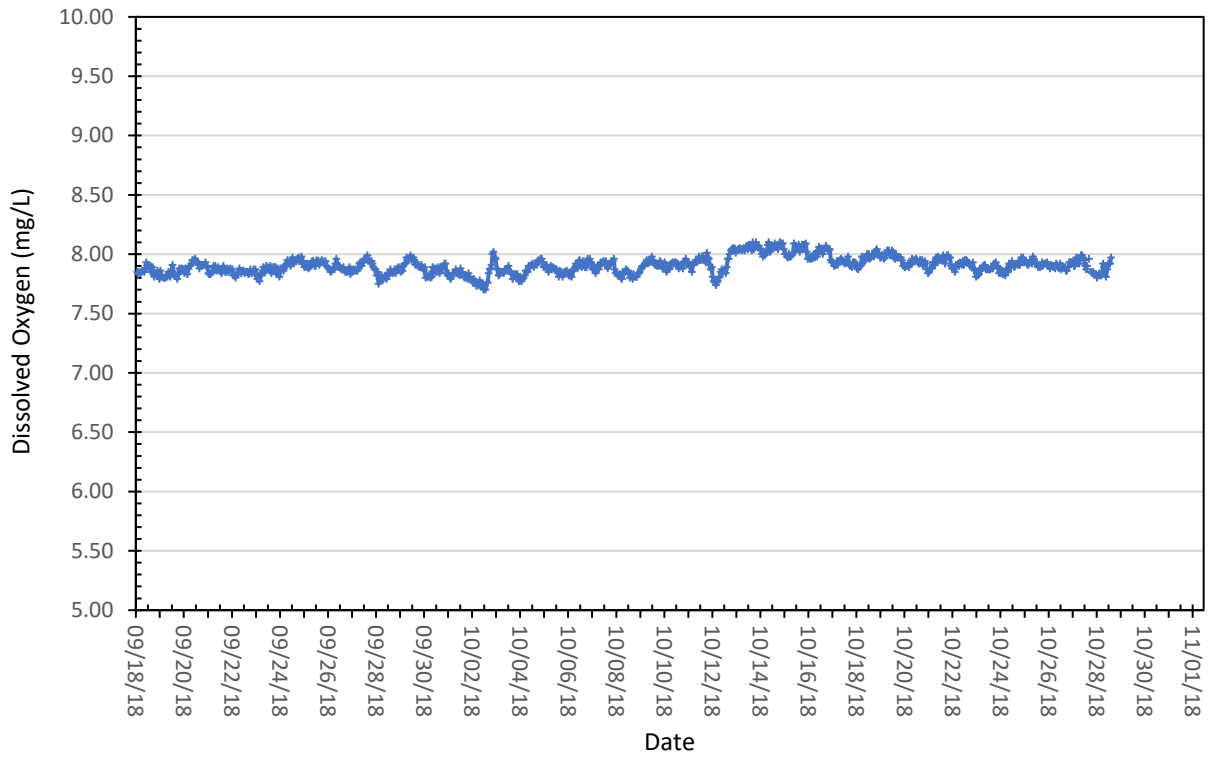
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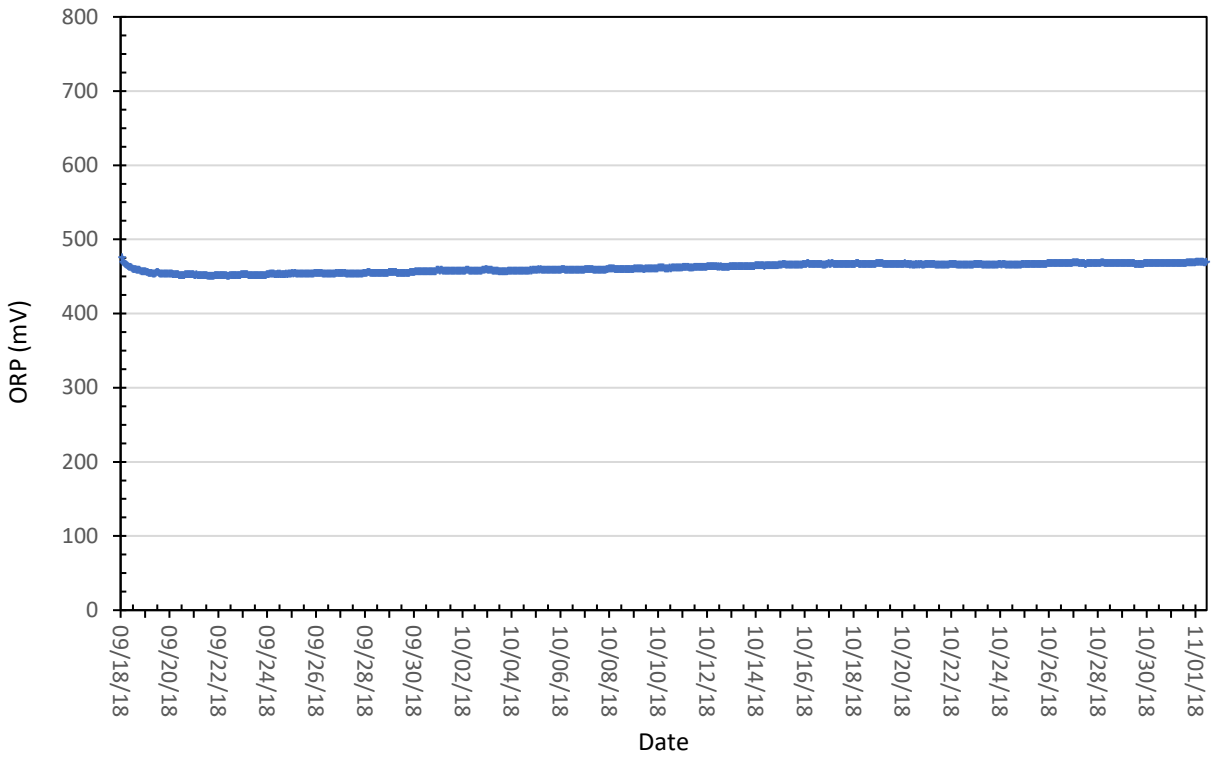
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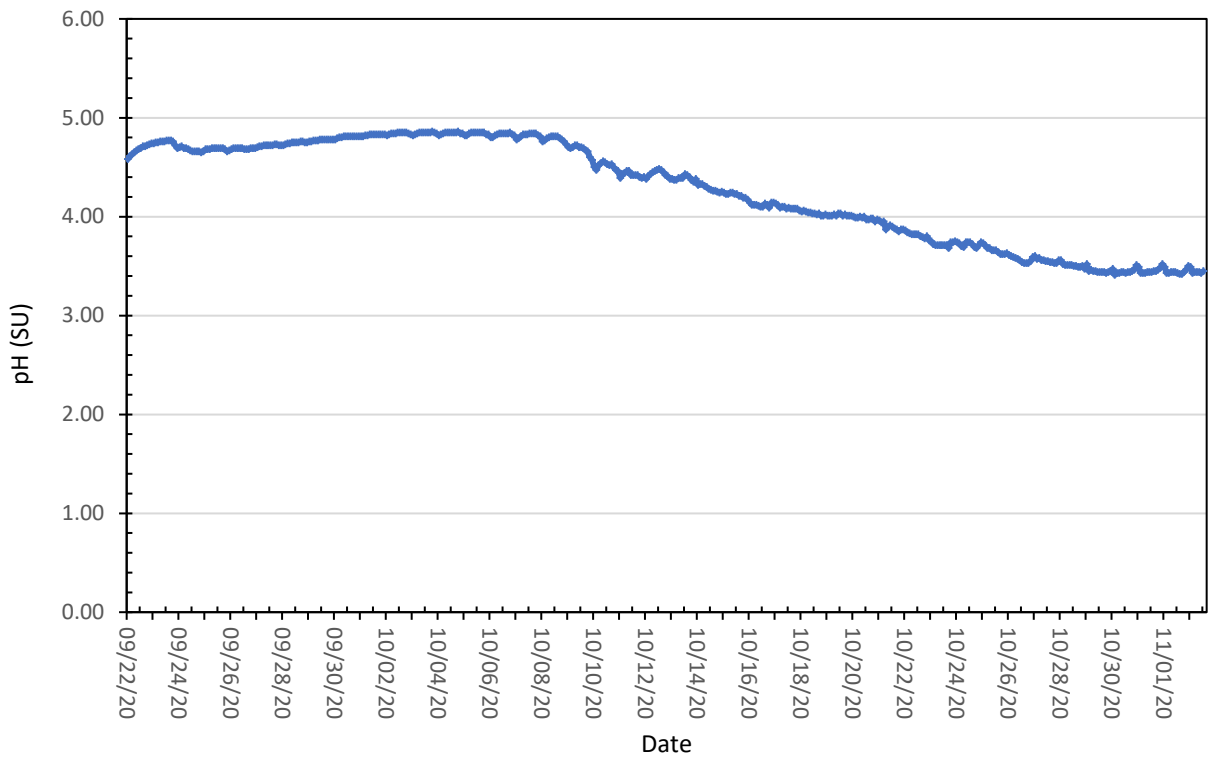
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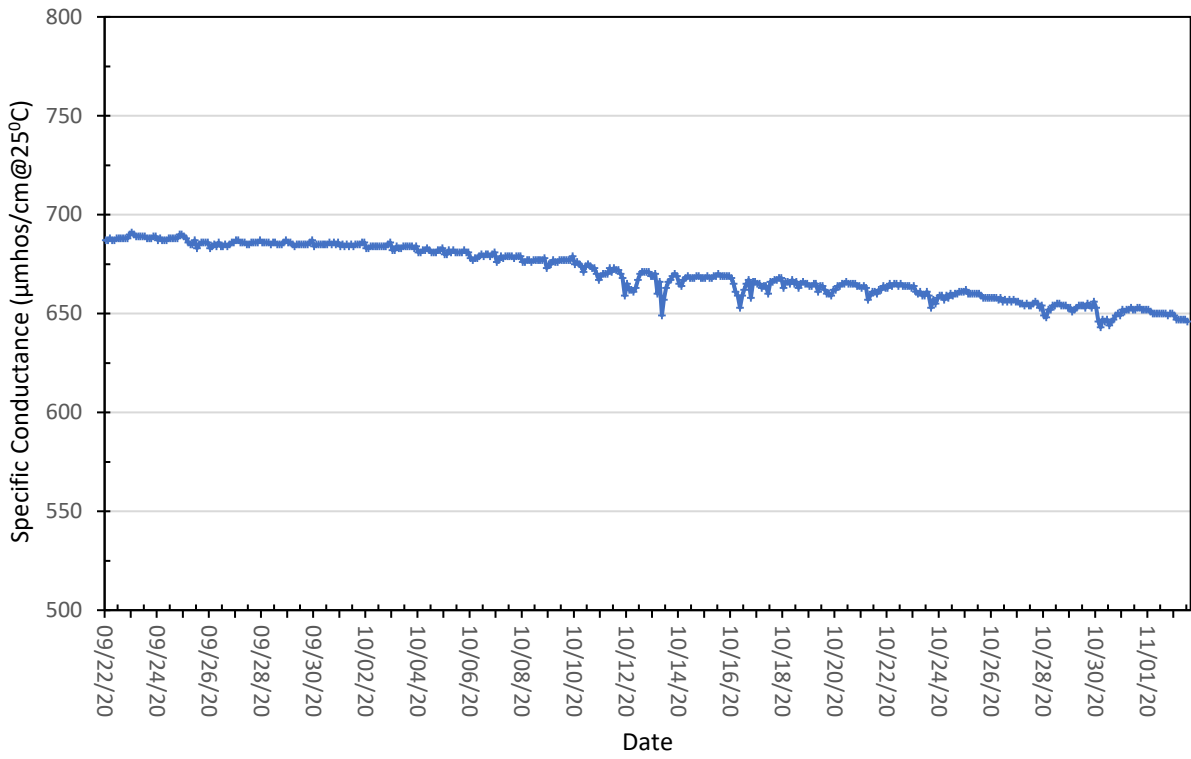
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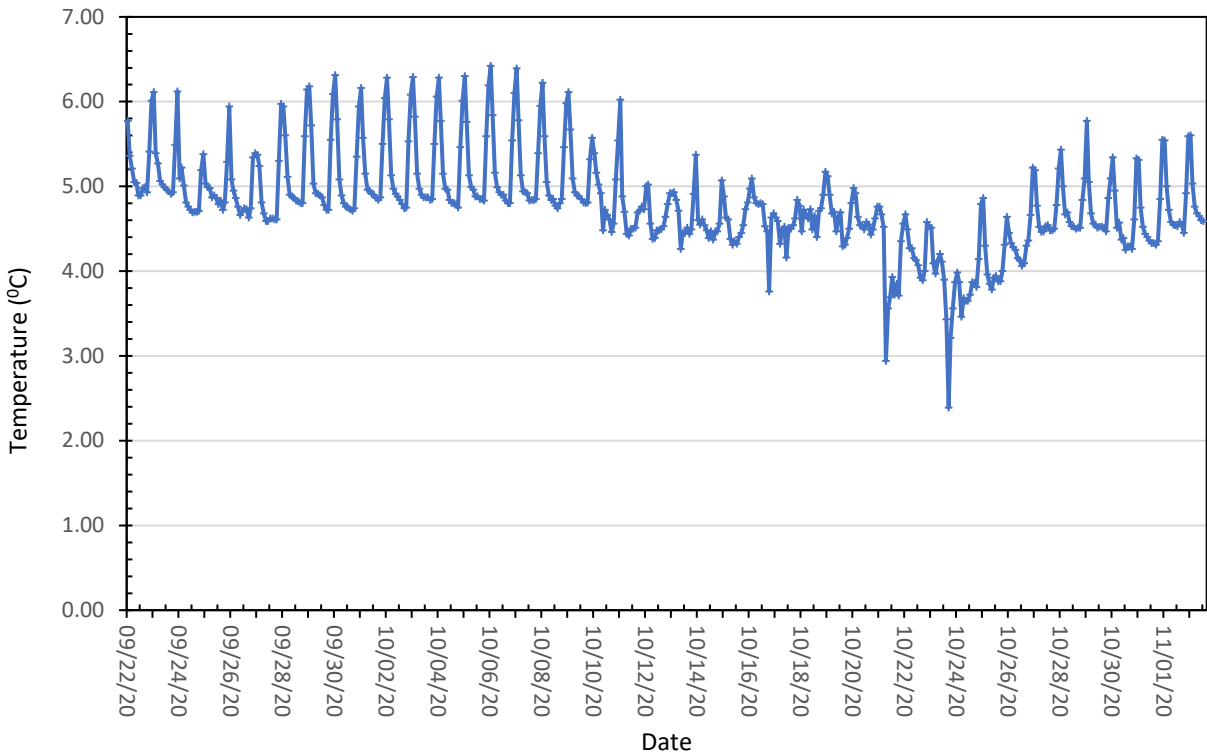
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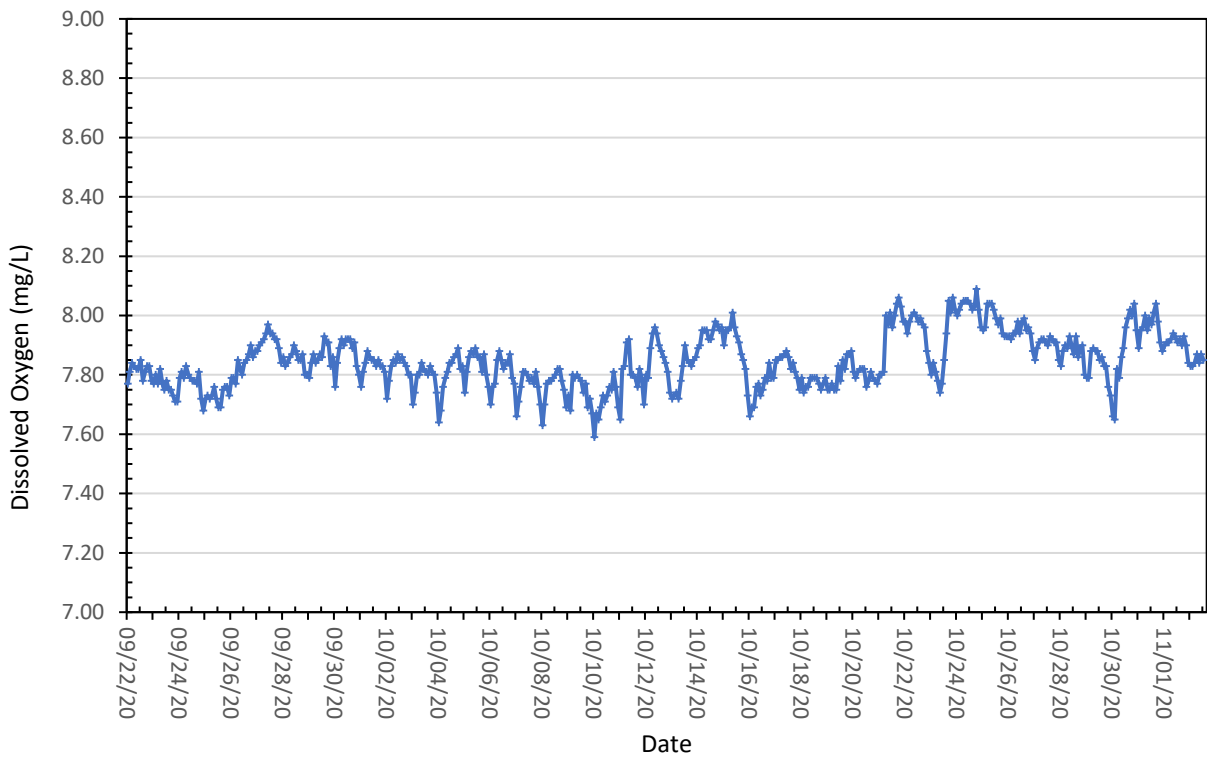
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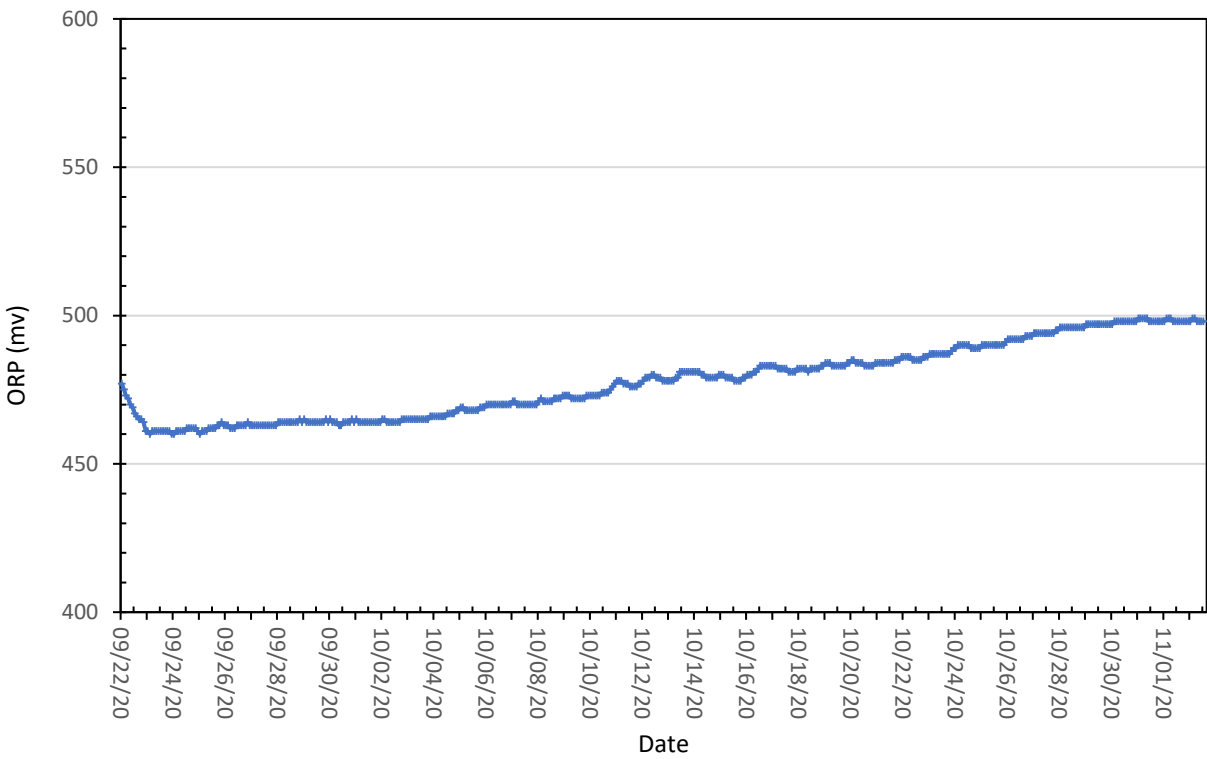
Crystal Mine Adit Discharge



Crystal Mine Adit Discharge



Crystal Mine Adit Discharge



Appendix 4: Water-Quality Results

Location Information

Sample Id/Site Id:	222065 / 128469	Sample Date:	9/13/2016 12:54:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / GARY ICOPINI
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION
Datum:	NAD27	Lab Date:	10/19/2016 6:51:15 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	93.020	4.642	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	29.860	2.457	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.620	0.244	Chloride (Cl)	0.790	0.022
Potassium (K)	3.140	0.080	Sulfate (SO4)	785.100	16.354
Iron (Fe)	85.643	3.067	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	15.089	0.549	Fluoride (F)	0.330	0.017
Silica (SiO2)	32.290		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		13.222	Total Anions		16.393

Trace Element Results (µg/L)

Aluminum (Al):	9,494.500	Cesium (Cs):	4.470	Molybdenum (Mo):	1.150 J	Strontium (Sr):	316.100
Antimony (Sb):	5.200	Chromium (Cr):	<0.250 U	Nickel (Ni):	60.230	Thallium (Tl):	<0.250 U
Arsenic (As):	1,694.030	Cobalt (Co):	207.890	Niobium (Nb):	<0.250 U	Thorium (Th):	7.460
Barium (Ba):	12.410	Copper (Cu):	9,390.500	Neodymium (Nd):	18.840	Tin (Sn):	<0.250 U
Beryllium (Be):	1.220 J	Gallium (Ga):	1.090 J	Palladium (Pd):	0.860 J	Titanium (Ti):	9.680
Boron (B):	54.260	Lanthanum (La):	17.210	Praseodymium (Pr):	4.730	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	200.480	Rubidium (Rb):	14.780	Uranium (U):	186.330
Cadmium (Cd):	220.020	Lithium (Li):	21.510 J	Silver (Ag):	<0.250 U	Vanadium (V):	1.540
Cerium (Ce):	40.020	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,759.600
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1096.53	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1096.53	Hardness as CaCO3:	355.17	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1320	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1556	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.97	Ryznar Stability Index:	16.063	Field Nitrate (mg/L):	NR
Lab pH:	2.9	Sodium Adsorption Ratio:	0.1385	Field Dissolved O2 (mg/L):	7.600
Water Temp (°C):	5.17	Langlier Saturation Index:	-6.581	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	680
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	291.000	Acidity to 8.3 (mg/L CaCO3)	497.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.

Location Information

Sample Id/Site Id:	222066 / 128469	Sample Date:	9/13/2016 12:54:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / GARY ICOPINI
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION
Datum:	NAD27	Lab Date:	10/19/2016 6:51:15 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	93.260	4.654	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	30.240	2.488	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.540	0.241	Chloride (Cl)	NR	0.000
Potassium (K)	3.110	0.080	Sulfate (SO4)	NR	0.000
Iron (Fe)	87.368	3.129	Nitrate (as N)	NR	0.000
Manganese (Mn)	14.844	0.540	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		13.202	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,669.940	Cesium (Cs):	4.470	Molybdenum (Mo):	1.950	Strontium (Sr):	323.560
Antimony (Sb):	7.040	Chromium (Cr):	<0.250 U	Nickel (Ni):	63.320	Thallium (Tl):	<0.250 U
Arsenic (As):	2,392.740	Cobalt (Co):	210.210	Niobium (Nb):	<0.250 U	Thorium (Th):	6.620
Barium (Ba):	13.270	Copper (Cu):	8,921.700	Neodymium (Nd):	19.060	Tin (Sn):	<0.250 U
Beryllium (Be):	1.230 J	Gallium (Ga):	1.340	Palladium (Pd):	0.910 J	Titanium (Ti):	22.440
Boron (B):	57.450	Lanthanum (La):	17.320	Praseodymium (Pr):	4.700	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	202.490	Rubidium (Rb):	15.880	Uranium (U):	184.330
Cadmium (Cd):	208.980	Lithium (Li):	26.760	Silver (Ag):	NR	Vanadium (V):	17.300
Cerium (Ce):	39.880	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,578.840
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	357.34	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1320	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.040 J
Field pH:	2.97	Ryznar Stability Index:	18.961	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1381	Field Dissolved O2 (mg/L):	7.600
Water Temp (°C):	5.17	Langlier Saturation Index:	-9.480	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	680
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222217 / 128469	Sample Date:	11/7/2016 11:53:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / THOMSON, CONNIE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION
Datum:	NAD27	Lab Date:	11/21/2016 7:55:10 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	95.750	4.778	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	30.690	2.525	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.390	0.234	Chloride (Cl)	0.700	0.020
Potassium (K)	3.050	0.078	Sulfate (SO4)	711.500	14.821
Iron (Fe)	78.380	2.807	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	15.194	0.553	Fluoride (F)	0.490	0.026
Silica (SiO2)	32.940		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		13.017	Total Anions		14.866

Trace Element Results (µg/L)

Aluminum (Al):	8,638.500	Cesium (Cs):	4.300	Molybdenum (Mo):	0.890 J	Strontium (Sr):	308.520
Antimony (Sb):	2.800	Chromium (Cr):	0.950 J	Nickel (Ni):	59.170	Thallium (Tl):	<0.250 U
Arsenic (As):	896.640	Cobalt (Co):	188.870	Niobium (Nb):	<0.250 U	Thorium (Th):	5.790
Barium (Ba):	10.120	Copper (Cu):	8,185.500	Neodymium (Nd):	17.580	Tin (Sn):	<0.250 U
Beryllium (Be):	1.110 J	Gallium (Ga):	0.900 J	Palladium (Pd):	0.850 J	Titanium (Ti):	10.420
Boron (B):	49.300	Lanthanum (La):	15.990	Praseodymium (Pr):	4.290	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	185.680	Rubidium (Rb):	13.510	Uranium (U):	165.680
Cadmium (Cd):	208.260	Lithium (Li):	23.850 J	Silver (Ag):	<0.250 U	Vanadium (V):	0.630 J
Cerium (Ce):	36.580	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,535.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1016.8	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1016.8	Hardness as CaCO3:	365.41	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1293	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1545	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.15	Ryznar Stability Index:	15.928	Field Nitrate (mg/L):	NR
Lab pH:	3.01	Sodium Adsorption Ratio:	0.1138	Field Dissolved O2 (mg/L):	7.700
Water Temp (°C):	5.14	Langlier Saturation Index:	-6.459	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	668
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	360.000	Acidity to 8.3 (mg/L CaCO3)	610.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222218 / 128469	Sample Date:	11/7/2016 11:53:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / THOMSON, CONNIE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION DUP
Datum:	NAD27	Lab Date:	11/21/2016 7:55:10 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:1 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	93.230	4.652	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	30.320	2.495	Carbonate (CO3)	0.000	0.000
Sodium (Na)	6.170	0.268	Chloride (Cl)	0.700	0.020
Potassium (K)	2.610	0.067	Sulfate (SO4)	719.600	14.989
Iron (Fe)	76.410	2.736	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	14.780	0.538	Fluoride (F)	0.340	0.018
Silica (SiO2)	32.590		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		12.730	Total Anions		15.027

Trace Element Results (µg/L)

Aluminum (Al):	8,405.500	Cesium (Cs):	3.840	Molybdenum (Mo):	0.660 J	Strontium (Sr):	291.370
Antimony (Sb):	2.640	Chromium (Cr):	0.850 J	Nickel (Ni):	54.460	Thallium (Tl):	<0.250 U
Arsenic (As):	896.230	Cobalt (Co):	173.980	Niobium (Nb):	<0.250 U	Thorium (Th):	5.480
Barium (Ba):	8.650	Copper (Cu):	7,823.500	Neodymium (Nd):	16.170	Tin (Sn):	<0.250 U
Beryllium (Be):	1.010 J	Gallium (Ga):	0.850 J	Palladium (Pd):	0.740 J	Titanium (Ti):	10.240
Boron (B):	48.690	Lanthanum (La):	14.690	Praseodymium (Pr):	3.930	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	170.630	Rubidium (Rb):	12.420	Uranium (U):	154.050
Cadmium (Cd):	193.590	Lithium (Li):	22.300 J	Silver (Ag):	<0.250 U	Vanadium (V):	0.570 J
Cerium (Ce):	33.510	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	25,545.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1019.33	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1019.33	Hardness as CaCO3:	357.59	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1293	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1552	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.15	Ryznar Stability Index:	15.981	Field Nitrate (mg/L):	NR
Lab pH:	2.98	Sodium Adsorption Ratio:	0.1381	Field Dissolved O2 (mg/L):	7.700
Water Temp (°C):	5.14	Langlier Saturation Index:	-6.500	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	668
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	256.000	Acidity to 8.3 (mg/L CaCO3)	480.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222219 / 128469	Sample Date:	11/7/2016 11:53:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / THOMSON, CONNIE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION
Datum:	NAD27	Lab Date:	11/21/2016 7:55:11 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	95.740	4.777	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	30.790	2.534	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.490	0.239	Chloride (Cl)	NR	0.000
Potassium (K)	2.900	0.074	Sulfate (SO4)	NR	0.000
Iron (Fe)	77.090	2.761	Nitrate (as N)	NR	0.000
Manganese (Mn)	15.465	0.563	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		12.981	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,607.250	Cesium (Cs):	4.380	Molybdenum (Mo):	1.470	Strontium (Sr):	323.650
Antimony (Sb):	4.170	Chromium (Cr):	1.390	Nickel (Ni):	59.380	Thallium (Tl):	<0.250 U
Arsenic (As):	1,326.440	Cobalt (Co):	190.850	Niobium (Nb):	<0.250 U	Thorium (Th):	5.030
Barium (Ba):	10.510	Copper (Cu):	8,099.670	Neodymium (Nd):	18.050	Tin (Sn):	<0.250 U
Beryllium (Be):	1.060 J	Gallium (Ga):	1.100 J	Palladium (Pd):	0.920 J	Titanium (Ti):	11.020
Boron (B):	56.030	Lanthanum (La):	16.270	Praseodymium (Pr):	4.320	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	192.490	Rubidium (Rb):	14.330	Uranium (U):	166.920
Cadmium (Cd):	207.810	Lithium (Li):	23.580 J	Silver (Ag):	NR	Vanadium (V):	0.710 J
Cerium (Ce):	36.860	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,450.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	365.79	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1293	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.15	Ryznar Stability Index:	18.938	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1138	Field Dissolved O2 (mg/L):	7.700
Water Temp (°C):	5.14	Langlier Saturation Index:	-9.469	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	668
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222220 / 128469	Sample Date:	11/7/2016 11:53:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / THOMSON, CONNIE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION DUP
Datum:	NAD27	Lab Date:	11/21/2016 7:55:11 PM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	96.330	4.807	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	30.800	2.535	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.270	0.229	Chloride (Cl)	NR	0.000
Potassium (K)	2.990	0.076	Sulfate (SO4)	NR	0.000
Iron (Fe)	78.055	2.795	Nitrate (as N)	NR	0.000
Manganese (Mn)	15.545	0.566	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		13.038	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,582.750	Cesium (Cs):	4.520	Molybdenum (Mo):	3.160	Strontium (Sr):	327.960
Antimony (Sb):	4.370	Chromium (Cr):	1.310	Nickel (Ni):	61.070	Thallium (Tl):	0.560 J
Arsenic (As):	1,345.130	Cobalt (Co):	197.380	Niobium (Nb):	<0.250 U	Thorium (Th):	5.030
Barium (Ba):	9.510	Copper (Cu):	8,077.830	Neodymium (Nd):	18.770	Tin (Sn):	<0.250 U
Beryllium (Be):	1.070 J	Gallium (Ga):	1.040 J	Palladium (Pd):	0.870 J	Titanium (Ti):	10.570
Boron (B):	55.660	Lanthanum (La):	17.040	Praseodymium (Pr):	4.550	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	195.970	Rubidium (Rb):	14.750	Uranium (U):	173.880
Cadmium (Cd):	188.350	Lithium (Li):	23.190 J	Silver (Ag):	NR	Vanadium (V):	0.920 J
Cerium (Ce):	38.810	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,440.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	367.31	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1293	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.15	Ryznar Stability Index:	18.932	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1135	Field Dissolved O2 (mg/L):	7.700
Water Temp (°C):	5.14	Langlier Saturation Index:	-9.466	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	668
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	225093 / 128469	Sample Date:	8/31/2017 2:15:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	9/29/2017 7:19:33 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	88.720	4.427	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	29.000	2.386	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.360	0.233	Chloride (Cl)	0.760	0.021
Potassium (K)	2.870	0.073	Sulfate (SO4)	807.800	16.826
Iron (Fe)	122.350	4.381	Nitrate (as N)	0.040 J	0.003
Manganese (Mn)	16.475	0.600	Fluoride (F)	0.520	0.027
Silica (SiO2)	32.770		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		14.564	Total Anions		16.878

Trace Element Results (µg/L)

Aluminum (Al):	10,825.000	Cesium (Cs):	5.200	Molybdenum (Mo):	2.870	Strontium (Sr):	299.890
Antimony (Sb):	9.920	Chromium (Cr):	2.010	Nickel (Ni):	64.310	Thallium (Tl):	<0.250 U
Arsenic (As):	2,353.190	Cobalt (Co):	227.160	Niobium (Nb):	<0.250 U	Thorium (Th):	9.400
Barium (Ba):	14.830	Copper (Cu):	10,635.000	Neodymium (Nd):	23.620	Tin (Sn):	<0.250 U
Beryllium (Be):	1.900	Gallium (Ga):	1.680	Palladium (Pd):	1.160 J	Titanium (Ti):	13.500
Boron (B):	95.350	Lanthanum (La):	19.710	Praseodymium (Pr):	5.680	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	242.480	Rubidium (Rb):	14.860	Uranium (U):	169.680
Cadmium (Cd):	288.740	Lithium (Li):	25.540	Silver (Ag):	0.690 J	Vanadium (V):	5.120
Cerium (Ce):	45.330	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	29,720.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1157.9	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1157.9	Hardness as CaCO3:	340.9	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1377	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1595	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	0.050 J
Field pH:	2.5	Ryznar Stability Index:	16.194	Field Nitrate (mg/L):	NR
Lab pH:	2.81	Sodium Adsorption Ratio:	0.1178	Field Dissolved O2 (mg/L):	5.400
Water Temp (°C):	5.82	Langlier Saturation Index:	-6.692	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	680
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	291.000	Acidity to 8.3 (mg/L CaCO3)	477.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: SAMPLE COLLECTED FROM UPPER FLUME
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	225095 / 128469	Sample Date:	8/31/2017 2:15:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	9/29/2017 7:19:35 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	88.840	4.433	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	29.070	2.392	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.450	0.237	Chloride (Cl)	NR	0.000
Potassium (K)	2.920	0.075	Sulfate (SO4)	NR	0.000
Iron (Fe)	122.250	4.378	Nitrate (as N)	NR	0.000
Manganese (Mn)	16.420	0.598	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		14.532	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	10,530.000	Cesium (Cs):	5.000	Molybdenum (Mo):	2.840	Strontium (Sr):	313.540
Antimony (Sb):	12.410	Chromium (Cr):	3.440	Nickel (Ni):	68.580	Thallium (Tl):	<0.250 U
Arsenic (As):	2,984.370	Cobalt (Co):	240.790	Niobium (Nb):	<0.250 U	Thorium (Th):	10.570
Barium (Ba):	15.310	Copper (Cu):	10,495.000	Neodymium (Nd):	23.690	Tin (Sn):	<0.250 U
Beryllium (Be):	1.980	Gallium (Ga):	2.170	Palladium (Pd):	1.310	Titanium (Ti):	17.010
Boron (B):	99.110	Lanthanum (La):	21.900	Praseodymium (Pr):	5.610	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	269.700	Rubidium (Rb):	15.950	Uranium (U):	226.220
Cadmium (Cd):	307.960	Lithium (Li):	26.830	Silver (Ag):	NR	Vanadium (V):	4.620
Cerium (Ce):	46.920	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	29,490.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	341.49	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1377	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.060 J
Field pH:	2.5	Ryznar Stability Index:	19.003	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1177	Field Dissolved O2 (mg/L):	5.400
Water Temp (°C):	5.82	Langlier Saturation Index:	-9.501	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	680
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: SAMPLE COLLECTED FROM UPPER FLUME
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230895 / 128469	Sample Date:	8/1/2018 12:10:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	9/4/2018 10:45:04 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	81.780	4.081	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	28.510	2.346	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.030	0.219	Chloride (Cl)	0.730	0.021
Potassium (K)	2.900	0.074	Sulfate (SO4)	924.800	19.264
Iron (Fe)	145.400	5.207	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	17.495	0.637	Fluoride (F)	0.440	0.023
Silica (SiO2)	35.120		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		15.157	Total Anions		19.307

Trace Element Results (µg/L)

Aluminum (Al):	11,600.000	Cesium (Cs):	5.870	Molybdenum (Mo):	2.330	Strontium (Sr):	274.920
Antimony (Sb):	26.520	Chromium (Cr):	2.320	Nickel (Ni):	74.800	Thallium (Tl):	<0.250 U
Arsenic (As):	3,428.220	Cobalt (Co):	238.290	Niobium (Nb):	<0.250 U	Thorium (Th):	10.570
Barium (Ba):	14.240	Copper (Cu):	10,800.000	Neodymium (Nd):	21.910	Tin (Sn):	<0.250 U
Beryllium (Be):	1.800	Gallium (Ga):	1.690	Palladium (Pd):	1.210 J	Titanium (Ti):	11.150
Boron (B):	20.380	Lanthanum (La):	18.340	Praseodymium (Pr):	5.560	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	324.970	Rubidium (Rb):	17.240	Uranium (U):	227.670
Cadmium (Cd):	302.460	Lithium (Li):	30.140	Silver (Ag):	<0.250 U	Vanadium (V):	10.110
Cerium (Ce):	41.510	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	31,255.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1294.95	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1294.95	Hardness as CaCO3:	321.55	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1583	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1789	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	0.060 J
Field pH:	2.15	Ryznar Stability Index:	16.205	Field Nitrate (mg/L):	NR
Lab pH:	2.87	Sodium Adsorption Ratio:	0.1213	Field Dissolved O2 (mg/L):	7.300
Water Temp (°C):	6.26	Langlier Saturation Index:	-6.667	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	694
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	444.000	Acidity to 8.3 (mg/L CaCO3)	769.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FLUME FULL OF SEDIMENT
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230898 / 128469	Sample Date:	8/1/2018 12:10:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	9/4/2018 10:45:05 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	81.830	4.083	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	28.620	2.355	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.430	0.193	Chloride (Cl)	NR	0.000
Potassium (K)	2.890	0.074	Sulfate (SO4)	NR	0.000
Iron (Fe)	146.225	5.236	Nitrate (as N)	NR	0.000
Manganese (Mn)	17.920	0.652	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		15.161	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	11,402.500	Cesium (Cs):	5.910	Molybdenum (Mo):	2.700	Strontium (Sr):	283.370
Antimony (Sb):	29.250	Chromium (Cr):	3.420	Nickel (Ni):	73.870	Thallium (Tl):	<0.250 U
Arsenic (As):	4,290.000	Cobalt (Co):	245.170	Niobium (Nb):	<0.250 U	Thorium (Th):	11.500
Barium (Ba):	14.300	Copper (Cu):	10,730.000	Neodymium (Nd):	22.400	Tin (Sn):	<0.250 U
Beryllium (Be):	1.930	Gallium (Ga):	1.970	Palladium (Pd):	1.600	Titanium (Ti):	12.730
Boron (B):	24.350	Lanthanum (La):	18.630	Praseodymium (Pr):	5.690	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	350.880	Rubidium (Rb):	17.430	Uranium (U):	238.680
Cadmium (Cd):	306.400	Lithium (Li):	34.230	Silver (Ag):	NR	Vanadium (V):	9.690
Cerium (Ce):	42.260	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	31,165.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	322.13	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1583	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.060 J
Field pH:	2.15	Ryznar Stability Index:	19.074	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.097	Field Dissolved O2 (mg/L):	7.300
Water Temp (°C):	6.26	Langlier Saturation Index:	-9.537	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	694
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230900 / 128469	Sample Date:	8/1/2018 12:10:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN DUP
Datum:	NAD27	Lab Date:	9/4/2018 10:45:05 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	81.380	4.061	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	28.490	2.344	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.770	0.207	Chloride (Cl)	NR	0.000
Potassium (K)	2.820	0.072	Sulfate (SO4)	NR	0.000
Iron (Fe)	145.650	5.216	Nitrate (as N)	NR	0.000
Manganese (Mn)	17.905	0.652	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		15.104	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	11,325.000	Cesium (Cs):	6.060	Molybdenum (Mo):	2.950	Strontium (Sr):	286.620
Antimony (Sb):	29.600	Chromium (Cr):	3.340	Nickel (Ni):	73.470	Thallium (Tl):	<0.250 U
Arsenic (As):	4,217.000	Cobalt (Co):	241.870	Niobium (Nb):	<0.250 U	Thorium (Th):	11.610
Barium (Ba):	14.480	Copper (Cu):	10,640.000	Neodymium (Nd):	22.980	Tin (Sn):	<0.250 U
Beryllium (Be):	2.020	Gallium (Ga):	2.030	Palladium (Pd):	1.830	Titanium (Ti):	12.730
Boron (B):	22.000	Lanthanum (La):	19.050	Praseodymium (Pr):	5.770	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	353.780	Rubidium (Rb):	17.960	Uranium (U):	241.670
Cadmium (Cd):	311.940	Lithium (Li):	33.200	Silver (Ag):	NR	Vanadium (V):	10.060
Cerium (Ce):	43.420	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	31,010.000
						Zirconium (Zr):	1.100 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	320.47	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1583	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.070 J
Field pH:	2.15	Ryznar Stability Index:	19.079	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1215	Field Dissolved O2 (mg/L):	7.300
Water Temp (°C):	6.26	Langlier Saturation Index:	-9.539	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	694
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230903 / 128469	Sample Date:	8/1/2018 12:10:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN DUP
Datum:	NAD27	Lab Date:	9/4/2018 10:45:06 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	81.740	4.079	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	28.820	2.372	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.120	0.223	Chloride (Cl)	0.790	0.022
Potassium (K)	2.790	0.071	Sulfate (SO4)	958.100	19.957
Iron (Fe)	145.050	5.194	Nitrate (as N)	0.050	0.004
Manganese (Mn)	17.570	0.640	Fluoride (F)	0.450	0.024
Silica (SiO2)	35.220		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		15.165	Total Anions		20.007

Trace Element Results (µg/L)

Aluminum (Al):	11,580.000	Cesium (Cs):	5.650	Molybdenum (Mo):	2.190	Strontium (Sr):	269.800
Antimony (Sb):	29.150	Chromium (Cr):	2.340	Nickel (Ni):	71.520	Thallium (Tl):	<0.250 U
Arsenic (As):	3,359.380	Cobalt (Co):	233.410	Niobium (Nb):	<0.250 U	Thorium (Th):	10.400
Barium (Ba):	13.870	Copper (Cu):	10,740.000	Neodymium (Nd):	21.390	Tin (Sn):	<0.250 U
Beryllium (Be):	1.720	Gallium (Ga):	1.540	Palladium (Pd):	1.130 J	Titanium (Ti):	10.140
Boron (B):	18.750	Lanthanum (La):	17.790	Praseodymium (Pr):	5.390	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	320.060	Rubidium (Rb):	16.350	Uranium (U):	221.640
Cadmium (Cd):	293.310	Lithium (Li):	29.470	Silver (Ag):	<0.250 U	Vanadium (V):	9.670
Cerium (Ce):	40.090	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	31,165.000
						Zirconium (Zr):	0.990 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1329.05	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1329.05	Hardness as CaCO3:	322.73	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1583	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1782	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	0.050 J
Field pH:	2.15	Ryznar Stability Index:	16.225	Field Nitrate (mg/L):	NR
Lab pH:	2.85	Sodium Adsorption Ratio:	0.1211	Field Dissolved O2 (mg/L):	7.300
Water Temp (°C):	6.26	Langlier Saturation Index:	-6.688	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	694
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	509.000	Acidity to 8.3 (mg/L CaCO3)	819.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	235390 / 128469	Sample Date:	11/15/2018 1:12:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	12/13/2018 7:54:02 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	83.490	4.166	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	27.430	2.257	Carbonate (CO3)	0.000	0.000
Sodium (Na)	4.900	0.213	Chloride (Cl)	0.610	0.017
Potassium (K)	2.640	0.068	Sulfate (SO4)	750.800	15.639
Iron (Fe)	98.385	3.523	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	14.660	0.534	Fluoride (F)	0.520	0.027
Silica (SiO2)	32.010		Orthophosphate (as P)	0.080 J	0.000
Total Cations		12.605	Total Anions		15.684

Trace Element Results (µg/L)

Aluminum (Al):	8,214.000	Cesium (Cs):	5.010	Molybdenum (Mo):	1.560	Strontium (Sr):	280.110
Antimony (Sb):	6.180	Chromium (Cr):	1.490	Nickel (Ni):	62.030	Thallium (Tl):	<0.250 U
Arsenic (As):	577.770	Cobalt (Co):	185.950	Niobium (Nb):	<0.250 U	Thorium (Th):	4.270
Barium (Ba):	12.620	Copper (Cu):	5,616.330	Neodymium (Nd):	15.970	Tin (Sn):	<0.250 U
Beryllium (Be):	1.410	Gallium (Ga):	1.320	Palladium (Pd):	1.010 J	Titanium (Ti):	7.670
Boron (B):	100.430	Lanthanum (La):	12.960	Praseodymium (Pr):	3.820	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	214.480	Rubidium (Rb):	15.190	Uranium (U):	122.960
Cadmium (Cd):	254.190	Lithium (Li):	26.920	Silver (Ag):	<0.250 U	Vanadium (V):	3.630
Cerium (Ce):	29.340	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	24,150.000
						Zirconium (Zr):	0.560 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1054.9	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1054.9	Hardness as CaCO3:	321.38	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1278	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1436	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.84	Ryznar Stability Index:	16.107	Field Nitrate (mg/L):	NR
Lab pH:	2.95	Sodium Adsorption Ratio:	0.1214	Field Dissolved O2 (mg/L):	7.610
Water Temp (°C):	4.84	Langlier Saturation Index:	-6.578	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	677
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	274.000	Acidity to 8.3 (mg/L CaCO3)	509.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FLUME STAGE HIEGHT 0.26
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	235392 / 128469	Sample Date:	11/15/2018 1:12:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE DRAIN
Datum:	NAD27	Lab Date:	12/13/2018 7:54:03 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	85.310	4.257	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	28.120	2.314	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.790	0.208	Chloride (Cl)	NR	0.000
Potassium (K)	2.940	0.075	Sulfate (SO4)	NR	0.000
Iron (Fe)	106.275	3.806	Nitrate (as N)	NR	0.000
Manganese (Mn)	15.215	0.554	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		13.086	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,233.500	Cesium (Cs):	4.740	Molybdenum (Mo):	4.790	Strontium (Sr):	289.510
Antimony (Sb):	7.540	Chromium (Cr):	1.850	Nickel (Ni):	62.520	Thallium (Tl):	0.890 J
Arsenic (As):	1,175.850	Cobalt (Co):	188.340	Niobium (Nb):	<0.250 U	Thorium (Th):	3.990
Barium (Ba):	12.660	Copper (Cu):	5,699.000	Neodymium (Nd):	14.810	Tin (Sn):	<0.250 U
Beryllium (Be):	1.290	Gallium (Ga):	1.340	Palladium (Pd):	0.960 J	Titanium (Ti):	10.260
Boron (B):	100.330	Lanthanum (La):	12.020	Praseodymium (Pr):	3.570	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	177.710	Rubidium (Rb):	15.770	Uranium (U):	114.880
Cadmium (Cd):	235.340	Lithium (Li):	26.620	Silver (Ag):	NR	Vanadium (V):	3.570
Cerium (Ce):	27.340	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	24,895.000
						Zirconium (Zr):	0.720 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	328.76	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1278	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.84	Ryznar Stability Index:	19.038	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.12	Field Dissolved O2 (mg/L):	7.610
Water Temp (°C):	4.84	Langlier Saturation Index:	-9.519	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	677
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FLUME STAGE HIEGHT 0.26
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246203 / 128469	Sample Date:	7/14/2020 12:34:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE FLUME
Datum:	NAD27	Lab Date:	8/12/2020 8:27:23 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	77.670	3.876	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	28.170	2.318	Carbonate (CO3)	0.000	0.000
Sodium (Na)	4.910	0.214	Chloride (Cl)	0.750	0.021
Potassium (K)	2.730	0.070	Sulfate (SO4)	1,035.000	21.559
Iron (Fe)	180.777	6.474	Nitrate (as N)	0.060	0.004
Manganese (Mn)	18.873	0.687	Fluoride (F)	0.600	0.032
Silica (SiO2)	39.440		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		16.217	Total Anions		21.616

Trace Element Results (µg/L)

Aluminum (Al):	11,794.970	Cesium (Cs):	5.000	Molybdenum (Mo):	2.850	Strontium (Sr):	233.540
Antimony (Sb):	38.300	Chromium (Cr):	2.630	Nickel (Ni):	69.660	Thallium (Tl):	<0.250 U
Arsenic (As):	4,543.130	Cobalt (Co):	242.350	Niobium (Nb):	<0.250 U	Thorium (Th):	7.140
Barium (Ba):	11.470	Copper (Cu):	11,556.360	Neodymium (Nd):	21.160	Tin (Sn):	<0.250 U
Beryllium (Be):	1.460	Gallium (Ga):	1.650	Palladium (Pd):	1.240 J	Titanium (Ti):	20.700
Boron (B):	150.010	Lanthanum (La):	14.810	Praseodymium (Pr):	4.500	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	285.500	Rubidium (Rb):	15.060	Uranium (U):	146.450
Cadmium (Cd):	214.720	Lithium (Li):	33.800	Silver (Ag):	<0.250 U	Vanadium (V):	10.260
Cerium (Ce):	34.730	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	28,927.600
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1442.12	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1442.12	Hardness as CaCO3:	309.89	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1649	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1703	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.38	Ryznar Stability Index:	16.259	Field Nitrate (mg/L):	NR
Lab pH:	2.86	Sodium Adsorption Ratio:	0.1236	Field Dissolved O2 (mg/L):	7.870
Water Temp (°C):	5.73	Langlier Saturation Index:	-6.700	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	684
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	858.000	Acidity to 8.3 (mg/L CaCO3)	1,270.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR
 Field Remarks: FE(II) = 105 MG/L
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246206 / 128469	Sample Date:	7/14/2020 12:34:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE FLUME
Datum:	NAD27	Lab Date:	8/12/2020 8:27:25 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	78.770	3.931	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	27.830	2.290	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.820	0.210	Chloride (Cl)	NR	0.000
Potassium (K)	2.830	0.072	Sulfate (SO4)	NR	0.000
Iron (Fe)	177.181	6.345	Nitrate (as N)	NR	0.000
Manganese (Mn)	19.070	0.694	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		16.136	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	11,853.120	Cesium (Cs):	5.010	Molybdenum (Mo):	3.080	Strontium (Sr):	241.330
Antimony (Sb):	42.310	Chromium (Cr):	3.210	Nickel (Ni):	72.600	Thallium (Tl):	<0.250 U
Arsenic (As):	5,555.840	Cobalt (Co):	251.360	Niobium (Nb):	<0.250 U	Thorium (Th):	7.150
Barium (Ba):	11.810	Copper (Cu):	11,413.490	Neodymium (Nd):	20.960	Tin (Sn):	<0.250 U
Beryllium (Be):	1.440	Gallium (Ga):	1.830	Palladium (Pd):	1.300	Titanium (Ti):	23.130
Boron (B):	156.270	Lanthanum (La):	13.700	Praseodymium (Pr):	4.430	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	254.200	Rubidium (Rb):	15.750	Uranium (U):	158.160
Cadmium (Cd):	213.660	Lithium (Li):	35.010	Silver (Ag):	NR	Vanadium (V):	9.550
Cerium (Ce):	34.600	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	29,330.070
						Zirconium (Zr):	0.690 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	311.24	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1649	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.38	Ryznar Stability Index:	19.107	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1233	Field Dissolved O2 (mg/L):	7.870
Water Temp (°C):	5.73	Langlier Saturation Index:	-9.554	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	684
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR
 Field Remarks: FE(II) = 105 MG/L
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249613 / 128469	Sample Date:	9/22/2020 12:15:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE FLUME
Datum:	NAD27	Lab Date:	11/9/2020 10:14:47 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	77.250	3.855	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	25.530	2.101	Carbonate (CO3)	0.000	0.000
Sodium (Na)	4.930	0.214	Chloride (Cl)	0.750	0.021
Potassium (K)	2.840	0.073	Sulfate (SO4)	813.300	16.941
Iron (Fe)	106.681	3.820	Nitrate (as N)	<0.010 U	0.000
Manganese (Mn)	14.582	0.531	Fluoride (F)	0.560	0.029
Silica (SiO2)	34.430		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		12.433	Total Anions		16.992

Trace Element Results (µg/L)

Aluminum (Al):	8,623.450	Cesium (Cs):	6.130	Molybdenum (Mo):	1.380	Strontium (Sr):	284.570
Antimony (Sb):	7.560	Chromium (Cr):	1.090 J	Nickel (Ni):	53.370	Thallium (Tl):	<0.250 U
Arsenic (As):	556.050	Cobalt (Co):	184.590	Niobium (Nb):	<0.250 U	Thorium (Th):	3.230
Barium (Ba):	13.590	Copper (Cu):	5,665.010	Neodymium (Nd):	16.340	Tin (Sn):	<0.250 U
Beryllium (Be):	1.010 J	Gallium (Ga):	1.550	Palladium (Pd):	1.000 J	Titanium (Ti):	12.450
Boron (B):	144.200	Lanthanum (La):	15.710	Praseodymium (Pr):	4.750	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	223.780	Rubidium (Rb):	17.700	Uranium (U):	161.510
Cadmium (Cd):	197.730	Lithium (Li):	32.890	Silver (Ag):	0.540 J	Vanadium (V):	4.000
Cerium (Ce):	36.400	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	22,318.220
						Zirconium (Zr):	0.990 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1118.39	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1118.39	Hardness as CaCO3:	297.97	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1231	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1350	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.79	Ryznar Stability Index:	16.164	Field Nitrate (mg/L):	NR
Lab pH:	2.96	Sodium Adsorption Ratio:	0.126	Field Dissolved O2 (mg/L):	7.330
Water Temp (°C):	5.05	Langlier Saturation Index:	-6.602	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	687
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	379.000	Acidity to 8.3 (mg/L CaCO3)	721.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249616 / 128469	Sample Date:	9/22/2020 12:15:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 25" N 112° 17' 40" W	Field Number:	UPPER BULLION MINE FLUME
Datum:	NAD27	Lab Date:	11/9/2020 10:14:48 AM
Altitude:	7500	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:	BASIN 7 1/2'	SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	76.490	3.817	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	25.980	2.138	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.790	0.208	Chloride (Cl)	NR	0.000
Potassium (K)	2.730	0.070	Sulfate (SO4)	NR	0.000
Iron (Fe)	109.173	3.909	Nitrate (as N)	NR	0.000
Manganese (Mn)	14.328	0.522	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		12.504	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,600.820	Cesium (Cs):	5.170	Molybdenum (Mo):	1.830	Strontium (Sr):	289.730
Antimony (Sb):	8.780	Chromium (Cr):	2.150	Nickel (Ni):	56.830	Thallium (Tl):	0.580 J
Arsenic (As):	1,162.200	Cobalt (Co):	190.590	Niobium (Nb):	<0.250 U	Thorium (Th):	4.330
Barium (Ba):	14.390	Copper (Cu):	5,759.330	Neodymium (Nd):	17.730	Tin (Sn):	<0.250 U
Beryllium (Be):	1.190 J	Gallium (Ga):	1.430	Palladium (Pd):	1.720	Titanium (Ti):	14.280
Boron (B):	148.820	Lanthanum (La):	13.960	Praseodymium (Pr):	4.210	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	236.960	Rubidium (Rb):	14.750	Uranium (U):	161.860
Cadmium (Cd):	222.960	Lithium (Li):	31.070	Silver (Ag):	NR	Vanadium (V):	4.550
Cerium (Ce):	29.600	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	22,297.880
						Zirconium (Zr):	1.420

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	297.93	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1231	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.79	Ryznar Stability Index:	19.133	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.126	Field Dissolved O2 (mg/L):	7.330
Water Temp (°C):	5.05	Langlier Saturation Index:	-9.566	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	687
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222063 / 285107	Sample Date:	9/13/2016 11:20:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / GARY ICOPINI
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION
Datum:	NAD83	Lab Date:	10/19/2016 6:51:15 PM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	84.950	4.239	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	27.150	2.234	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.590	0.243	Chloride (Cl)	0.920	0.026
Potassium (K)	2.610	0.067	Sulfate (SO4)	778.900	16.224
Iron (Fe)	64.195	2.299	Nitrate (as N)	0.060	0.004
Manganese (Mn)	13.257	0.483	Fluoride (F)	0.310	0.016
Silica (SiO2)	34.160		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		11.484	Total Anions		16.271

Trace Element Results (µg/L)

Aluminum (Al):	8,334.000	Cesium (Cs):	3.890	Molybdenum (Mo):	0.950 J	Strontium (Sr):	280.820
Antimony (Sb):	3.570	Chromium (Cr):	<0.250 U	Nickel (Ni):	61.150	Thallium (Tl):	<0.250 U
Arsenic (As):	1,285.750	Cobalt (Co):	173.780	Niobium (Nb):	<0.250 U	Thorium (Th):	6.900
Barium (Ba):	11.000	Copper (Cu):	8,053.250	Neodymium (Nd):	17.540	Tin (Sn):	<0.250 U
Beryllium (Be):	1.280	Gallium (Ga):	0.930 J	Palladium (Pd):	0.860 J	Titanium (Ti):	9.780
Boron (B):	42.550	Lanthanum (La):	16.680	Praseodymium (Pr):	4.460	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	173.980	Rubidium (Rb):	13.220	Uranium (U):	174.140
Cadmium (Cd):	175.760	Lithium (Li):	21.350 J	Silver (Ag):	<0.250 U	Vanadium (V):	1.030 J
Cerium (Ce):	36.570	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	23,840.490
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1052.33	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1052.33	Hardness as CaCO3:	323.87	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1360	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1534	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.84	Ryznar Stability Index:	16.082	Field Nitrate (mg/L):	NR
Lab pH:	2.96	Sodium Adsorption Ratio:	0.1451	Field Dissolved O2 (mg/L):	9.450
Water Temp (°C):	6.6	Langlier Saturation Index:	-6.561	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	712
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	351.000	Acidity to 8.3 (mg/L CaCO3)	553.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	222064 / 285107	Sample Date:	9/13/2016 11:20:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / GARY ICOPINI
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION
Datum:	NAD83	Lab Date:	10/19/2016 6:51:15 PM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	96.260	4.803	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	30.440	2.505	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.730	0.249	Chloride (Cl)	NR	0.000
Potassium (K)	3.090	0.079	Sulfate (SO4)	NR	0.000
Iron (Fe)	71.339	2.555	Nitrate (as N)	NR	0.000
Manganese (Mn)	14.966	0.545	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		12.791	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,519.290	Cesium (Cs):	4.330	Molybdenum (Mo):	1.640	Strontium (Sr):	327.430
Antimony (Sb):	4.580	Chromium (Cr):	<0.250 U	Nickel (Ni):	63.670	Thallium (Tl):	<0.250 U
Arsenic (As):	1,848.430	Cobalt (Co):	199.810	Niobium (Nb):	<0.250 U	Thorium (Th):	5.630
Barium (Ba):	12.360	Copper (Cu):	8,733.510	Neodymium (Nd):	19.220	Tin (Sn):	<0.250 U
Beryllium (Be):	1.400	Gallium (Ga):	1.330	Palladium (Pd):	1.130 J	Titanium (Ti):	11.670
Boron (B):	48.940	Lanthanum (La):	18.530	Praseodymium (Pr):	4.830	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	191.490	Rubidium (Rb):	16.080	Uranium (U):	177.730
Cadmium (Cd):	206.020	Lithium (Li):	27.880	Silver (Ag):	NR	Vanadium (V):	19.270
Cerium (Ce):	40.210	Mercury (Hg):	NR	Selenium (Se):	1.080 J	Zinc (Zn):	26,831.310
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	365.65	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1360	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.84	Ryznar Stability Index:	18.933	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1365	Field Dissolved O2 (mg/L):	9.450
Water Temp (°C):	6.6	Langlier Saturation Index:	-9.467	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	712
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition:

Field Remarks:

Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	225092 / 285107	Sample Date:	8/31/2017 1:35:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	9/29/2017 7:19:33 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	90.580	4.520	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	29.610	2.437	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.480	0.238	Chloride (Cl)	0.780	0.022
Potassium (K)	3.060	0.078	Sulfate (SO4)	813.400	16.943
Iron (Fe)	103.900	3.721	Nitrate (as N)	0.060	0.004
Manganese (Mn)	16.425	0.598	Fluoride (F)	0.540	0.028
Silica (SiO2)	34.280		Orthophosphate (as P)	0.060 J	0.000
Total Cations		14.085	Total Anions		16.998

Trace Element Results (µg/L)

Aluminum (Al):	11,035.000	Cesium (Cs):	5.090	Molybdenum (Mo):	4.070	Strontium (Sr):	299.630
Antimony (Sb):	6.490	Chromium (Cr):	1.620	Nickel (Ni):	68.180	Thallium (Tl):	<0.250 U
Arsenic (As):	1,733.110	Cobalt (Co):	220.070	Niobium (Nb):	<0.250 U	Thorium (Th):	10.180
Barium (Ba):	14.580	Copper (Cu):	10,645.000	Neodymium (Nd):	22.730	Tin (Sn):	<0.250 U
Beryllium (Be):	1.890	Gallium (Ga):	1.640	Palladium (Pd):	1.450	Titanium (Ti):	14.750
Boron (B):	80.870	Lanthanum (La):	20.200	Praseodymium (Pr):	5.510	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	269.250	Rubidium (Rb):	15.450	Uranium (U):	197.230
Cadmium (Cd):	273.340	Lithium (Li):	27.060	Silver (Ag):	1.390	Vanadium (V):	2.090
Cerium (Ce):	43.850	Mercury (Hg):	NR	Selenium (Se):	1.000 J	Zinc (Zn):	29,985.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1148.86	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1148.86	Hardness as CaCO3:	348.05	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1519	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1567	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	0.040 J
Field pH:	3.34	Ryznar Stability Index:	16.126	Field Nitrate (mg/L):	NR
Lab pH:	2.86	Sodium Adsorption Ratio:	0.1166	Field Dissolved O2 (mg/L):	6.610
Water Temp (°C):	17.12	Langlier Saturation Index:	-6.633	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	693
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	291.000	Acidity to 8.3 (mg/L CaCO3)	516.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: SAMPLE COLLECTED FROM LOWER FLUME
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	225094 / 285107	Sample Date:	8/31/2017 1:35:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	9/29/2017 7:19:35 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	90.950	4.538	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	29.690	2.443	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.730	0.249	Chloride (Cl)	NR	0.000
Potassium (K)	3.000	0.077	Sulfate (SO4)	NR	0.000
Iron (Fe)	102.150	3.658	Nitrate (as N)	NR	0.000
Manganese (Mn)	16.415	0.598	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		13.996	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	10,620.000	Cesium (Cs):	5.210	Molybdenum (Mo):	2.140	Strontium (Sr):	306.130
Antimony (Sb):	7.590	Chromium (Cr):	2.920	Nickel (Ni):	68.680	Thallium (Tl):	<0.250 U
Arsenic (As):	2,125.440	Cobalt (Co):	225.100	Niobium (Nb):	<0.250 U	Thorium (Th):	10.920
Barium (Ba):	14.750	Copper (Cu):	10,438.330	Neodymium (Nd):	23.750	Tin (Sn):	<0.250 U
Beryllium (Be):	1.920	Gallium (Ga):	1.820	Palladium (Pd):	1.440	Titanium (Ti):	16.730
Boron (B):	84.530	Lanthanum (La):	21.090	Praseodymium (Pr):	5.710	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	282.770	Rubidium (Rb):	15.860	Uranium (U):	209.830
Cadmium (Cd):	277.400	Lithium (Li):	27.730	Silver (Ag):	NR	Vanadium (V):	2.430
Cerium (Ce):	44.920	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	29,720.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	349.31	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1519	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.050 J
Field pH:	3.34	Ryznar Stability Index:	18.982	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1397	Field Dissolved O2 (mg/L):	6.610
Water Temp (°C):	17.12	Langlier Saturation Index:	-9.491	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	693
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: SAMPLE COLLECTED FROM LOWER FLUME
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230894 / 285107	Sample Date:	8/1/2018 11:00:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	9/4/2018 10:45:04 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	82.920	4.138	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	28.400	2.337	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.130	0.223	Chloride (Cl)	0.820	0.023
Potassium (K)	2.750	0.070	Sulfate (SO4)	923.000	19.226
Iron (Fe)	128.700	4.609	Nitrate (as N)	0.060	0.004
Manganese (Mn)	17.415	0.634	Fluoride (F)	0.460	0.024
Silica (SiO2)	37.730		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		14.582	Total Anions		19.278

Trace Element Results (µg/L)

Aluminum (Al):	11,550.000	Cesium (Cs):	5.870	Molybdenum (Mo):	2.030	Strontium (Sr):	282.500
Antimony (Sb):	21.850	Chromium (Cr):	2.460	Nickel (Ni):	73.660	Thallium (Tl):	<0.250 U
Arsenic (As):	3,084.110	Cobalt (Co):	233.620	Niobium (Nb):	<0.250 U	Thorium (Th):	11.080
Barium (Ba):	14.200	Copper (Cu):	10,460.000	Neodymium (Nd):	24.150	Tin (Sn):	<0.250 U
Beryllium (Be):	2.080	Gallium (Ga):	1.490	Palladium (Pd):	1.440	Titanium (Ti):	12.040
Boron (B):	17.990	Lanthanum (La):	21.410	Praseodymium (Pr):	6.080	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	313.760	Rubidium (Rb):	17.460	Uranium (U):	231.620
Cadmium (Cd):	307.570	Lithium (Li):	32.920	Silver (Ag):	<0.250 U	Vanadium (V):	7.280
Cerium (Ce):	44.580	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	31,030.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1280.36	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1280.36	Hardness as CaCO3:	323.95	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1300	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1792	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	0.040 J
Field pH:	2.61	Ryznar Stability Index:	16.193	Field Nitrate (mg/L):	NR
Lab pH:	2.87	Sodium Adsorption Ratio:	0.1209	Field Dissolved O2 (mg/L):	7.900
Water Temp (°C):	14.1	Langlier Saturation Index:	-6.661	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	700
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	479.000	Acidity to 8.3 (mg/L CaCO3)	809.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: CLEANED OUT FLUME AFTER 11 MONTHS OF FLOW
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230897 / 285107	Sample Date:	8/1/2018 11:00:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	9/4/2018 10:45:05 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	82.540	4.119	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	28.460	2.342	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.660	0.203	Chloride (Cl)	NR	0.000
Potassium (K)	2.910	0.074	Sulfate (SO4)	NR	0.000
Iron (Fe)	128.675	4.608	Nitrate (as N)	NR	0.000
Manganese (Mn)	17.455	0.635	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		14.517	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	11,340.000	Cesium (Cs):	5.900	Molybdenum (Mo):	2.270	Strontium (Sr):	287.690
Antimony (Sb):	23.420	Chromium (Cr):	3.380	Nickel (Ni):	76.560	Thallium (Tl):	<0.250 U
Arsenic (As):	3,500.210	Cobalt (Co):	238.970	Niobium (Nb):	<0.250 U	Thorium (Th):	11.640
Barium (Ba):	13.990	Copper (Cu):	10,312.500	Neodymium (Nd):	24.320	Tin (Sn):	<0.250 U
Beryllium (Be):	2.130	Gallium (Ga):	1.860	Palladium (Pd):	2.140	Titanium (Ti):	12.000
Boron (B):	20.350	Lanthanum (La):	21.680	Praseodymium (Pr):	6.190	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	324.070	Rubidium (Rb):	18.050	Uranium (U):	238.210
Cadmium (Cd):	307.080	Lithium (Li):	35.090	Silver (Ag):	NR	Vanadium (V):	7.970
Cerium (Ce):	45.150	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	30,785.000
						Zirconium (Zr):	1.100 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	323.24	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1300	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.040 J
Field pH:	2.61	Ryznar Stability Index:	19.067	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.121	Field Dissolved O2 (mg/L):	7.900
Water Temp (°C):	14.1	Langlier Saturation Index:	-9.533	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	700
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	235389 / 285107	Sample Date:	11/15/2018 12:24:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	12/13/2018 7:54:02 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	65.490	3.268	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	21.300	1.753	Carbonate (CO3)	0.000	0.000
Sodium (Na)	4.080	0.177	Chloride (Cl)	0.650	0.018
Potassium (K)	1.910	0.049	Sulfate (SO4)	721.220	15.023
Iron (Fe)	65.105	2.331	Nitrate (as N)	0.050 J	0.004
Manganese (Mn)	11.370	0.414	Fluoride (F)	0.520	0.027
Silica (SiO2)	33.950		Orthophosphate (as P)	0.030 J	0.000
Total Cations		9.450	Total Anions		15.072

Trace Element Results (µg/L)

Aluminum (Al):	6,593.000	Cesium (Cs):	3.570	Molybdenum (Mo):	1.070 J	Strontium (Sr):	222.920
Antimony (Sb):	3.440	Chromium (Cr):	1.130 J	Nickel (Ni):	51.200	Thallium (Tl):	<0.250 U
Arsenic (As):	461.210	Cobalt (Co):	143.740	Niobium (Nb):	<0.250 U	Thorium (Th):	4.310
Barium (Ba):	9.060	Copper (Cu):	4,300.330	Neodymium (Nd):	15.420	Tin (Sn):	<0.250 U
Beryllium (Be):	1.410	Gallium (Ga):	0.990 J	Palladium (Pd):	0.890 J	Titanium (Ti):	8.370
Boron (B):	68.000	Lanthanum (La):	14.480	Praseodymium (Pr):	3.880	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	157.260	Rubidium (Rb):	12.350	Uranium (U):	111.090
Cadmium (Cd):	212.100	Lithium (Li):	23.840 J	Silver (Ag):	<0.250 U	Vanadium (V):	1.760
Cerium (Ce):	26.900	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	18,885.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	955.57	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	955.57	Hardness as CaCO3:	251.2	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1229	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1391	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.55	Ryznar Stability Index:	16.358	Field Nitrate (mg/L):	NR
Lab pH:	2.91	Sodium Adsorption Ratio:	0.1098	Field Dissolved O2 (mg/L):	10.770
Water Temp (°C):	-0.01	Langlier Saturation Index:	-6.724	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	707
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	321.000	Acidity to 8.3 (mg/L CaCO3)	544.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FLUME STAGE HIEGHT 0.12
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	235391 / 285107	Sample Date:	11/15/2018 12:24:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE DRAIN
Datum:	NAD83	Lab Date:	12/13/2018 7:54:03 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	85.790	4.281	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	27.580	2.270	Carbonate (CO3)	NR	0.000
Sodium (Na)	5.000	0.218	Chloride (Cl)	NR	0.000
Potassium (K)	2.810	0.072	Sulfate (SO4)	NR	0.000
Iron (Fe)	83.943	3.006	Nitrate (as N)	NR	0.000
Manganese (Mn)	15.110	0.550	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		12.275	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,389.500	Cesium (Cs):	4.260	Molybdenum (Mo):	1.510	Strontium (Sr):	285.850
Antimony (Sb):	4.040	Chromium (Cr):	1.790	Nickel (Ni):	62.260	Thallium (Tl):	<0.250 U
Arsenic (As):	764.990	Cobalt (Co):	180.320	Niobium (Nb):	<0.250 U	Thorium (Th):	4.510
Barium (Ba):	11.740	Copper (Cu):	5,561.670	Neodymium (Nd):	16.900	Tin (Sn):	<0.250 U
Beryllium (Be):	1.480	Gallium (Ga):	1.220 J	Palladium (Pd):	1.120 J	Titanium (Ti):	9.870
Boron (B):	79.730	Lanthanum (La):	15.970	Praseodymium (Pr):	4.170	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	153.640	Rubidium (Rb):	15.400	Uranium (U):	108.840
Cadmium (Cd):	228.130	Lithium (Li):	28.680	Silver (Ag):	NR	Vanadium (V):	2.440
Cerium (Ce):	29.520	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	24,750.000
						Zirconium (Zr):	0.830 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	327.74	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1229	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.55	Ryznar Stability Index:	19.033	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1202	Field Dissolved O2 (mg/L):	10.770
Water Temp (°C):	-0.01	Langlier Saturation Index:	-9.517	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	707
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FLUME STAGE HIEGHT 0.12
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246202 / 285107	Sample Date:	7/14/2020 11:15:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE FLUME
Datum:	NAD83	Lab Date:	8/12/2020 8:27:23 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	73.490	3.667	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	25.920	2.133	Carbonate (CO3)	0.000	0.000
Sodium (Na)	4.900	0.213	Chloride (Cl)	0.790	0.022
Potassium (K)	2.460	0.063	Sulfate (SO4)	948.700	19.761
Iron (Fe)	150.275	5.381	Nitrate (as N)	0.090	0.006
Manganese (Mn)	16.995	0.619	Fluoride (F)	0.600	0.032
Silica (SiO2)	40.360		Orthophosphate (as P)	0.060 J	0.000
Total Cations		14.447	Total Anions		19.822

Trace Element Results (µg/L)

Aluminum (Al):	11,111.960	Cesium (Cs):	4.470	Molybdenum (Mo):	2.290	Strontium (Sr):	226.670
Antimony (Sb):	23.350	Chromium (Cr):	2.450	Nickel (Ni):	65.010	Thallium (Tl):	<0.250 U
Arsenic (As):	3,701.260	Cobalt (Co):	213.590	Niobium (Nb):	<0.250 U	Thorium (Th):	6.340
Barium (Ba):	11.020	Copper (Cu):	10,178.280	Neodymium (Nd):	20.420	Tin (Sn):	<0.250 U
Beryllium (Be):	1.560	Gallium (Ga):	1.470	Palladium (Pd):	1.400	Titanium (Ti):	18.980
Boron (B):	123.200	Lanthanum (La):	15.560	Praseodymium (Pr):	4.430	Tungsten (W):	<0.250 U
Bromide (Br):	<10.000 U	Lead (Pb):	244.060	Rubidium (Rb):	14.710	Uranium (U):	144.710
Cadmium (Cd):	201.380	Lithium (Li):	33.480	Silver (Ag):	<0.250 U	Vanadium (V):	7.960
Cerium (Ce):	33.950	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,103.190
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1311.8	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1311.8	Hardness as CaCO3:	290.19	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1582	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1593	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.48	Ryznar Stability Index:	16.348	Field Nitrate (mg/L):	NR
Lab pH:	2.82	Sodium Adsorption Ratio:	0.1277	Field Dissolved O2 (mg/L):	8.280
Water Temp (°C):	12.1	Langlier Saturation Index:	-6.764	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	701
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	571.000	Acidity to 8.3 (mg/L CaCO3)	954.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR
 Field Remarks: FE(II) = 62 MG/L
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246205 / 285107	Sample Date:	7/14/2020 11:15:00 AM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE FLUME
Datum:	NAD83	Lab Date:	8/12/2020 8:27:25 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	73.870	3.686	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	25.340	2.085	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.690	0.204	Chloride (Cl)	NR	0.000
Potassium (K)	2.530	0.065	Sulfate (SO4)	NR	0.000
Iron (Fe)	144.389	5.171	Nitrate (as N)	NR	0.000
Manganese (Mn)	16.888	0.615	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		14.168	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	10,968.270	Cesium (Cs):	4.420	Molybdenum (Mo):	2.790	Strontium (Sr):	228.490
Antimony (Sb):	25.290	Chromium (Cr):	3.230	Nickel (Ni):	68.700	Thallium (Tl):	<0.250 U
Arsenic (As):	4,363.990	Cobalt (Co):	220.340	Niobium (Nb):	<0.250 U	Thorium (Th):	6.270
Barium (Ba):	11.850	Copper (Cu):	9,749.570	Neodymium (Nd):	20.590	Tin (Sn):	<0.250 U
Beryllium (Be):	1.560	Gallium (Ga):	1.670	Palladium (Pd):	1.450	Titanium (Ti):	23.050
Boron (B):	124.670	Lanthanum (La):	14.490	Praseodymium (Pr):	4.400	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	244.000	Rubidium (Rb):	15.240	Uranium (U):	141.920
Cadmium (Cd):	201.150	Lithium (Li):	35.470	Silver (Ag):	NR	Vanadium (V):	7.590
Cerium (Ce):	33.690	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	26,152.220
						Zirconium (Zr):	0.940 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	288.75	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1582	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.48	Ryznar Stability Index:	19.163	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.128	Field Dissolved O2 (mg/L):	8.280
Water Temp (°C):	12.1	Langlier Saturation Index:	-9.582	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	701
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR
 Field Remarks: FE(II) = 62 MG/L
 Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249614 / 285107	Sample Date:	9/22/2020 1:20:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE FLUME
Datum:	NAD83	Lab Date:	11/9/2020 10:14:47 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	77.850	3.885	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	25.510	2.099	Carbonate (CO3)	0.000	0.000
Sodium (Na)	5.340	0.232	Chloride (Cl)	0.770	0.022
Potassium (K)	2.920	0.075	Sulfate (SO4)	815.800	16.993
Iron (Fe)	90.327	3.235	Nitrate (as N)	0.060	0.004
Manganese (Mn)	14.571	0.530	Fluoride (F)	0.570	0.030
Silica (SiO2)	35.350		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		11.908	Total Anions		17.049

Trace Element Results (µg/L)

Aluminum (Al):	8,723.530	Cesium (Cs):	6.160	Molybdenum (Mo):	1.350	Strontium (Sr):	269.280
Antimony (Sb):	4.390	Chromium (Cr):	1.050 J	Nickel (Ni):	54.610	Thallium (Tl):	<0.250 U
Arsenic (As):	419.630	Cobalt (Co):	184.630	Niobium (Nb):	1.860	Thorium (Th):	4.420
Barium (Ba):	13.650	Copper (Cu):	5,656.250	Neodymium (Nd):	16.980	Tin (Sn):	<0.250 U
Beryllium (Be):	1.160 J	Gallium (Ga):	1.500	Palladium (Pd):	1.150 J	Titanium (Ti):	12.150
Boron (B):	127.300	Lanthanum (La):	17.750	Praseodymium (Pr):	5.150	Tungsten (W):	0.510 J
Bromide (Br):	<10.000 U	Lead (Pb):	222.380	Rubidium (Rb):	18.230	Uranium (U):	148.870
Cadmium (Cd):	200.290	Lithium (Li):	34.260	Silver (Ag):	<0.250 U	Vanadium (V):	2.070
Cerium (Ce):	37.910	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	22,432.800
						Zirconium (Zr):	0.870 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	1106.17	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	1106.17	Hardness as CaCO3:	299.39	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1281	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1373	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	2.83	Ryznar Stability Index:	16.177	Field Nitrate (mg/L):	NR
Lab pH:	2.94	Sodium Adsorption Ratio:	0.1257	Field Dissolved O2 (mg/L):	8.240
Water Temp (°C):	11.86	Langlier Saturation Index:	-6.619	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	710
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	351.000	Acidity to 8.3 (mg/L CaCO3)	638.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249617 / 285107	Sample Date:	9/22/2020 1:20:00 PM
Location (TRS):	07N 06W 13 DCDB	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 21' 26" N 112° 17' 45" W	Field Number:	LOWER BULLION MINE FLUME
Datum:	NAD83	Lab Date:	11/9/2020 10:14:48 AM
Altitude:	7100	Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	78.370	3.911	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	26.580	2.187	Carbonate (CO3)	NR	0.000
Sodium (Na)	4.930	0.214	Chloride (Cl)	NR	0.000
Potassium (K)	2.700	0.069	Sulfate (SO4)	NR	0.000
Iron (Fe)	94.524	3.385	Nitrate (as N)	NR	0.000
Manganese (Mn)	14.567	0.530	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		12.149	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	8,673.380	Cesium (Cs):	5.180	Molybdenum (Mo):	1.100 J	Strontium (Sr):	290.330
Antimony (Sb):	5.250	Chromium (Cr):	2.030	Nickel (Ni):	57.960	Thallium (Tl):	<0.250 U
Arsenic (As):	889.150	Cobalt (Co):	195.770	Niobium (Nb):	1.500	Thorium (Th):	3.380
Barium (Ba):	14.520	Copper (Cu):	5,774.950	Neodymium (Nd):	18.630	Tin (Sn):	<0.250 U
Beryllium (Be):	1.330	Gallium (Ga):	1.390	Palladium (Pd):	1.210 J	Titanium (Ti):	13.710
Boron (B):	122.120	Lanthanum (La):	15.450	Praseodymium (Pr):	4.480	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	238.950	Rubidium (Rb):	14.640	Uranium (U):	162.760
Cadmium (Cd):	222.770	Lithium (Li):	31.570	Silver (Ag):	NR	Vanadium (V):	2.150
Cerium (Ce):	33.530	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	22,504.040
						Zirconium (Zr):	0.780 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	305.09	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	1281	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	0.030 J
Field pH:	2.83	Ryznar Stability Index:	19.112	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1246	Field Dissolved O2 (mg/L):	8.240
Water Temp (°C):	11.86	Langlier Saturation Index:	-9.556	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	710
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - SLIGHT RUST COLOR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

Disclaimer

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Location Information

Sample Id/Site Id:	230896 / 257068	Sample Date:	8/1/2018 12:53:00 PM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE DRAIN
Datum:	WGS84	Lab Date:	9/4/2018 10:45:04 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	57.910	2.890	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	15.580	1.282	Carbonate (CO3)	0.000	0.000
Sodium (Na)	3.200	0.139	Chloride (Cl)	0.680	0.019
Potassium (K)	1.330	0.034	Sulfate (SO4)	623.100	12.979
Iron (Fe)	62.505	2.238	Nitrate (as N)	0.090	0.006
Manganese (Mn)	11.078	0.403	Fluoride (F)	0.160	0.008
Silica (SiO2)	24.070		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		10.423	Total Anions		13.013

Trace Element Results (µg/L)

Aluminum (Al):	13,387.500	Cesium (Cs):	3.540	Molybdenum (Mo):	<0.100 U	Strontium (Sr):	227.880
Antimony (Sb):	6.630	Chromium (Cr):	<0.100 U	Nickel (Ni):	36.090	Thallium (Tl):	<0.100 U
Arsenic (As):	394.560	Cobalt (Co):	232.430	Niobium (Nb):	<0.100 U	Thorium (Th):	0.540
Barium (Ba):	27.160	Copper (Cu):	13,425.000	Neodymium (Nd):	9.000	Tin (Sn):	<0.100 U
Beryllium (Be):	1.610	Gallium (Ga):	1.160	Palladium (Pd):	1.160	Titanium (Ti):	11.370
Boron (B):	3.390	Lanthanum (La):	11.190	Praseodymium (Pr):	2.440	Tungsten (W):	<0.100 U
Bromide (Br):	<10.000 U	Lead (Pb):	157.150	Rubidium (Rb):	9.140	Uranium (U):	49.730
Cadmium (Cd):	645.530	Lithium (Li):	20.110	Silver (Ag):	<0.100 U	Vanadium (V):	0.340 J
Cerium (Ce):	20.180	Mercury (Hg):	NR	Selenium (Se):	0.640	Zinc (Zn):	49,675.000
						Zirconium (Zr):	<0.100 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	875.98	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	875.98	Hardness as CaCO3:	208.73	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	895.8	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	1089	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.97	Ryznar Stability Index:	15.404	Field Nitrate (mg/L):	NR
Lab pH:	3.97	Sodium Adsorption Ratio:	0.0904	Field Dissolved O2 (mg/L):	7.280
Water Temp (°C):	5.79	Langlier Saturation Index:	-5.717	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	510
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	218.000	Acidity to 8.3 (mg/L CaCO3)	563.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - YELLOWISH COLOR
 Field Remarks: SAND BAGS IN FRONT OF FLUME - MOVED FLUME DOWNSTREAM ABOUT 20 FEET
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	230899 / 257068	Sample Date:	8/1/2018 12:53:00 PM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY/MCGRATH, STEVE/DUAIME, TED
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE DRAIN
Datum:	WGS84	Lab Date:	9/4/2018 10:45:05 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	61.800	3.084	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	16.530	1.360	Carbonate (CO3)	NR	0.000
Sodium (Na)	3.540	0.154	Chloride (Cl)	NR	0.000
Potassium (K)	1.540	0.039	Sulfate (SO4)	NR	0.000
Iron (Fe)	66.483	2.381	Nitrate (as N)	NR	0.000
Manganese (Mn)	11.598	0.422	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		10.990	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	13,813.750	Cesium (Cs):	3.890	Molybdenum (Mo):	0.570 J	Strontium (Sr):	244.020
Antimony (Sb):	11.370	Chromium (Cr):	0.940 J	Nickel (Ni):	38.260	Thallium (Tl):	<0.250 U
Arsenic (As):	807.030	Cobalt (Co):	249.520	Niobium (Nb):	<0.250 U	Thorium (Th):	1.070 J
Barium (Ba):	29.050	Copper (Cu):	13,816.670	Neodymium (Nd):	9.900	Tin (Sn):	<0.250 U
Beryllium (Be):	1.800	Gallium (Ga):	1.500	Palladium (Pd):	1.280	Titanium (Ti):	10.590
Boron (B):	8.560	Lanthanum (La):	12.080	Praseodymium (Pr):	2.620	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	184.030	Rubidium (Rb):	10.110	Uranium (U):	53.590
Cadmium (Cd):	683.890	Lithium (Li):	27.170	Silver (Ag):	NR	Vanadium (V):	0.740 J
Cerium (Ce):	21.740	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	51,420.000
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	222.35	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	895.8	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.97	Ryznar Stability Index:	19.318	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.1167	Field Dissolved O2 (mg/L):	7.280
Water Temp (°C):	5.79	Langlier Saturation Index:	-9.659	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	510
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR - YELLOWISH COLOR
 Field Remarks:
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246204 / 257068	Sample Date:	7/14/2020 2:35:00 PM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE FLUME
Datum:	WGS84	Lab Date:	8/12/2020 8:27:23 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	55.900	2.789	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	15.280	1.257	Carbonate (CO3)	0.000	0.000
Sodium (Na)	3.340	0.145	Chloride (Cl)	0.610	0.017
Potassium (K)	1.320	0.034	Sulfate (SO4)	517.300	10.775
Iron (Fe)	42.056	1.506	Nitrate (as N)	0.100	0.007
Manganese (Mn)	10.018	0.365	Fluoride (F)	0.180	0.009
Silica (SiO2)	24.490		Orthophosphate (as P)	<0.020 U	0.000
Total Cations		8.653	Total Anions		10.809

Trace Element Results (µg/L)

Aluminum (Al):	9,921.030	Cesium (Cs):	3.100	Molybdenum (Mo):	<0.100 U	Strontium (Sr):	200.220
Antimony (Sb):	2.230	Chromium (Cr):	0.280 J	Nickel (Ni):	32.100	Thallium (Tl):	<0.100 U
Arsenic (As):	132.360	Cobalt (Co):	174.630	Niobium (Nb):	<0.100 U	Thorium (Th):	0.240 J
Barium (Ba):	24.080	Copper (Cu):	9,931.480	Neodymium (Nd):	8.180	Tin (Sn):	<0.100 U
Beryllium (Be):	1.360	Gallium (Ga):	1.250	Palladium (Pd):	1.050	Titanium (Ti):	9.160
Boron (B):	37.450	Lanthanum (La):	9.470	Praseodymium (Pr):	1.940	Tungsten (W):	<0.100 U
Bromide (Br):	<10.000 U	Lead (Pb):	106.210	Rubidium (Rb):	7.870	Uranium (U):	37.270
Cadmium (Cd):	479.770	Lithium (Li):	23.350	Silver (Ag):	<0.100 U	Vanadium (V):	<0.100 U
Cerium (Ce):	16.920	Mercury (Hg):	NR	Selenium (Se):	0.850	Zinc (Zn):	37,042.480
						Zirconium (Zr):	<0.100 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	726.07	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	726.07	Hardness as CaCO3:	202.47	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	745.4	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	813.2	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.87	Ryznar Stability Index:	15.395	Field Nitrate (mg/L):	NR
Lab pH:	4.01	Sodium Adsorption Ratio:	0.0917	Field Dissolved O2 (mg/L):	7.480
Water Temp (°C):	5.88	Langlier Saturation Index:	-5.693	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	522
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	189.000	Acidity to 8.3 (mg/L CaCO3)	596.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FE(II) = 44.7 MG/L
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	246207 / 257068	Sample Date:	7/14/2020 2:35:00 PM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE FLUME
Datum:	WGS84	Lab Date:	8/12/2020 8:27:25 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:0 ra:1 fu:0 fa:0
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	54.060	2.698	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	14.570	1.199	Carbonate (CO3)	NR	0.000
Sodium (Na)	3.160	0.137	Chloride (Cl)	NR	0.000
Potassium (K)	1.340	0.034	Sulfate (SO4)	NR	0.000
Iron (Fe)	42.120	1.508	Nitrate (as N)	NR	0.000
Manganese (Mn)	10.032	0.365	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		8.500	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	9,954.680	Cesium (Cs):	3.190	Molybdenum (Mo):	0.560 J	Strontium (Sr):	208.200
Antimony (Sb):	6.370	Chromium (Cr):	0.930	Nickel (Ni):	34.890	Thallium (Tl):	<0.180 U
Arsenic (As):	477.180	Cobalt (Co):	181.390	Niobium (Nb):	<0.180 U	Thorium (Th):	0.720 J
Barium (Ba):	25.490	Copper (Cu):	9,732.940	Neodymium (Nd):	8.570	Tin (Sn):	<0.180 U
Beryllium (Be):	1.460	Gallium (Ga):	1.460	Palladium (Pd):	1.340	Titanium (Ti):	13.540
Boron (B):	49.210	Lanthanum (La):	9.820	Praseodymium (Pr):	2.040	Tungsten (W):	<0.180 U
Bromide (Br):	NR	Lead (Pb):	112.020	Rubidium (Rb):	8.570	Uranium (U):	35.130
Cadmium (Cd):	518.260	Lithium (Li):	27.520	Silver (Ag):	NR	Vanadium (V):	<0.180 U
Cerium (Ce):	17.510	Mercury (Hg):	NR	Selenium (Se):	1.130	Zinc (Zn):	37,144.100
						Zirconium (Zr):	<0.180 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	194.96	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	745.4	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	3.87	Ryznar Stability Index:	19.434	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.0935	Field Dissolved O2 (mg/L):	7.480
Water Temp (°C):	5.88	Langlier Saturation Index:	-9.717	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	522
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR
 Field Remarks: FE(II) = 44.7 MG/L
 Lab Remarks:

Explanation: mg/L = milligrams per Liter; µg/L = micrograms per Liter; ft = feet; NR = No Reading in GWIC

Qualifiers: A = Hydride atomic absorption; E = Estimated due to interference; H = Exceeded holding time; J = Estimated quantity above detection limit but below reporting limit; K = Na+K combined; N = Spiked sample recovery not within control limits; P = Preserved sample; S = Method of standard additions; U = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249612 / 257068	Sample Date:	9/22/2020 10:48:00 AM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE FLUME
Datum:	WGS84	Lab Date:	11/9/2020 10:14:47 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	DISSOLVED
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	47.190	2.355	Bicarbonate (HCO3)	0.000	0.000
Magnesium (Mg)	13.500	1.111	Carbonate (CO3)	0.000	0.000
Sodium (Na)	3.310	0.144	Chloride (Cl)	0.660	0.019
Potassium (K)	1.320	0.034	Sulfate (SO4)	484.000	10.082
Iron (Fe)	40.743	1.459	Nitrate (as N)	0.070	0.005
Manganese (Mn)	10.887	0.396	Fluoride (F)	0.220	0.012
Silica (SiO2)	21.160		Orthophosphate (as P)	0.020 J	0.000
Total Cations		7.299	Total Anions		10.117

Trace Element Results (µg/L)

Aluminum (Al):	4,139.800	Cesium (Cs):	3.640	Molybdenum (Mo):	0.550	Strontium (Sr):	183.600
Antimony (Sb):	3.240	Chromium (Cr):	<0.100 U	Nickel (Ni):	29.060	Thallium (Tl):	0.210 J
Arsenic (As):	107.040	Cobalt (Co):	175.950	Niobium (Nb):	0.510	Thorium (Th):	<0.100 U
Barium (Ba):	23.440	Copper (Cu):	6,007.410	Neodymium (Nd):	6.140	Tin (Sn):	<0.100 U
Beryllium (Be):	0.940	Gallium (Ga):	1.630	Palladium (Pd):	1.010	Titanium (Ti):	7.650
Boron (B):	61.100	Lanthanum (La):	9.310	Praseodymium (Pr):	1.990	Tungsten (W):	<0.100 U
Bromide (Br):	<10.000 U	Lead (Pb):	69.960	Rubidium (Rb):	9.530	Uranium (U):	25.950
Cadmium (Cd):	368.170	Lithium (Li):	20.640	Silver (Ag):	0.250 J	Vanadium (V):	<0.100 U
Cerium (Ce):	17.000	Mercury (Hg):	NR	Selenium (Se):	0.660	Zinc (Zn):	37,300.150
						Zirconium (Zr):	0.280 J

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	670.14	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	670.14	Hardness as CaCO3:	173.4	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	691.4	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	729.9	Alkalinity as CaCO3 (mg/L):	0	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	4.35	Ryznar Stability Index:	15.102	Field Nitrate (mg/L):	NR
Lab pH:	4.45	Sodium Adsorption Ratio:	0.0991	Field Dissolved O2 (mg/L):	7.840
Water Temp (°C):	5.8	Langlier Saturation Index:	-5.326	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	<0.010 U	Field Redox (mV):	461
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	0.000	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	235.000	Acidity to 8.3 (mg/L CaCO3)	603.000
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

Qualifiers: **A** = Hydride atomic absorption; **E** = Estimated due to interference; **H** = Exceeded holding time; **J** = Estimated quantity above detection limit but below reporting limit; **K** = Na+K combined; **N** = Spiked sample recovery not within control limits; **P** = Preserved sample; **S** = Method of standard additions; **U** = Undetected quantity below detection limit; * = Duplicate analysis not within control limits; ** = Sum of Dissolved Constituents is the sum of major cations (Na, Ca, K, Mg, Mn, Fe) and anions (HCO3, CO3, SO4, Cl, SiO2, NO3, F) in mg/L. Total Dissolved Solids is reported as equivalent weight of evaporation residue.

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Location Information

Sample Id/Site Id:	249615 / 257068	Sample Date:	9/22/2020 10:48:00 AM
Location (TRS):	07N 05W 20 B	Agency/Sampler:	MBMG / ICOPINI, GARY
Latitude/Longitude:	46° 20' 53" N 112° 15' 41" W	Field Number:	CRYSTAL MINE FLUME
Datum:	WGS84	Lab Date:	11/9/2020 10:14:48 AM
Altitude:		Lab/Analyst:	MBMG / TIMMER, JACKIE
County/State:	JEFFERSON / MT	Sample Method/Handling:	GRAB / ru:1 ra:0 fu:1 fa:1
Site Type:	MINE DRAINAGE	Procedure Type:	TOTAL RECOVERABLE
Geology:		Total Depth (ft):	NR
USGS 7.5' Quad:		SWL-MP (ft):	NR
PWS Id:		Depth Water Enters (ft):	NR
Project:	DLFORST, BASIN_WTRSHD		

Major Ion Results

	mg/L	meq/L		mg/L	meq/L
Calcium (Ca)	50.150	2.502	Bicarbonate (HCO3)	NR	0.000
Magnesium (Mg)	14.760	1.215	Carbonate (CO3)	NR	0.000
Sodium (Na)	3.410	0.148	Chloride (Cl)	NR	0.000
Potassium (K)	1.320	0.034	Sulfate (SO4)	NR	0.000
Iron (Fe)	45.019	1.612	Nitrate (as N)	NR	0.000
Manganese (Mn)	11.422	0.416	Fluoride (F)	NR	0.000
Silica (SiO2)	NR		Orthophosphate (as P)	NR	0.000
Total Cations		7.928	Total Anions		0.000

Trace Element Results (µg/L)

Aluminum (Al):	5,196.790	Cesium (Cs):	3.470	Molybdenum (Mo):	0.560 J	Strontium (Sr):	216.650
Antimony (Sb):	4.460	Chromium (Cr):	0.940 J	Nickel (Ni):	31.720	Thallium (Tl):	<0.250 U
Arsenic (As):	268.720	Cobalt (Co):	199.380	Niobium (Nb):	1.000 J	Thorium (Th):	0.530 J
Barium (Ba):	27.120	Copper (Cu):	6,508.290	Neodymium (Nd):	7.440	Tin (Sn):	<0.250 U
Beryllium (Be):	1.110 J	Gallium (Ga):	1.610	Palladium (Pd):	1.090 J	Titanium (Ti):	13.460
Boron (B):	58.300	Lanthanum (La):	9.120	Praseodymium (Pr):	1.950	Tungsten (W):	<0.250 U
Bromide (Br):	NR	Lead (Pb):	84.870	Rubidium (Rb):	8.900	Uranium (U):	25.390
Cadmium (Cd):	557.350	Lithium (Li):	19.300 J	Silver (Ag):	NR	Vanadium (V):	<0.250 U
Cerium (Ce):	16.560	Mercury (Hg):	NR	Selenium (Se):	<0.250 U	Zinc (Zn):	39,498.270
						Zirconium (Zr):	<0.250 U

Field Chemistry and Other Analytical Results

**Total Dissolved Solids (mg/L):	NR	Field Hardness as CaCO3 (mg/L):	NR	Ammonia (mg/L):	NR
**Sum of Diss. Constituents (mg/L):	NR	Hardness as CaCO3:	185.98	T.P. Hydrocarbons (µg/L):	NR
Field Conductivity (µmhos):	691.4	Field Alkalinity as CaCO3 (mg/L):	NR	PCP (µg/L):	NR
Lab Conductivity (µmhos):	NR	Alkalinity as CaCO3 (mg/L):	NR	Phosphorus, TD (mg/L):	<0.030 U
Field pH:	4.35	Ryznar Stability Index:	19.499	Field Nitrate (mg/L):	NR
Lab pH:	NR	Sodium Adsorption Ratio:	0.0957	Field Dissolved O2 (mg/L):	7.840
Water Temp (°C):	5.8	Langlier Saturation Index:	-9.750	Field Chloride (mg/L):	NR
Air Temp (°C):	NR	Nitrite (mg/L as N):	NR	Field Redox (mV):	461
Nitrate + Nitrite (mg/L as N)	NR	Hydroxide (mg/L as OH):	NR	Lab, Dissolved Organic Carbon (mg/L):	NR
Total Kjeldahl Nitrogen (mg/L as N)	NR	Lab, Dissolved Inorganic Carbon (mg/L):	NR	Lab, Total Organic Carbon (mg/L):	NR
Total Nitrogen (mg/L as N)	NR	Acidity to 4.5 (mg/L CaCO3)	NR	Acidity to 8.3 (mg/L CaCO3)	NR
As(III) (µg/L)	NR	As(V) (µg/L)	NR	Total Susp Solids (mg/L)	NR

Notes

Sample Condition: CLEAR

Field Remarks:

Lab Remarks:

Explanation: **mg/L** = milligrams per Liter; **µg/L** = micrograms per Liter; **ft** = feet; **NR** = No Reading in GWIC

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