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APPENDIX G
SURFACE WATER

SURFACE WATER CHARACTERIZATION STUDY OF THE WHARF BOSTON EXPANSION PROJECT

REVISION 2 TOPICAL REPORT RSI-3138

PREPARED FOR
Coeur Wharf
10928 Wharf Road
Lead, South Dakota 57754

JUNE 2022

RESPEC

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REVISION 2 TOPICAL REPORT RSI-3138

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JUNE 2022

Project Number M0025.21001

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1.0 INTRODUCTION

Coeur Wharf (Wharf) has proposed to expand its existing gold mine operations in the area known as the Boston Expansion, which is located on the southern edge of the Wharf Mine along the Portland Ridgeline. This area is approximately 4 miles west of Lead, South Dakota, in Lawrence County. The proposed permit area consists of approximately 47.4 acres of private land located in Sections 2 and 3, Township 4 North, Range 2 East. Figure 1-1 shows the Boston Expansion Project study area. The blue outline represents the current permitted mine boundaries for Wharf and Golden Reward, and the fuschia outline represents the proposed Boston Expansion permit area.

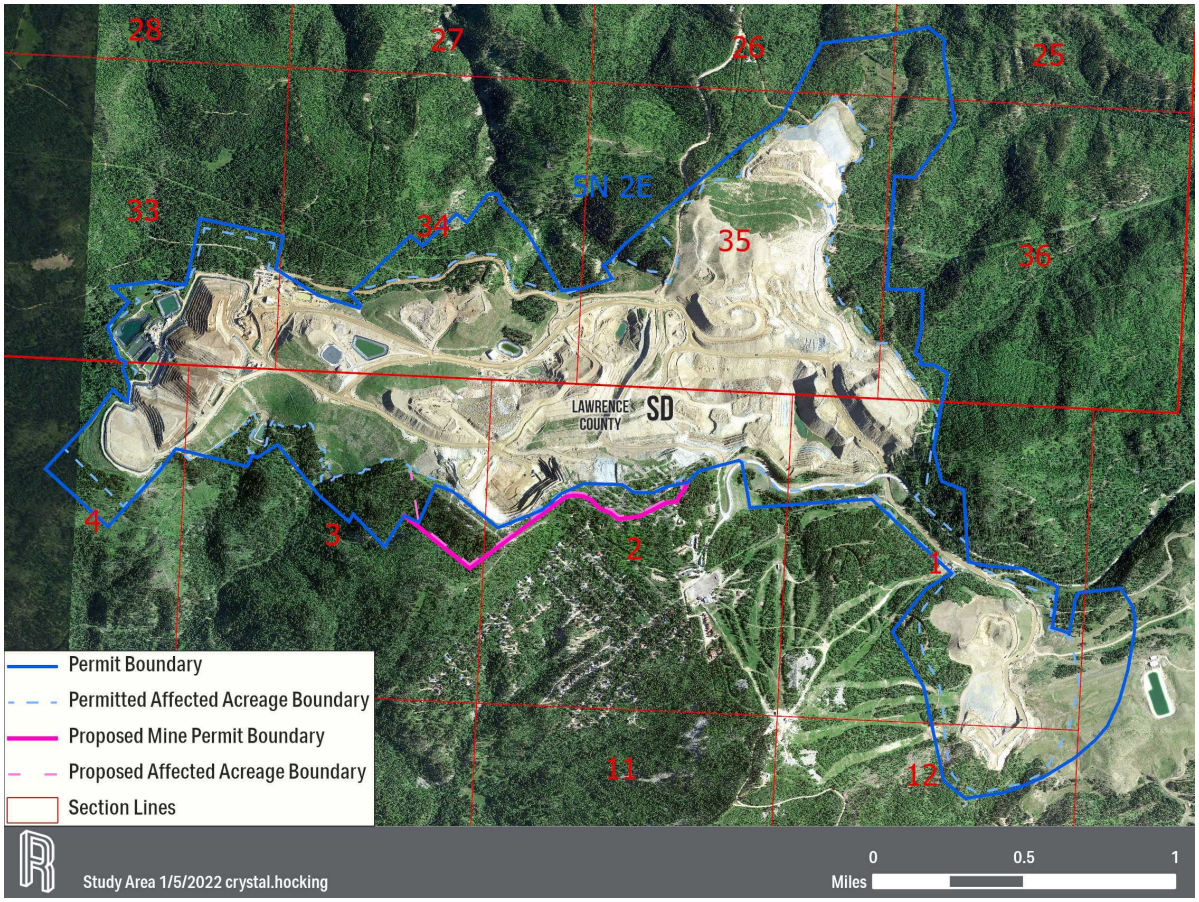


Figure 1-1. Boston Expansion Baseline Study Area Map.

A baseline environmental study in the Boston Expansion Area has been completed per the South Dakota Department of Agriculture and Natural Resources (SD DANR). The SD DANR mining rules, Administrative Rules of South Dakota (ARSD) 74:29, and statute South Dakota Codified Law (SDCL) 45-6B-7 require a baseline sampling plan to include the baseline water quality of all of the areas potentially affected by the proposed mining operation. In compliance with ARSD 74:29:02:07, surface waterbodies, which includes streams (perennial or ephemeral), must be sampled monthly for at least 1 year unless otherwise justified. Permit requirements also include measuring water level data for at least 1 year.

The following descriptions, analysis, and sampling methods are required for surface water by South Dakota law for mine permit applicants:

1. SDCL 45-6B-7 (9) (a-mm) and ARSD 74:29:02:07: Baseline water quality (Appendix D and Section 3.3)
2. ARSD 74:29:02:11: Effect on hydrologic balance on surface water (Section 4.0)
3. ARSD 74:29:02:11(1): Baseline surface water report (entire report)
4. ARSD 74:29:02:11(3): Surface water inventory map (Appendix G)
5. ARSD 74:29:02:11(7): Surface water monitoring plan for life of mine (Appendix C)
6. SDCL 45-6B-41 and ARSD 74:29:07:08: Hydrologic balance – surface water (Section 4.0).

The purpose of this report is to summarize the condition of the surface water environment near the proposed mining operation based on available water quality data because no surface water features are located within the Boston Expansion Area. This report provides the data and analyses to support a permit application for the proposed Boston Expansion Area. A statistical analysis of the water quality for 1 year of baseline data (January 1, 2020 to December 31, 2020) and a 5-year data summary (January 1, 2015 to December 31, 2020) are also included in this report.

This report is organized to optimize available information and understand the surface water quality near the Boston Expansion Area. Chapter 2.0 provides information regarding the physical characteristics near the expansion area. A summary of the water quality information is provided in Chapter 3.0, and Chapter 4.0 summarizes any potential impacts to the surface water as a result of conducting mining activities in the Boston Expansion Area. References are provided in Chapter 5.0. The report concludes with several appendices. Appendix A includes site-specific parameter lists, Appendix B provides a sampling site map, and Appendix C includes the sampling methods. Water quality results and water quality statistics for each site are provided in Appendices D and E, respectively. Time series of water quality parameters for each site are shown in Appendix F, and Appendix G provides a surface water inventory map.

2.0 SURFACE WATER INVENTORY

2.1 HYDROLOGIC UNITS

The Wharf Mine and Boston Expansion Area are located approximately 4 miles west of Lead, South Dakota, in Lawrence County and situated within the Lower Belle Fourche (Hydrologic Unit Code [HUC] 10120202) and Redwater (HUC 10120203) subbasins within the Belle Fourche Basin (HUC 101202). The Belle Fourche Basin is primarily located in Wyoming and South Dakota with a small portion in southeastern Montana. The basin drains approximately 7,230 square miles, and land elevations range from approximately 2,030 feet to 7,113 feet above mean sea level (amsl).

The Boston Expansion Area occurs within the Annie Creek, Lost Camp Gulch, and Nevada Gulch Creek drainages. Land elevations of the Boston Expansion Area range from 6,320 to 6,560 feet amsl. The area drains into the Redwater (HUC 10120203) and Lower Belle Fourche (HUC 10120202) subbasins, as shown in Figure 2-1 and Appendix G. Within these subbasins, the Boston Expansion Area occurs within the Spearfish Creek Watershed (HUC 1012020302) and Middle Belle Fourche River Watershed (HUC 1012020205). Within these watersheds, the Boston Expansion Area occurs within the Middle Spearfish Creek subwatershed (HUC 101202030203) and Upper Whitewood Creek subwatershed (HUC 101202020506).

2.2 STREAMS

Three small tributaries (i.e., Annie Creek, Lost Camp Gulch, and Nevada Gulch Creek) are adjacent to the Boston Expansion Area. The Lost Camp Gulch tributary drains into Annie Creek, Spearfish Creek, and Redwater Creek before entering the Belle Fourche River near Belle Fourche, South Dakota, approximately 23 miles north of the Boston Expansion Area. The Nevada Gulch Creek drains into Whitetail Creek, which drains into Whitewood Creek south of Lead, South Dakota. Whitewood Creek enters the Belle Fourche River near Vale, South Dakota, approximately 30 miles northeast of the Boston Expansion Area.

Annie Creek is a perennial stream located approximately 0.3 miles west of the Boston Expansion Area that flows south-southwest into Spearfish Creek. Annie Creek has five baseline sampling sites (Annie Creek II, CP001/NPDES001, CP005/NPDES005, Annie Creek at United States Geological Survey [USGS], and 46MN31). The Wharf site of Annie Creek at USGS and the SD DANR site of 46MN31 are located near the USGS 06430800 gage station. Lost Camp Gulch is a perennial stream that flows west to its confluence with Annie Creek. Lost Camp Gulch has one baseline surface water monitoring site (Lost Camp) located approximately 0.8 mile southwest of the Boston Expansion Area near the confluence with Annie Creek. Nevada Gulch Creek is located approximately 0.3 mile east of the Boston Expansion Area and flows east to its confluence with Fantail Creek and then enters Whitetail Creek. Nevada Gulch Creek is an ephemeral stream at the upper baseline surface water monitoring site (SS-20) and is a perennial stream at the lower baseline near the surface water monitoring site (SS-04).

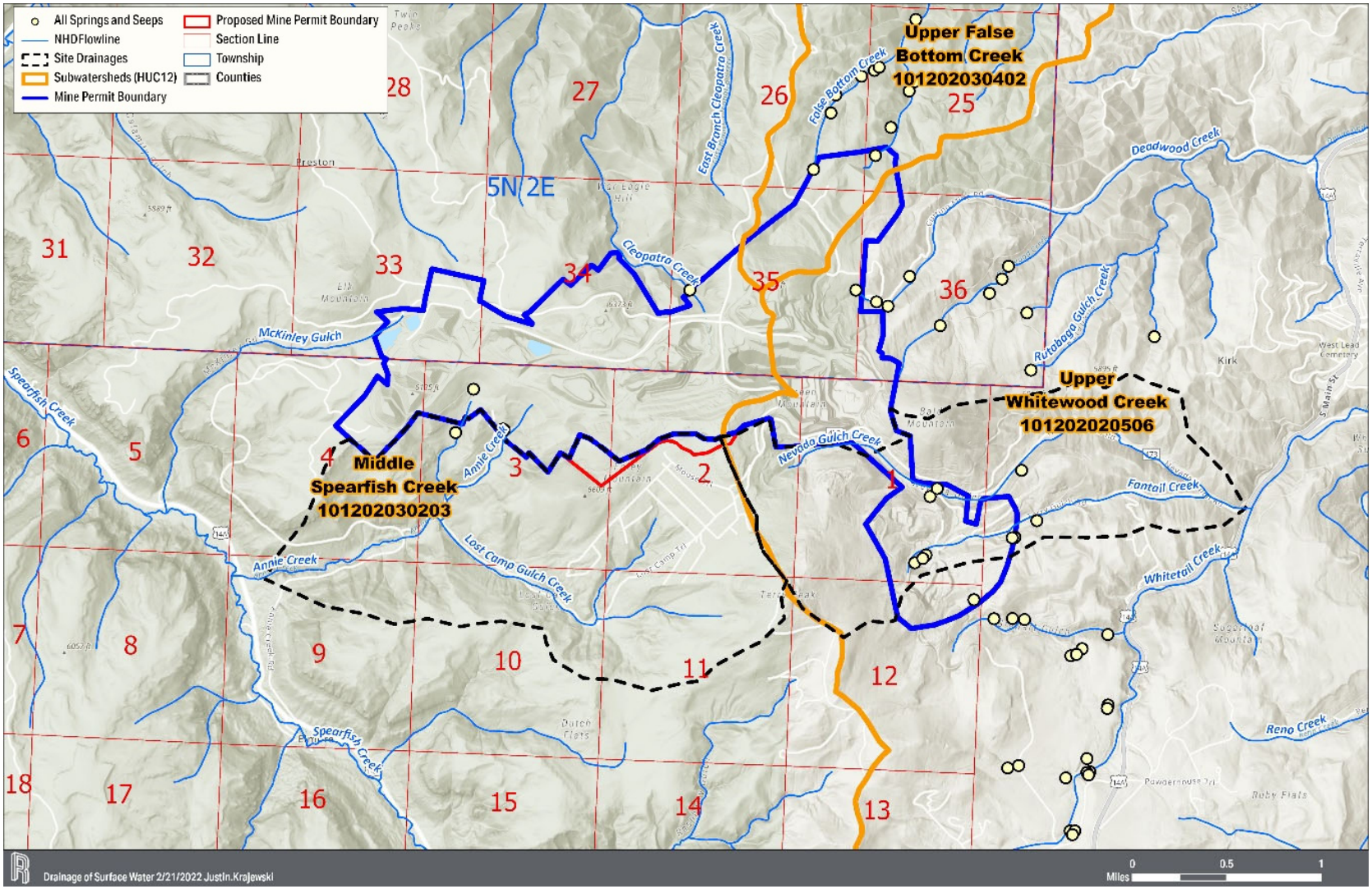


Figure 2-1. Drainage of Surface Water From the Wharf Mine and Proposed Boston Expansion Area.

The local subwatersheds and topographical map indicates that Annie Creek, Lost Camp Gulch, and Nevada Gulch Creek have proposed surface disturbance within their drainages. The proposed surface disturbance would occur primarily within the drainages of Annie Creek (approximately 27.3 acres), Lost Camp Gulch (approximately 18.1 acres), and a small area within Nevada Gulch Creek (approximately 2 acres). Surface disturbances within the Boston Expansion Area will not directly overlie any streams, and the existing pit would capture most precipitation within the area.

2.3 BENEFICIAL USES

As included in ARSD 74:51:02 and 74:51:03, all South Dakota lakes and streams are designated as one or more of the following beneficial uses:

1. Domestic water supply waters
2. Cold-water permanent fish life propagation waters
3. Cold-water marginal fish life propagation waters
4. Warm-water permanent fish life propagation waters
5. Warm-water semipermanent fish life propagation waters
6. Warm-water marginal fish life propagation waters
7. Immersion recreation waters
8. Limited-contact recreation waters
9. Fish and wildlife propagation, recreation, and stock-watering waters
10. Irrigation waters
11. Commerce and industry waters.

All South Dakota streams are assigned the beneficial uses of (9) fish and wildlife propagation, recreation, and stock watering and (10) irrigation. All South Dakota lakes are assigned the beneficial uses of (9) fish and wildlife propagation, recreation, and stock watering. Table 2-1 lists the beneficial uses assigned to Annie Creek, Lost Camp Gulch, and Nevada Gulch Creek located within the drainages in or near the Boston Expansion Area [ARSD 74:51:03:02; ARSD 74:51:03:10].

Table 2-1. Beneficial Uses of Streams Within Drainages in and Near the Proposed Boston Expansion Area [South Dakota Legislature Administrative Rules, 2021]

Waterbody	From	To	Beneficial Uses	County
Annie Creek	Spearfish Creek	Sec 3, T4N, R2E	3, 8, 9, and 10	Lawrence
Lost Camp Gulch			9 and 10	Lawrence
Nevada Gulch Creek	The Confluence With Fantail Creek	Sec 6, T4N, R3E	3, 8, 9, and 10	Lawrence

Water quality standards associated with the beneficial uses of Annie Creek, Lost Camp Gulch, and Nevada Gulch Creek are shown in Table 2-2. The South Dakota 2022 Integrated Report (IR) lists Annie Creek as fully supporting the stream's designated beneficial uses; however, Lost Camp Gulch and Nevada Gulch Creek were not listed as to the status of their beneficial uses [South Dakota Department of Agriculture and Natural Resources, 2022]. Whitetail Creek, which Nevada Gulch Creek flows into, is

listed as fully supporting its designated beneficial uses. None of these streams were listed as impaired or not supporting their designated beneficial uses in the 2022 IR [South Dakota Department of Agriculture and Natural Resources, 2022].

Table 2-2. Numeric Criteria Assigned to Beneficial Uses of Surface Waters of the State [South Dakota Legislature Administrative Rules, 2021]

Parameters[a] (mg/L)	(3) Cold-Water Marginal Fish Life Propagation	(8) Limited-Contact Recreation	(9) Fish and Wildlife Propagation, Recreation and Stock Watering	(10) Irrigation
Alkalinity ($CaCO_3$)			750[b]/1,313[c]	
Barium				
Chloride				
Coliform, total (per 100 mL)				
Escherichia coli[d] (per 100mL)		6,306/1,178[c]		
Conductivity (umhos/cm at 25°C)			4,000[b]/7,000[c]	2,500[b]/4,375[c]
Fluoride				
Hydrogen sulfide, undissociated	0.002			
Nitrogen, total ammonia as N	Equation-based standard[c]			
Nitrogen, nitrates as N			50[b]/88[c]	
Oxygen, dissolved[e]	≥ 5.0	≥ 5.0		
pH (standard units)	6.5–9.0		6.0–9.5	
Sodium Adsorption Ratio				10
Solids, suspended	90[b]/158[c]			
Solids, total dissolved			2,500[b]/4,375[c]	
Sulfate				
Temperature (°F)	75°F (23.9°C)			
Total Petroleum, Hydrocarbons			≤ 10	
Oil and Grease			≤ 10	

(a) Except where noted.
(b) 30-day average as defined in ARSD 74:51:01:01.
(c) Daily maximum.
(d) May 1 through September 30.
(e) Dissolved oxygen is measured anywhere in the water column of a nonstratified waterbody or the epilimnion of a stratified waterbody.

mg/L = milligram per liter
mL = milliliter
umhos/cm = micromhos per centimeter
°C = degrees Celsius
°F = degrees Fahrenheit

2.4 SPRINGS

No springs or seeps are located within the proposed Boston Expansion Area. Several springs are located around the Wharf Mine area and are provided in Table 2-3 and shown in Figure 2-2. Because these springs are fed by groundwater sources but feed surface water, they are summarized in this document and discussed more in detail in the groundwater characterization report [Walega and Hocking, 2022]. A few springs may be the result of perched water zones while others may be the expression of the regional water table [Walega and Hocking, 2022].

As part of the Boston Expansion and at the request of the SD DANR, Wharf conducted a field inventory for springs in May 2021. The inventory involved walking up the Lost Camp drainage from its confluence with Annie Creek to search for a water source. A small spring, Lost Camp Headwaters, was identified. The Lost Camp Headwaters spring was sampled while flowing in May 2021, but the site was dry between June and December 2021. The field inventory also identified a stormwater outfall from the subdivision, which was contributing flow to the drainage. Wharf acknowledges that another source of flow to Lost Camp Creek may exist but has yet to be identified, which includes but not limited to additional springs or gaining stream conditions. RESPEC hydrologists conducted an additional inventory of the Lost Camp drainage during May 2022 to attempt to identify additional sources of flow within the drainage (see Appendix H).

Seven spring localities are currently sampled as part of Wharf's ongoing water quality monitoring program: False Bottom Spring, Ross Spring, Beaver Springs, War Eagle, Annie Creek II, Ross Valley French Drain, and Lost Camp Headwaters (see Figure 2-2). Measured flows at these seven springs range from 1 to 2,010 gallons per minute (gpm) with higher flows occurring in the spring and early summer and low to no flows occurring in the later summer and fall. False Bottom Spring is located at the headwaters of False Bottom Creek, War Eagle is located on Cleopatra Creek, Lost Camp Headwaters is at the upper reach of Lost Camp Gulch, and the other four monitored springs are located on tributaries of Annie Creek [Walega and Hocking, 2022].

Most of the area springs and seeps identified in previous investigations are typically dry with intermittent periods of low flows. Based on historical surveys presented in the Golden Reward Mining Permit Application [Hydrometrics, Inc., 1988] and Wharf's Clinton Application [Wharf Resources (USA) Inc., 1997], other minor, unnamed springs in the area are located in the drainages of False Bottom Creek, Deadwood Creek, Nevada Gulch, Fantail Creek, and Stewart Gulch. A map of springs is presented in Figure 2-2. The majority of these springs produce only a few gallons of water per minute during the wet springtime of the year.

2.5 IMPOUNDMENTS

No impoundments are located within the Boston Expansion Area. Process ponds and water treatment ponds are located in the Wharf Mine and are approximately 1 mile northeast of the Boston Expansion Area. No additional impoundments, process ponds, or reservoirs are planned for the Boston Expansion.

Table 2-3. Springs and Seeps in the Expansion Project Vicinity (Page 1 of 2)

Map I.D.	Name or Previous Identifier	Source[a]	Flowing	Latitude	Longitude
1	—	1		44.3343	–103.809997
2	FI 16	1		44.331298	–103.820999
3	FI 14	1		44.331001	–103.821998
4	SI 8	1		44.326698	–103.809997
5	SI 11	1		44.3246	–103.804
6	SI 12	1		44.324199	–103.805
7	LI 2	1		44.320098	–103.801002
8	AI 1	1		44.3152	–103.803001
9	AI 1	1		44.315101	–103.803001
10	AI 1	1		44.314998	–103.803001
11	AI 4	1		44.314701	–103.805
12	AI 2	1		44.3106	–103.805
13	AI 2	1		44.3106	–103.804
14	AI 2	1		44.310298	–103.804
15	SP-4	2		44.367599	–103.824996
16	SP-5	2		44.366901	–103.824996
17	SP-7 False Bottom Spring	2		44.3619	–103.828002
18	SP-8	2		44.366401	–103.833
19	SP-1	2		44.360599	–103.834999
20	SP-9	2		44.3684	–103.829002
21	SP-10	2		44.368598	–103.828002
22	SP-14	2		44.348999	–103.820999
23	SP-15	2		44.350601	–103.828002
24	SP-17	2		44.351501	–103.830001
25	SP-20	2		44.345901	–103.810997
26	FI 10	1		44.332901	–103.811996
27	FI 10	1		44.332901	–103.811996
28	NI 9	1		44.3358	–103.820999
29	FI 1	1		44.330699	–103.821998
30	SI 1	1		44.327999	–103.816001
31	AI 7	1		44.3152	–103.811996
32	AI 6	1		44.315498	–103.809997
33	SP-6	2	X	44.364101	–103.827003
34	SP-13	2	X	44.3516	–103.816001
35	SP-18	2	X	44.350299	–103.811996

Table 2-3. Springs and Seeps in the Expansion Project Vicinity (Page 2 of 2)

Map I.D.	Name or Previous Identifier	Source[(a)]	Flowing	Latitude	Longitude
36	NI 13	1	X	44.3381	–103.810997
37	SI 7	1	X	44.326698	–103.811996
38	—	1	X	44.325801	–103.801002
39	SI 13	1	X	44.324001	–103.805
40	LI 1	1	X	44.3204	–103.801002
41	Ross Spring	3	X	44.339199	–103.872001
42	Beaver Springs	3	X	44.339698	–103.866996
43	—	3	X	44.365001	–103.833
44	—	3	X	44.3679	–103.830001
45	—	3	X	44.352699	–103.823997
46	—	3	X	44.326599	–103.814002
47	—	3	X	44.3162	–103.803001
48	—	3	X	44.336399	–103.819999
49	War Eagle	3	X	44.350898	–103.847999
50	Ross Valley French Drain	3	X	44.342601	–103.870002
51	Annie Creek II	3	X	44.339599	–103.866996
52	Lost Camp Headwater	3	X	44.3323	–103.8474

(a) 1—Golden Reward Application, 1896 Exhibit
2—Clinton Expansion Application, Exhibit 3-6.2
3—Wharf Resources.

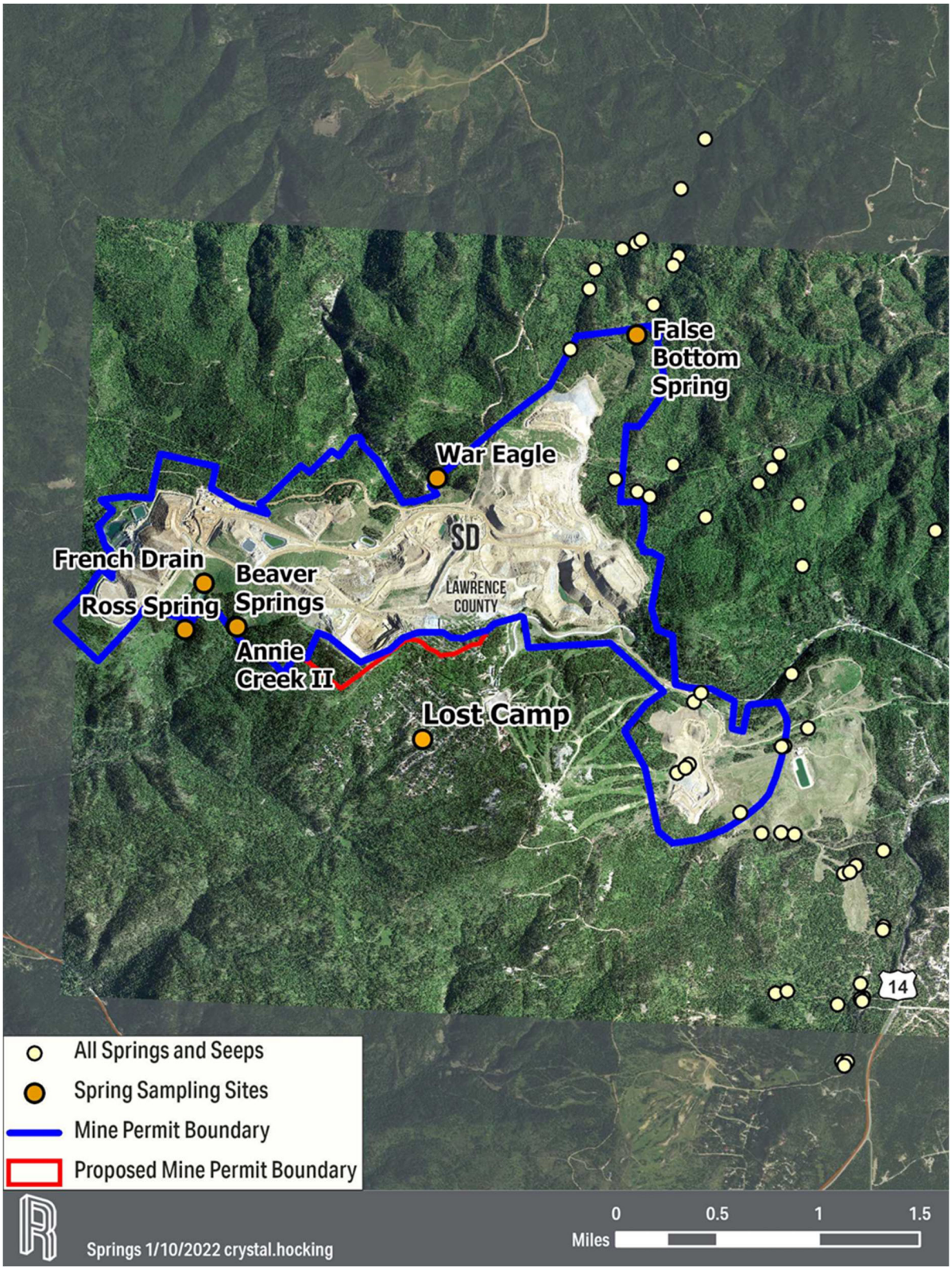


Figure 2-2. Springs and Spring Sampling Sites Map.

3.0 SURFACE WATER QUALITY

3.1 SAMPLING SITES

The existing Wharf surface water monitoring programs were evaluated to determine which sites were applicable to the Boston Expansion Area. Seven existing Wharf surface water monitoring sites (Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, SS-20, and SS-04) were chosen based on proximity to the Boston Expansion Area and SD DANR recommendations. In addition to the Wharf monitoring sites, Monitoring Site 46MN31 (Annie Creek near Elmore), which is sampled by the SD DANR, was selected for evaluation. These monitoring sites are listed in Table 3-1 and Figure 3-1. The chemical parameters analyzed in the sampling program were derived from SDCL 45-6B-7(9) and those parameters currently required by the SD DANR for the water quality program at the existing Wharf Mine. These eight sites (Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, SS-20, SS-04, and 46MN31) are considered baseline monitoring sites for the Boston Expansion Area. The past 5 years of data for these sites are discussed in Sections 3.3 and 3.4, and the water quality result tables and water quality summary statistics tables are included in Appendices D and E, respectively. Time series of the water quality analyses and field measurements are included in Appendix F.

Table 3-1. Existing Surface Water Monitoring Sites Applicable to the Boston Expansion Area

Site	Drainage	Sampling Frequency	Parameter List[(a)]	Latitude	Longitude
Annie Creek at USGS	Annie Creek	4 Times per Year	1	44.32725	-103.89458
Annie Creek II	Annie Creek	4 Times per Year	1	44.33920	-103.86668
CP001/NPDES001	Annie Creek	26 Times per Year	5	44.33387	-103.87272
CP005/NPDES005	Annie Creek	26 Times per Year	5	44.33234	-103.87399
46MN31	Annie Creek	4 Times per Year	4	44.33034	-103.87719
Lost Camp	Lost Camp	4 Times per Year	3	44.33231	-103.87315
TSS-04	Nevada Gulch Creek	4 Times per Year	2	44.33605	-103.81994
SS-20	Nevada Gulch Creek	4 Times per Year	2	44.33783	-103.82499

(a) Parameter lists or groups are provided in Appendix A. (b) (c)

Midcontinent Testing Laboratories, Inc. in Rapid City, South Dakota, analyzed the water quality samples from all sites. Please note that the following the surface water sites (Annie Creek at USGS, Annie Creek II, Lost Camp, SS-20, and SS-04) are sampled for total metals while the CP001/NPDES001, CP005/NPDES005, and 46MN31 are sampled for total recoverable metals.

The Annie Creek at USGS site was sampled four times per year from 2015 through 2019, five times in 2020, and four times in 2021 for the following parameters:

- conductivity
- pH
- Total Dissolved Solids (TDS)
- nitrate
- nitrite
- sulfate

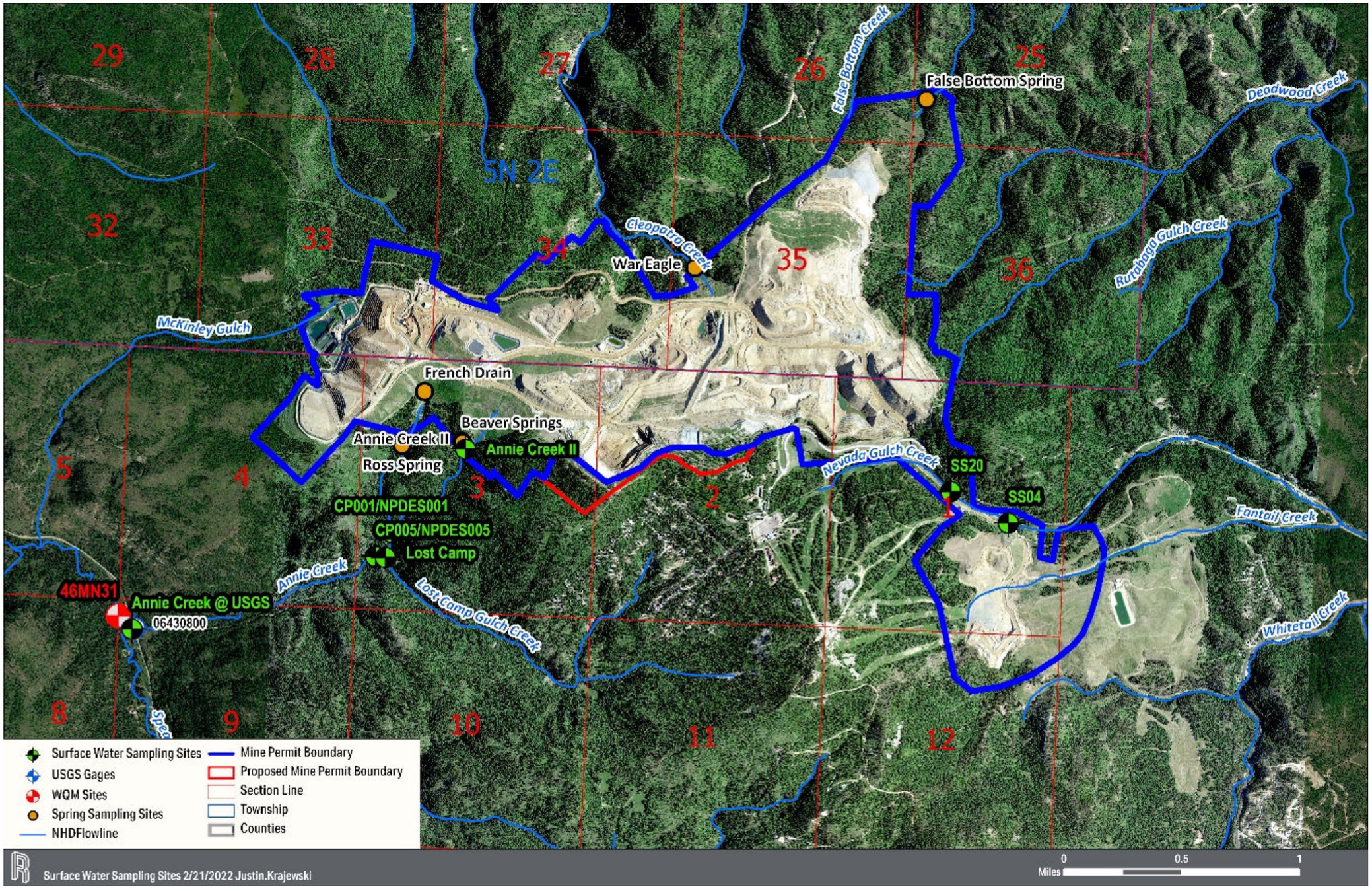


Figure 3-1. Locations of Surface Water Sampling Sites at the Wharf Mine Applicable to the Boston Expansion Area.

- Total Suspended Solids (TSS)
- bicarbonate
- cyanide (CN) (total and Weak Acid Dissociable [WAD])
- fluoride
- ammonia
- arsenic
- gold
- mercury
- selenium
- dissolved sodium.

Field measurements were also collected for conductivity, oxygen reduction potential (ORP), dissolved oxygen (DO), pH, water temperature, and flow rate during the same period.

The Annie Creek II was sampled four times per year from 2015 through 2017, five times in 2018, and four times per year from 2019 through 2021 for the following parameters:

- conductivity
- pH
- TDS
- TSS
- bicarbonate
- CN and WAD
- fluoride
- ammonia
- nitrate
- nitrite
- sulfate
- arsenic
- gold
- mercury
- selenium
- dissolved sodium.

Field measurements were also collected for conductivity, ORP, DO, pH, water temperature, and flow rate during the same period.

The CP001/NPDES001 site was sampled 27 times per year in 2015 and 2016, 28 times per year in 2017 and 2020, and 26 times per year in 2018, 2019, and 2021 for the following parameters:

- conductivity
- pH
- TDS
- TSS
- BOD, 5-day
- CN WAD
- hardness
- ammonia
- nitrate
- sulfate
- arsenic
- cadmium
- chromium
- copper
- lead
- mercury
- selenium
- silver
- zinc
- dissolved calcium
- dissolved magnesium
- dissolved phosphorus.

Additionally, CP001/NPDES001 was sampled for CN WAD eight times in 2018 and two times in 2019. In 2017, CP001/NPDES001 was sampled once each for BOD, 5-Day, and ammonia in 2017. Field measurements were also collected for conductivity, ORP, DO, pH, water temperature, and flow rate during the same period.

The CP005/NPDES005 site was sampled 27 times per year in 2015 and 2016, 29 times in 2017, 30 times in 2018, 28 times in 2020, and 26 times in 2019 and 2021, for the following parameters:

- conductivity
- pH
- TDS
- TSS
- BOD, 5-day
- CN WAD
- hardness
- ammonia
- nitrate
- sulfate
- arsenic
- cadmium
- chromium
- copper
- lead
- mercury
- selenium
- silver
- zinc
- dissolved calcium
- dissolved magnesium
- dissolved phosphorus.

Additionally, CP005/NPDES005 was sampled for BOD, 5-day once in 2017. Field measurements were also collected for conductivity, ORP, DO, pH, water temperature, and flow rate during the same period.

The Lost Camp site was sampled once in 2015, nine times in 2016, eleven times in 2017, seven times in 2018, four times each in 2019 and 2020, and five times in 2021 for the following parameters:

- conductivity
- pH
- TDS
- TSS
- bicarbonate
- CN (total and WAD)
- fluoride
- ammonia
- nitrate
- nitrite
- sulfate
- arsenic
- gold
- mercury
- selenium
- dissolved sodium.

Field measurements were also collected for conductivity, ORP, DO, pH, water temperature, and flow rate during the same period.

The SS-20 site was sampled three times per year in 2015 and 2018, two times per year in 2016, 2017, 2019, and 2020, and one time in 2021 for the following parameters:

- conductivity
- pH
- TSS
- bicarbonate
- nitrate
- nitrite
- sulfate
- arsenic
- mercury
- selenium
- dissolved sodium.

Field measurements were also collected for conductivity, pH, water temperature, and flow rate during the same period.

The SS-04 site was sampled four times each year from 2015 through 2021 for the following parameters:

- conductivity
- pH
- TSS
- bicarbonate
- nitrate
- nitrite
- sulfate
- arsenic
- mercury
- selenium
- dissolved sodium

Field measurements were also collected for conductivity, ORP, DO, pH, water temperature, and flow rate during the same period.

The 46MN31 site was sampled four times per year from 2015 through 2020 and three times in 2021 for the following parameters:

- ammonia
- arsenic
- bicarbonate
- cadmium
- calcium
- chromium
- CN (WAD)
- copper
- gold
- hardness
- Kjeldahl nitrogen
- lead
- magnesium
- mercury
- nickel
- nitrate
- organic carbon
- phosphorus
- selenium
- silver
- TDS
- TSS
- zinc

Alkalinity was sampled once in 2015. Total CN was sampled three times in 2021 and aluminum was sampled three times each in 2020 and 2021. Field measurements were also collected for conductivity, depth, width, DO, pH, and water temperature during the water quality sampling dates at the 46MN31 site from 2015 through 2021. Air temperature was also recorded from 2015 through 2019.

The USGS has operated a surface water data collection site since 2006 in the vicinity of the proposed permit area. USGS 06430800 (Annie Creek near Lead, South Dakota) is located approximately 1 mile downstream of the confluence of Annie Creek and Lost Camp Gulch, as shown in Figure 3-1. Discharge data are available for the Annie Creek at USGS site from October 1988 through November 2018 as well as gage height data from October 2017 through November 2018, which can be downloaded from the USGS website (https://waterdata.usgs.gov/nwis/inventory?agency_code=USGS&site_no=06430800) [U.S. Geological Survey, 2021].

3.2 SAMPLING METHODS

Wharf collected samples at the Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, SS-20, and SS-04 monitoring sites following Wharf's sampling protocols (Appendix

C). The SD DANR collected samples at the 46MN31 site in accordance with the *Surface Water Quality Program & Feedlot Permit Program, Standard Operating Procedures, Field Water Quality Sampling* available at (https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/docs/DANR_SOPrev3.pdf) [SD DANR, 2022] and are also provided in Appendix C.

3.3 DATA RESULTS

Raw water quality data for each surface water sampling site relevant to Wharf's Boston Expansion Project plans are included in Appendix D. Appendix E contains statistical summaries of the parameters by each site from 2015 through 2021. Table 3-2 provides the summary statistics for six baseline sites (Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, and 46MN31) by parameter in the Annie Creek drainage. Table 3-3 displays the summary statistics for two baseline sites (SS-20 and SS-04) in the Nevada Gulch drainage. If a water quality result was reported as less than the method detection limit (MDL) value in the raw data, that result was included in the statistical analyses as the MDL value. Comprehensive statistics for each of the eight baseline sampling sites are included in Appendix E and contain the number of samples analyzed, number detected, mean, standard deviation, quartile one (Q1), median, quartile three (Q3), minimum, and maximum values. Time-series graphs were generated for sampling parameters for the six sites in the Annie Creek drainage as well as the two sites in the Nevada Gulch drainage and are included in Appendix F.

If a water quality result was reported as less than the practical quantitation limit (PQL) value in the raw data, that result was included in the statistical analyses as one-half of the PQL value. If a PQL was not listed for some of a single constituent's results but was listed for other results of the same constituent, the listed PQL value was used for all of that constituent's results. Also, if a result was reported as zero in the raw data for a constituent having a specified PQL, one-half of the specified PQL was used in the statistical analyses instead of the zero value.

3.4 AQUATIC RESOURCES

Annual aquatic species and habitat surveys have been conducted by GEI Consultants, Inc. (GEI), formerly Chadwick Ecological Consultants, Inc. (CEC) and Chadwick & Associates, Inc. (C&A), since the early 1990s on streams that flow through or have drainages within the Wharf and Golden Reward Mines as required in their National Pollution Discharge Elimination System Permit [GEI, 2021]. The 2020 study evaluated habitat, fish, benthic macroinvertebrates, and periphyton in Annie Creek, Ross Valley, Lost Camp Gulch, Deadwood Creek, False Bottom Creek, McKinley Gulch, Cleopatra Creek, Fantail Creek, Nevada Gulch, Stewart Gulch, Reno Creek, and Labrador Gulch [GEI, 2021]. The 2020 study is discussed in detail in the *Wharf Boston Expansion Project Request for Determination of Special, Exceptional, Critical, or Unique Lands and Notice of Intent to Operate* [Wharf, 2021].

There are no aquatic sites located within the Boston Expansion Area [Wharf, 2021]. Overall, aquatic monitoring in 2020 on streams near the Wharf Mine and Boston Expansion Area indicates healthy fish, benthic macroinvertebrate, and periphyton communities. The absence of fish in some streams is related to low flows, and sedimentation from nearby roads has led to decreased macroinvertebrate and periphyton population metrics in some streams [GEI, 2021]. However, the 2020 aquatic report concludes that mining activities at the Wharf Mine did not directly impact aquatic resources in the study streams [GEI, 2021].

Table 3-2. Summary Statistics for Water Quality Parameters for the Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, and 46MN31 Sites Near the Boston Expansion Area (2015–2021) (Page 1 of 3)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Field Conductivity (µmhos/cm)	485	NA	NA	437.28	162.35	80	330	460	510	1030
Field Depth (feet)	27	NA	NA	0.45	0.28	0.1	0.3	0.4	0.5	1.2
Field Width (feet)	27	NA	NA	6.41	1.74	3	5	7	8	10
Field ORP (mV)	218	NA	NA	151.20	68.62	-55	116	165.5	203.25	264
Field Dissolved Oxygen (DO) (mg/L)	485	NA	NA	10.50	1.71	0.87	9.45	10.5	11.4	15.8
Field pH (SU)	488	NA	NA	8.36	0.37	7.18	8.1975	8.46	8.62	10.3
Field Water Temperature (°C)	488	NA	NA	6.35	5.12	–5	1.8	5.3	10.1	19.8
Field Air Temperature (°C)	18	NA	NA	10.61	9.33	–6	4.5	9.5	18.25	26
Field Flow Rate (gal/min)	433	NA	NA	464.85	1,311.34	0.175	70.46	120	325.6	18600
Arsenic (As), Dissolved (ug/L)	27	0.01	0	12.46	4.56	6	10	10	16	20
Cadmium (Cd), Dissolved (mg/L)	27	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium (Ca), Dissolved (mg/L)	223	1.00	0	48.67	14.16	11.3	39.25	53.8	59.3	71.9
Chromium (Cr), Dissolved (mg/L)	27	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Copper (Cu), Dissolved (mg/L)	27	0.01	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Lead (Pb), Dissolved (mg/L)	27	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Magnesium (Mg), Dissolved (mg/L)	223	0.50	0	20.80	7.46	3.26	15.3	22.8	26.8	42.5
Mercury (Hg), Dissolved (mg/L)	27	0.01	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Nickel (Ni), Dissolved (mg/L)	27	0.01	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium (Se),Dissolved (mg/L)	27	0.00	0	0.00	0.00	0.00131	0.0025	0.0025	0.0025	0.0025
Silver (Ag), Dissolved (mg/L)	27	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Sodium (Na), Dissolved (mg/L)	100	0.02	0	8.88	5.73	3.07	4.23	5.93	14.8	21.2
Zinc (Zn), Dissolved (mg/L)	27	0.00	0	0.25	0.00	0.25	0.25	0.25	0.25	0.25

Table 3-2. Summary Statistics for Water Quality Parameters for the Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, and 46MN31 Sites Near the Boston Expansion Area (2015–2021) (Page 2 of 3)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Mercury (Hg),Total (mg/L)	309	0.00	0	0.00	0.00	0.00005	0.0001	0.0001	0.0001	0.0002
Aluminum (Al), Total Recoverable (ug/L)	6	0.00	0	363.58	464.84	28.7	53	139.85	776.75	1190
Arsenic (As),Total (mg/L)	101	0.00	0	0.02	0.02	0.0025	0.006	0.013	0.0515	0.081
Arsenic (As), Total Recoverable (mg/L)	374	0.00	0	0.01	0.00	0.0025	0.01	0.012	0.014	0.038
Cadmium (Cd), Total Recoverable (mg/L)	184	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium (Cr), Total Recoverable (mg/L)	75	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.022
Copper (Cu), Total Recoverable (mg/L)	184	0.00	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.009
Gold (Au), Total (mg/L)	99	0.00	0.050505051	0.00	0.00	0.00028	0.00028	0.0005	0.002	0.011
Iron (Fe), Total Recoverable (mg/L)	10	0.00	0	0.15	0.16	0.0005	0.015625	0.084	0.298	0.437
Lead (Pb), Total Recoverable (mg/L)	189	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.009
Nickel (Ni), Total Recoverable (mg/L)	11	0.00	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium (Se), Total (mg/L)	99	0.00	0	0.01	0.00	0.0025	0.0025	0.0025	0.01	0.017
Selenium (Se), Total Recoverable (mg/L)	376	0.00	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.007
Silver (Ag), Total Recoverable (mg/L)	75	0.00	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.001
Zinc (Zn), Total Recoverable (mg/L)	186	0.01	0	0.03	0.04	0.025	0.025	0.025	0.025	0.349
Bicarbonate (mg/L)	100	0.51	0	151.79	51.89	50.6	117	148.5	192	261
Cyanide, Total (mg/L)	102	0.00	0	0.01	0.00	0.005	0.005	0.005	0.005	0.018
Biochemical Oxygen Demand, 5 Day (mg/L)	375	NA	0	1.53	0.25	1.5	1.5	1.5	1.5	3.6
Cyanide, WAD (mg/L)	512	0.00	0	0.00	0.00	0.002	0.005	0.005	0.005	0.016
Fluoride (mg/L)	100	0.00	0	0.21	0.11	0.077	0.12125	0.1655	0.321	0.446
Nitrogen, Ammonia (NH3) (mg/L)	501	0.01	0	0.02	0.01	0	0.025	0.025	0.025	0.056
Nitrogen, Nitrate (NO3)+Nitrite (NO2) (mg/L)	27		0	4.52	2.04	0.754	2.64	5.1	6.01	7.21
Nitrogen, Nitrate (NO3) (mg/L)	283	0.06	0	4.81	5.56	0.025	1.25	2.76	5.97	26.5

Table 3-2. Summary Statistics for Water Quality Parameters for the Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, and 46MN31 Sites Near the Boston Expansion Area (2015–2021) (Page 3 of 3)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Nitrogen, Nitrite (NO2) (mg/L)	100	0.01	0	0.09	0.10	0.025	0.025	0.025	0.25	0.25
Kjeldahl Nitrogen (mg/L)	25	0.50	0	0.05	0.13	0.025	0.025	0.025	0.025	0.67
Phosphorus, Total (mg/L)	27	0.01	0	0.06	0.03	0.033	0.045	0.049	0.057	0.197
Phosphorus, Dissolved (mg/L)	100	0.00	0	0.03	0.01	0.005	0.026	0.0325	0.038	0.104
Sulfate (SO4) (mg/L)	102	0.68	0	72.26	103.71	0.5	0.5	14.8	188.25	299
Alkalinity (mg/L)	1	NA	0	170.00		170	170	170		170
Electrical Conductivity (µmhos/cm)	263	0.15	0	444.49	184.47	84.4	300.5	456	518	1010
Hardness (mg/L)	223	5.00	0	207.20	65.06	41.6	159	229	257	308
Organic Carbon, Dissolved (mg/L)	25	0.20	0	2.04	0.71	1.03	1.52	1.84	2.665	3.41
pH (SU)	474	NA	0	8.31	0.22	7.61	8.22	8.385	8.4625	8.68
Total Dissolved Solids (mg/L)	315	17.60	0	244.46	119.63	79	157.5	231	277	682
Total Suspended Solids (mg/L)	501	3.49	0	8.00	20.05	0	5	5	5	300

MDL = method detection limit
mV = millivolts
mg/L = milligrams per liter
SU = standard units
°C = degrees Celsius
gal/min = gallons per minute
ug/L = micrograms per liter

Table 3-3. Summary Statistics for Water Quality Parameters for the SS-04 and SS-20 Sites Near the Boston Expansion Area (2015–2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Field Conductivity (µmhos/cm)	43	NA	NA	611.86	256.54	200	415	570	820	1170
Field ORP (mV)	28	NA	NA	20.46	66.90	–63	–28.75	3.5	50.5	172
Field Dissolved Oxygen (DO) (mg/L)	28	NA	NA	9.55	1.42	7.46	8.4525	9.575	10.0875	14.04
Field pH (SU)	43	NA	NA	7.29	0.28	6.75	7.065	7.33	7.5	7.97
Field Water Temperature (°C)	43	NA	NA	8.12	4.27	1.4	4.1	8.3	11	16.3
Field Flow Rate (gal/min)	43	NA	NA	163.09	317.50	7	30	45	110	1510
Sodium (Na), Dissolved (mg/L)	43	0.02	0	31.38	14.51	9.93	20.85	26.1	43.1	69
Mercury (Hg),Total (mg/L)	43	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Arsenic (As),Total (mg/L)	43	0.0005	0	0.02	0.01	0.007	0.014	0.017	0.02	0.071
Selenium (Se),Total (mg/L)	43	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Bicarbonate (mg/L)	43	0.513	0	68.81	20.25	36.2	54.15	67.1	88.5	113
Nitrogen, Nitrate (NO3) (mg/L)	43	0.056	0	1.51	1.13	0.114	0.7465	1.06	2.14	4.52
Nitrogen, Nitrite (NO2) (mg/L)	43	0.005	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
Sulfate (SO4) (mg/L)	43	0.679	0	110.74	136.40	0.5	19.1	35.7	179	473
Electrical Conductivity (µmhos/cm)	43	0.153	0	599.72	261.69	196	406	565	811	1190
pH (SU)	43	NA	0	7.35	0.30	6.61	7.15	7.41	7.56	7.92
Total Suspended Solids (mg/L)	43	3.49	0	16.09	35.20	5	5	5	19	234
Total Suspended Solids (mg/L)	501	3.49	0	8.00	20.05	0	5	5	5	300

MDL = method detection limit
mV = millivolts
mg/L = milligrams per liter
SU = standard units
°C = degrees Celsius
gal/min = gallons per minute
ug/L = micrograms per liter

3.5 ANALYSIS OF SURFACE WATER QUALITY DATA

The objective of the sampling program was to develop a baseline database from evaluating surface water quality data collected at locations near the area before the expansion. Water quality sample results were analyzed from eight surface water monitoring sites (Annie Creek at USGS, Annie Creek II, Lost Camp, CP001/NPDES001, CP005/NPDES005, SS-20, SS-04, and 46MN31). More detailed water quality results and statistics for each site are provided in Appendices D and E, respectively. Time series of water quality parameters for each site are shown in Appendix F. The water quality results at these eight baseline surface water sampling sites are generally typical for surface water quality in the region and include the following.

- pH values ranged from 7.61 to 8.68 and the median value among the sites was 8.385 for sites in the Annie Creek drainage
- pH values ranged from 6.61 to 7.92 and the median value among the sites was 7.41 for sites in the Nevada Gulch drainage
- Field conductivity values ranged from 80 to 1,030 micromhos per centimeter (µmhos/cm) and the median value among the sites was 460 µmhos/cm for sites in the Annie Creek drainage
- Field conductivity values ranged from 200 to 1,170 µmhos/cm and the median value among the sites was 570 µmhos/cm for sites in the Nevada Gulch drainage.

Baseline data for evaluating surface water quality in potentially disturbed drainages were obtained at eight existing surface water monitoring sites that were chosen based on their proximity to the Boston Expansion Area and the SD DANR recommendations. Seven of the sites were Wharf monitoring sites and one was SD DANR monitoring site 46MN31 (Annie Creek near Elmore). These sites were sampled from 2015 through 2021 and will continue to be sampled on an established schedule. Between 11 and 23 set chemical parameters were analyzed at each site and the required frequency of sampling events varied from site to site. Parameters sampled are the same as those required for the existing Wharf water quality program and required by SDCL 45-6B-7(9). Any changes to the sites, sample frequency, or sample parameters will be established in conjunction with the SD DANR.

An analysis of field parameters compared to the South Dakota state criteria showed none of the collected data exceeded the criteria for the cold-water marginal fish life propagation use of 75°F (23.9°C). All but three (3 of 513) dissolved oxygen (DO) readings were below the criteria for the cold-water marginal fish life propagation use of 5 mg/L. Two of these DO readings were recorded at the CP001/NPDES001 site on December 29, 2015, and December 10, 2018. The other DO reading was recorded at the CP005/NPDES005 site on December 10, 2018. The cause of the low DO readings is unknown and other DO readings recorded on those sample dates were normal. All but one (1 of 531) field pH readings were within the South Dakota state criteria for the cold-water marginal fish life propagation (6.5–9.0) and fish and wildlife propagation, recreation, and stock watering (6.0–9.5) beneficial uses. A pH reading of 10.3 was recorded at the CP005/NPDES005 site on December 19, 2016, however the cause of this pH reading is unknown, and the other pH reading recorded on this sample date at the Lost Camp site was normal.

All of the samples collected and analyzed were below the South Dakota and/or Environmental Protection Agency criteria for conductivity, water temperature, nitrate, arsenic, cyanide, TDS, and no

exceedances of the criteria were detected at the eight sampling sites within the past 6 years. All of the samples collected and analyzed were below the SD daily maximum nitrate criteria of 88 mg/L and the EPA's freshwater-recommended limit for arsenic of 0.340 mg/L.

An analysis of the TSS sample results indicated that 541 (all but three) of the samples collected were below the TSS limit of 158 mg/L for cold-water marginal fish life propagation beneficial use. There were two TSS samples that exceeded the limit at the CP005/NPDES005 sampling site, which included a TSS sample result of 300 mg/L that was collected on August 19, 2016, and a TSS sample of 266 mg/L was collected on June 18, 2018. In both of these cases upgradient Wharf sample sites were less than 10 mg/l and the adjacent feeder stream to site CP005/NPDES005 was identified as the source of elevated TSS, likely from ATV traffic and erosion impacts as noted in State correspondence for those times. The other TSS sample of 234 mg/L was collected at the SS04 sampling site on August 24, 2018, and it is unknown as to the cause as other parameters at this sampling site were normal on this date.

All of the samples collected at the Annie Creek at USGS, Lost Camp, CP001/NPDES001, CP005/NPDES005, SS-20, SS-04, and 46MN31during the past 6 years were below the EPA-recommended criteria selenium of 0.005 mg/L or 5 micrograms per liter (ug/L). The selenium results at Annie Creek II have been above the criteria of 0.005 mg/L from 2015 through 2021. Although these samples exceeded the selenium criteria, the sample site is for surveillance only and not a compliance point. These selenium levels have remained from 2015 through 2021 as shown in the selenium time series graph included in Appendix F. Moreover, the selenium levels from 2015 through 2021 at the downstream sites (Annie Creek at USGS, CP001/NPDES001, Lost Camp, CP005/NPDES005) showed no exceedances and are similar to the baseline water quality selenium results from 2006 through 2010 analyzed for the current permit.

All of the samples collected at the Annie Creek at USGS, CP001/NPDES001, Lost Camp, CP005/NPDES005, SS-20, SS-04, and 46MN31 in the past 6 years were also below the EPA-recommended criteria for WAD cyanide of 0.022 mg/L. There have been only 5 WAD cyanide detections out of the 512 total samples collected from 2015 through 2021. All five of these samples were collected at CP001/NPDES001 and all of five were below the WAD cyanide criteria. Moreover, the WAD cyanide levels from 2015 through 2021 at other monitoring sites in the drainage (Annie Creek at USGS, Annie Creek II, Lost Camp, CP005/NPDES005) showed no detections of WAD cyanide.

4.0 PROJECT IMPACTS

No impacts are expected to surface water quality and the surface water hydrologic balance as a result of mining in the Boston Expansion Area. Current Wharf mining operations are in accordance with policies for controlling sedimentation and erosion with drainage structures and would continue to be applicable for stormwater management on the proposed Boston Expansion Area. Surface disturbances within the Boston Expansion Area will not directly overlie any streams and are not expected to impact surface water flow or water quality in the Annie Creek, Lost Camp, and Nevada Gulch Creek drainages because the existing pit would capture most precipitation within the area.

The SD DANR did not request a detailed hydrologic modeling effort for the proposed Boston Expansion. No potential impacts of surface water hydrology were noted because the proposed Boston Expansion would involve a small area of approximately 47.4 acres and is predominantly situated on a ridge between the existing mine pit and the Annie Creek and Lost Camp Gulch drainages. Any changes to surface water runoff flow resulting from the proposed expansion would be insignificant and probably incalculable at the Annie Creek and Lost Camp surface water sampling sites.

Current plans do not include the spent ore disposal in the Boston Expansion Area. Policies for sedimentation, erosion, and drainage structures would apply to the proposed Boston Expansion, and control structures would be in place to prevent downstream sedimentation before any disturbance occurs. These structures would remain in place until suitable vegetation is established. Periodic inspections of the structures would occur, and operation and maintenance would be performed as considered necessary during the postclosure period.

An analysis of both field and laboratory results from eight surface water monitoring sites were compared to the state and federal water quality criteria for samples collected from 2015 through 2021. The water quality results at these surface water monitoring sites are typical for surface water quality in the region and are similar to the Wharf baseline water quality results from 2006 through 2010 analyzed as part of the existing permit. As discussed in Section 3.5, all of the samples analyzed were below the criteria for conductivity, water temperature, nitrate, arsenic, cyanide, and TDS. Only 3 of the 541 TSS samples were above the criteria.

Surface water quality exceedances will not likely occur at these sites downstream of the proposed Boston Expansion Area and are not a concern. This determination is based on no exceedances being observed for several of the surface water parameters and because of the very low frequency of South Dakota and EPA criteria exceedances detected at the surface water quality sites downstream of Wharf within the past 6 years. These findings combined with the 2020 aquatic monitoring on streams near the Wharf Mine and Boston Expansion Area indicating a healthy fish, benthic macroinvertebrate, and periphyton communities, help to further support the results.

5.0 REFERENCES

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APPENDIX A
PARAMETER LISTS

Table A-1. Water Quality Parameter List 1 for Quarterly Sampling at Wharf Site Annie Creek at USGS (2015–2021)

Parameter	Annie Creek at USGS
Conductivity, Field	X
ORP, Field	X
DO, Field	X
pH, Field	X
Water Temp, Field	X
Flow Rate, Field	X
Arsenic	T
Gold	T
Mercury	T
Sodium	D
Bicarbonate	X
CN, Total	X
CN, WAD	X
Fluoride	X
N, Ammonia	X
N, Nitrate	X
N, Nitrite	X
Selenium	T
Sulfate	X
Conductivity, Electrical	X
pH	X
TDS	X
TSS	X

Notes:
X = sample measured or analyzed for parameter
ORP = oxygen reduction potential
DO = dissolved oxygen
T = sample measured or analyzed for total parameter
D = sample measured or analyzed for dissolved parameter
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
Please note that the Annie Creek at USGS site is sampled for total metals.
All units are milligram per liter with the following exceptions: conductivity (micromhos per centimeter), ORP (millivolts), pH (standard units), temperature (degrees Celsius), and flow rate (gallon per minute).

Table A-2. Water Quality Parameter List 2 for Quarterly Sampling at Wharf Sites SS-20 and SS-04 (2015–2021)

Parameter	SS-20 and SS-04
Conductivity, Field	X
pH, Field	X
Water Temp, Field	X
Flow Rate, Field	X
Arsenic	T
Mercury	T
Sodium	D
Bicarbonate	X
N, Nitrate	X
N, Nitrite	X
Selenium	T
Sulfate	X
Conductivity, Electrical	X
pH	X
TSS	X

Notes:
X = sample measured or analyzed for parameter
T = sample measured or analyzed for total parameter
D = sample measured or analyzed for dissolved parameter
N = nitrogen
TSS = total suspended solids
Please note that the SS 20 and SS-04 sites are sampled for total metals.
All units are milligram per liter with the following exceptions:
conductivity (micromhos per centimeter), pH (standard units),
temperature (degrees Celsius), and flow rate (gallon per minute).

Table A-3. Water Quality Parameter List 3 for Monthly Quarterly Sampling at Wharf Sites Lost Camp and Annie Creek II (2015–2021)

Parameter	Lost Camp and Annie Creek II
Conductivity, Field	X
ORP, Field	X
DO, Field	X
pH, Field	X
Water Temp, Field	X
Flow Rate, Field	X
Arsenic	T
Gold	T
Mercury	T
Sodium	D
Bicarbonate	X
CN, Total	X
CN, WAD	X
Fluoride	X
N, Ammonia	X
N, Nitrate	X
N, Nitrite	X
Selenium	T
Sulfate	X
Conductivity, Electrical	X
pH	X
TDS	X
TSS	X

Notes:
X - sample measured or analyzed for parameter
ORP = oxygen reduction potential
DO = dissolved oxygen
T = sample measured or analyzed for total parameter
D = sample measured or analyzed for dissolved parameter
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
Please note that the Annie Creek II and Lost Camp sites are sampled for total metals.
All units are milligram per liter with the following exceptions: conductivity (micromhos per centimeter), ORP (millivolts), pH (standard units), temperature (degrees Celsius), and flow rate (gallon per minute).

Table A-4. Water Quality Parameter List 4 for Quarterly Sampling at South Dakota Department of Agriculture and Natural Resources Site 46MN31 (2015–2021)

SD DANR Analysis Group 5	SD DANR Site 46MN31
Field Analysis Parameters	
Water Temp	X
Air Temp	X
DO	D
Conductivity	X
pH	X
Depth, Waterbody	X
Width, Waterbody	X
Laboratory Analysis Parameters	
Hardness	X
TDS	X
TSS	X
Phosphorous	T
N, Ammonia)	X
N, Nitrate	X
Kjeldahl N	X
CN, WAD	X
Arsenic	D
Cadmium	D
Chromium	D
Copper	D
Lead	D
Mercury	D, T
Nickel	D, T
Selenium	D
Silver	D, T
Zinc	D, T
Organic Carbon	D

Notes:
X - sample measured or analyzed for parameter
T = sample measured or analyzed for total parameter
D = sample measured or analyzed for dissolved parameter
CN = cyanide
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
WAD = Weak Acid Dissociable
DO = dissolved oxygen
Please note that the 46MN31 site is sampled for total recoverable metals.
All units are milligram per liter with the following exceptions: temperature (degrees Celsius), conductivity (micromhos per centimeter), pH (standard units), depth and width (feet), Aluminum, total recoverable (microgram per liter), and Lead, total recoverable (microgram per liter).

Table A-5. Additional Water Quality Parameters to Parameter List 4 Sampled at South Dakota Department of Agriculture and Natural Resources Site 46MN31 (February 10, 2015)

Parameter	SD DANR Site 46MN31 (2/10/2015)
Arsenic	T
Cadmium	TR
Chromium	TR
Copper	TR
Lead	TR
Nickel	TR
Silver	TR
Zinc	TR
Cyanide	T
Selenium	T
Alkalinity	X

Note:
X - sample measured or analyzed for parameter
T =sample measure or analyzed for total parameter
TR = sample measured or analyzed for total recoverable parameter
Please note that the 46MN31 site is sampled for total recoverable metals.
All units are milligram per liter with the following exception: Lead, total recoverable (microgram per liter).

Table A-6. Water Quality Parameter List 5 for Biweekly Sampling at Wharf Sites CP001/NPDES001 and CP005/NPDES005 (2015–2021)

Parameter	CP001/NPDES001 and CP005/NPDES005
Field Analysis Parameters	
Water Temp	X
Air Temp	X
DO	D
Conductivity	X
pH	X
Depth, Waterbody	X
Width, Waterbody	X
Laboratory Analysis Parameters	
Hardness	X
TDS	X
TSS	X
Phosphorous	T
N, Ammonia)	X
N, Nitrate	X
Kjeldahl N	X
CN, WAD	X
Arsenic	D
Cadmium	D
Chromium	D
Copper	D
Lead	D
Mercury	D, T
Nickel	D, T
Selenium	D
Silver	D, T
Zinc	D, T
Organic Carbon	D

Notes:
X - sample measured or analyzed for parameter
T = sample measured or analyzed for total parameter
D = sample measured or analyzed for dissolved parameter
CN = cyanide
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
WAD = Weak Acid Dissociable
DO = dissolved oxygen
Please note that the CP001/NPDES001 and CP005/NPDES005 sites are sampled for total recoverable metals.
All units are milligram per liter with the following exceptions: temperature (degrees Celsius), conductivity (micromhos per centimeter), pH (standard units), depth and width (feet), Aluminum, total recoverable (microgram per liter), and Lead, total recoverable (microgram per liter).

Table A-7. Contingency Water Quality Parameter List 5 for Biweekly Sampling at Wharf Sites CP001/NPDES001 and CP005/NPDES005 (2015–2021) (Page 1 of 2)

Parameter	Sampled	CP001 Chronic Limit (µg/L)	CP001 Acute Limit (µg/L)	CP005 Chronic Limit (µg/L)	CP005 Acute Limit (µg/L)	Sampling Conditions
Silver Total Recoverable	Quarterly	None	None	Hardness based	Hardness based	
Arsenic Total Recoverable	Biweekly	150	340	150	340	
Cadmium Total Recoverable	Monthly	50	100	Hardness based	Hardness based	
Chromium Total Recoverable	Quarterly	None	None	11	16	If above standard, can use ionic forms with hardness equations to determine if in compliance
Copper Total Recoverable	Monthly	150	300	Hardness based	Hardness based	
Mercury Total	Monthly	1	2	0.012	1.6	
Nickel Total Recoverable	Yearly					If sites are used for Yearly Biomonitoring sampling
Iron Total Recoverable	Yearly					If sites are used for Yearly Biomonitoring sampling
Lead Total Recoverable	Monthly	300	600	Hardness based	Hardness based	
Selenium Total Recoverable	Biweekly	4.6	12.8*	4.6	12.8*	*Speciation is used to determine if compliant with standard
Zinc Total Recoverable	Monthly	750	1500	Hardness based	Hardness based	
Nitrates	Monthly	50 mg/L	88 mg/L	50 mg/L	88 mg/L	
Ammonia	Biweekly	1.0 mg/L	1.75 mg/L	1.0 mg/L	1.75 mg/L	
Cyanide (WAD)	Biweekly	5.2	22	5.2	22	
pH	Biweekly	6.0 min	9.0 max	6.5 min	8.8 max	
Total Suspended Solids	Biweekly	90	158	90	158	
Total Dissolved Solids	Monthly	None	None	None	None	
Hardness	Monthly	None	None	None	None	
Total Residual Chlorine	As needed		19		19	Not currently using Chlorine for treatment
Dissolved Oxygen	Biweekly		5.0 min		5.0 min	
Biochemical Oxygen Demand (5-day)	Biweekly	10 mg/L	17.5 mg/L	10 mg/L	17.5 mg/L	
W.E.T. Acute	Quarterly		Pass		Pass	Alternate quarters between Ceriodaphnia and Pimephales Promelas

Table A-7. Contingency Water Quality Parameter List 5 for Biweekly Sampling at Wharf Sites CP001/NPDES001 and CP005/NPDES005 (2015–2021) (Page 2 of 2)

Parameter	Sampled	CP001 Chronic Limit (µg/L)	CP001 Acute Limit (µg/L)	CP005 Chronic Limit (µg/L)	CP005 Acute Limit (µg/L)	Sampling Conditions
Total Petroleum Hydrogen	As needed		10		10	Sampled for only if visible sheen on water
Dissolved Phosphorus				None	None	Monthly at CP005 only and yearly for both sites if they are used for Biomonitoring sampling
Flow (MGD)	Biweekly	None	None	None	None	
Temperature (°C)	Biweekly	None	None	None	None	
Visible Pollutants	Biweekly	No pollutants visible	No pollutants visible	No pollutants visible	No pollutants visible	

Table A-8. Water Quality Parameter Lists for All of the Sites (2015–2021) (Page 1 of 2)

Parameter	Annie Creek at USGS	46MN31	Lost Camp and Annie Creek II	SS20 and SS-04
Sampling Frequency	Quarterly	Quarterly	Quarterly	Quarterly
Conductivity, Field	X	X	X	X
Depth, Field		X		
Width, Field		X		
ORP, Field	X		X	
DO, Field	X	X	X	
pH, Field	X	X	X	X
Water Temp, Field	X	X	X	X
Air Temp, Field		X		
Flow Rate, Field	X		X	X
Aluminum		TR		
Arsenic	T	D	T	T
Cadmium		D		
Calcium		D		
Chromium		D		
Copper		D		
Gold	T		T	
Lead		D		
Magnesium		D		
Mercury	T	D, T	T	T
Nickel		D		
Silver		D		
Sodium	D		D	D
Zinc		D		
Bicarbonate	X		X	X
CN, Total	X		X	
CN, WAD	X	X	X	
Fluoride	X		X	
N, Ammonia	X	X	X	
N, Nitrate	X	X	X	X
N, Nitrite	X		X	X
Kjeldahl N		X		
Phosphorus		T		

Table A-8. Water Quality Parameter Lists for All Sites (2015–2020) (Page 2 of 2)

Parameter	Annie Creek at USGS	46MN31	Lost Camp and Annie Creek II	SS20 and SS-04
Selenium	T	D	T	T
Sulfate	X		X	X
Conductivity, Electrical	X		X	X
Hardness		X		
Organic Carbon		D		
pH	X		X	X
TDS	X	X	X	
TSS	X	X	X	X

Notes:

X = sample measured or analyzed for parameter

D = sample measured or analyzed for dissolved parameter

T = sample measured or analyzed for total parameter

TR = sample measured or analyzed for total recoverable parameter

DO = dissolved oxygen

N = nitrogen

TDS = total dissolved solids

TSS = total suspended solids

CN = cyanide

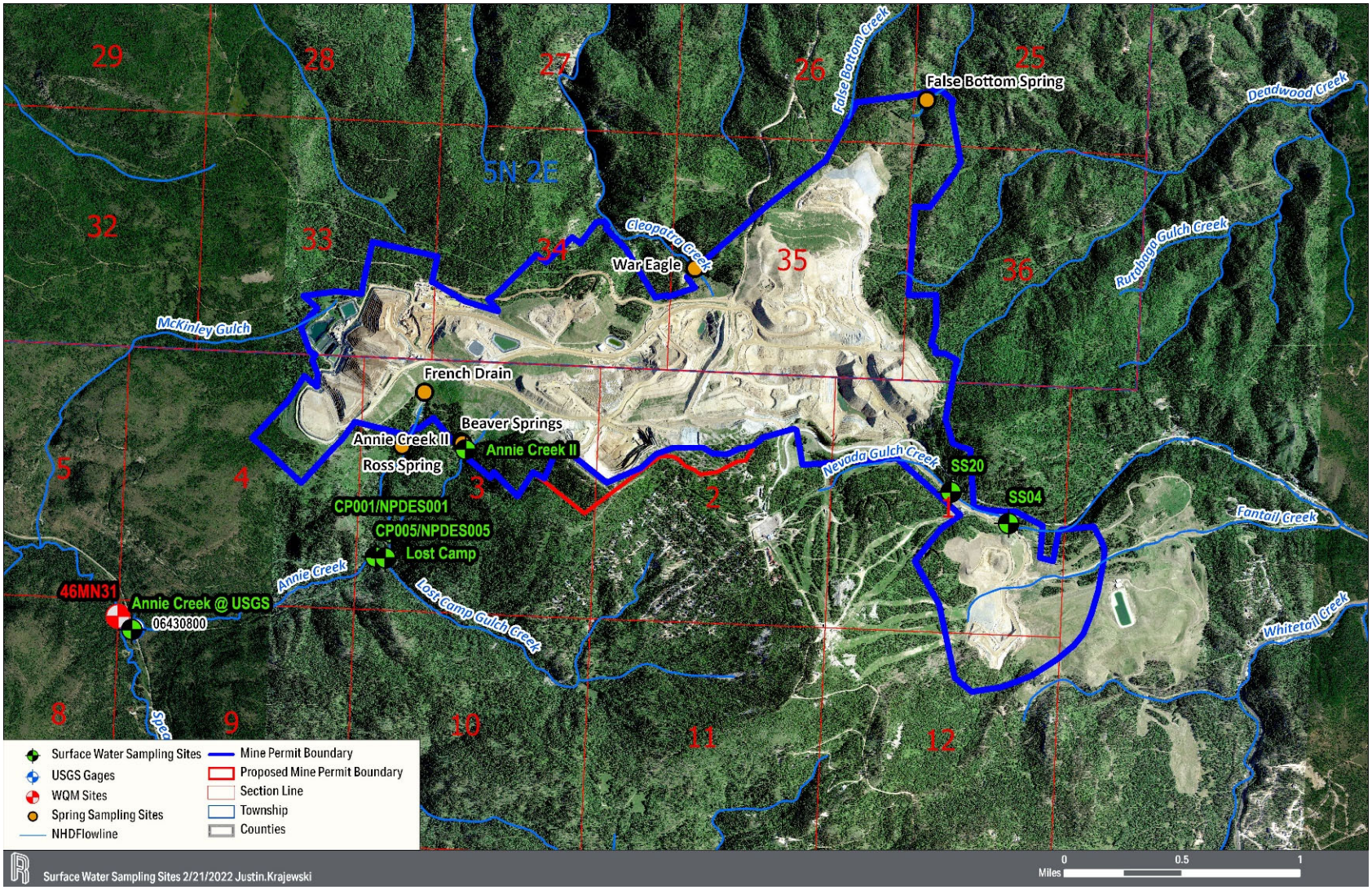
WAD = Weak Acid Dissociable

Please note that the surface water sites (Annie Creek at USGS, Annie Creek II, Lost Camp, SS-20, and SS-04) are sampled for total metals while the CP001/NPDES001, CP005/NPDES005, and 46MN31 are sampled for total recoverable metals.

All units are milligram per liter with the following exceptions: conductivity (micromhos per centimeter), depth and width (feet), flow rate (gallon per minute), ORP (millivolts), pH (standard units), temperature (degrees Celsius), Aluminum, total recoverable (microgram per liter), and Lead, total recoverable (microgram per liter).

APPENDIX B

SURFACE WATER SAMPLING MAP


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12
False Bottom Creek
False Bottom Spring
Deadwood Creek
Cleopatra Creek
War Eagle
Rurobago Gulch Creek
McKinley Gulch
French Drain
Beaver Springs
Annie Creek II
Annie Creek II
Ross Spring
Nevada Gulch Creek
SS20
SS04
Fantail Creek
CP001/NPDES001
CP005/NPDES005
Lost Camp
Annie Creek
Lost Camp Gulch Creek
46MN31
Annie Creek @ USGS
06430800
Whitetail Creek
Surface Water Sampling Sites
USGS Gages
WQM Sites
Spring Sampling Sites
NHDFlowline
Mine Permit Boundary
Proposed Mine Permit Boundary
Section Line
Township
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Surface Water Sampling Sites 2/21/2022 Justin.Krajewski
0
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1
Miles

APPENDIX C
SAMPLING METHODS

APPENDIX C-1: WHARF SURFACE WATER SITES (ANNIE CREEK AT USGS, CP001/NPDES001, CP005/NPDES005, LOST CAMP, ANNIE CREEK II, SS-04, AND SS-20)

WATER SAMPLING PROTOCOL FOR WHARF RESOURCES AND GOLDEN REWARD MINING COMPANIES

Preparation:

1. Always take the following equipment:
   - Bottles (Clean, laboratory supplied, the proper size and number)
   - Coolers w/ ice or snow
   - pH meters
   - Conductivity meters
   - Temperature meters
   - Water Level Indicator
   - Flow Meter
   - Tape Measure
   - Watch
   - Field Book
   - Pen
   - Felt Tip Marker
   - Keys for Well Cap Locks
   - Lubricant for Locks
   - Bailer
   - Bottle of Deionized Water
   - Waterproof Gloves
   - Two-Way Radio

2. Take the following equipment when weather conditions and vehicle capacity allow:
   - Paper Towels
   - Bottle Labels
   - Water Filter Barrel and Filters
   - Air Pump (Foot Pump)
   - Chain-of-Custody Forms
   - Sampling List Forms
   - Appropriate Preservatives
   - Portable Flume

3. Calibrate the pH and conductivity meters each morning prior to sampling. Please refer to calibration manuals supplied with the meters.

4. If sampling at the Surface Water Discharge Compliance Points or Outfalls and if hypochlorite is being utilized and the treated water is being discharged and flowing past any Compliance Point or Outfall to be sampled, check the calibration of the chlorine meter and take the kit with you.

Surface Water and Surface Water Discharge Permit (SWD) Sampling:

1. Always start at the furtherst downstream location and work your way upstream.

2. Record in field book sample location, date, and sample code (if using one).

3. Check the area around the surface site for any changes from nature or vandalism. Record any changes in the field book. In case of vandalism, report to supervisor or department head.

4. SWD: Take air temperature and record in field book.

5. SWD: Observe the sky conditions and record in field book. (cloudy, clear, etc.)

6. SWD: Observe wind conditions and record in field book. (calm, 0-5 mph, steady, gusty, etc.)

7. SWD: Observe is there is a visible sheen on the water and record in field book.

8. SWD: Observe the turbidity and record in the field book.

9. SWD: Record in the field book the precipitation conditions for the past 24 hours.

10. SWD: Observe the flow conditions and record in the field book. (high, low, average, etc.)

11. SWD: If hypochlorite is being utilized and the treated water is being discharged and flowing past this site, analyze a sample of the water for Total Residual Chlorine and record in field book. (Use the instructions included in the kit.)

12. Label the sample bottles with a permanent marker. List:
    a. Location
    b. Site Name or Code Number
    c. Date
    d. Time

13. Triple rinse all sample bottles with sample solution. To do this:
    a. partially fill the bottles
    b. replace the cap and shake bottle vigorously
    c. remove the lid and pour the water out
    d. repeat steps a. through c.
    e. repeat steps a. through c. again
    f. once the bottles and caps are rinsed, be careful not to touch the inside of the bottles and caps, or the tops of the bottles where the caps screw on

14. Take the pH of the sample solution and record in field book.

15. Take conductivity of the sample solution and record in the field book.

16.. Take temperature of the sample solution and record in the field book.

17. Collect sample in the rinsed bottles within the same minute and cap immediately.
    a. If safe, collect the sample from the middle of the stream. If unsafe, collect the sample while standing on the bank and reach out into the stream.
    b. Collect the sample facing upstream, so that the sample entering the bottle has not been influenced by any of your actions.
    c. Plunge the bottle to just below the surface of the water and allow to fill.
    d. Do not stir up sediment from the stream bottom when sampling.

18. Once the samples are obtained, immediately place them in an iced cooler.

19. Record the time of sampling in the field book.

20. Use the flow meter or portable flume to obtain flow according to its respective instruction manual.

21. Record the flow measurements in the field book.

22. Refer to section "**Sample Preparation**" below.

APPENDIX C-2: SD DANR SURFACE WATER SITE (46MN31)

SURFACE WATER QUALITY PROGRAM
&
FEEDLOT PERMIT PROGRAM

STANDARD OPERATING PROCEDURES

FIELD WATER QUALITY SAMPLING

Revision III

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Department of Environment and Natural Resources

Kelli Buscher, Administrator,
Surface Water Quality Program

Kent Woodmansey, Administrator,
Feedlot Permit Program

Jan 2016

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1.0 SURFACE WATER QUALITY PROGRAM AND FEEDLOT PERMIT PROGRAM DESCRIPTIONS

This document describes standard operating procedures for field water quality sampling for the Surface Water Quality Program (SWQP) and the Feedlot Permit Program (FPP).

The SWQP standards and monitoring section routinely monitors a network of South Dakota rivers and streams called the Water Quality Monitoring (WQM) network. In addition, the standards and monitoring team may collect water samples during Use Attainability Analyses (UAAs), fish kill investigations, complaint investigations, and special short-term monitoring projects. The surface water discharge permit section and the Feedlot Permit Program may also collect water quality samples during routine facility inspections, compliance sampling, and complaint investigations.

Environmental data collected by the SWQP and FPP may be used to determine 1) trends in water quality, 2) support of beneficial uses and water quality standards, 3) compliance with permit conditions, and/or 4) causes/sources of pollution. More information regarding SWQP and FPP sampling activities is available in the Quality Assurance Project Plan for the Surface Water Quality Program and Feedlot Permit Program (SWQ/FPP QAPP).

2.0 PRE-SAMPLING PROCEDURES

SWQP and FPP personnel conduct sampling work to meet a variety of goals/purposes. All sampling work requires pre-planning. During the planning stage, the scope of sampling to be performed is modified for the purpose of obtaining data necessary for meeting a specific and desired goal or purpose. Pre-planning procedures common to all sampling include the following:

1. Identify the objectives for sampling;
2. Review any existing data for the site/waterbody to be sampled;
3. Identify additional data requirements, including types of samples/characteristics and sampling frequency;
4. Examine maps and diagrams of the area/waterbody to be sampled;
5. Make a list of proposed sampling sites;
6. Check the operation of all required sampling equipment;
7. Load all required sampling equipment and obtain all required sample bottles, forms, documents, and field books;

A. Sample bottles may be obtained from the laboratory that will do the analysis

B. Deionized (DI) and "Polished" water may be obtained from the laboratory that will do the analysis.

8. Notify all stakeholders, including landowners, businesses, and city, state, federal, or tribal agencies;
9. Procure permission to access private property;
10. Perform reconnaissance (as necessary) of the proposed sampling sites and the general area/waterbody to be sampled;
11. Determine if the plan for sampling requires revision; and
12. Proceed with sampling activities.

3.0 DOCUMENTATION AND REPORTING

A. Documentation

Field recordkeeping activities are required. Recordkeeping is accomplished using either a field notebook or pre-printed project forms. It is recommended that all field notebooks and pre-preprinted project forms be waterproof. A standard format for field notebook recordkeeping is not required. All field records should include the following:

1. Field Notebook

a. Date and time;

b. Station ID (unique identification);

c. Station location (street number, avenue number, driving directions, WQM number, or GPS location);

d. Types of meters being used;

e. Meter calibration readings IF a meter calibration logbook is not kept with the meter (most meters will have an accompanying logbook for recording calibration activities);

f. Comments regarding any meter damage or difficulty in operation or calibration;

g. Weather conditions that could impact water quality (high wind, rainfall and runoff, temperature);

h. Velocity or discharge measurements (if flow measurements are taken);

i. The following field measurements are recorded for every sample site based on equipment used (if a measurement is not recorded, the rational should be stated in the notebook):

   i. air temperature;

   ii. water temperature;

   iii. pH;

   iv. specific conductance; and

   v. dissolved oxygen.

j. Fish size, length, species, and visual condition (if fish are collected);

k. Method of fish collection (net type, time and date set, length of stream segment, etc.);

l. Method of biological sample collection (net type, sampling equipment type, depth, etc.);

m. Discuss and identify all photographs;

n. Document site conditions/visual observations (riparian vegetation, bank and stream bottom, stream incision and definition, water appearance, flow, public access);

o. Document the name of any individual encountered during sampling and summarize the conversation along with any pertinent information.

2. Pre-printed project sheets

a. Completely fill out all applicable “blanks” on any pre-printed project forms;

b. All the information discussed in the section (1. Field Notebooks) must be gathered for each site.

3. Laboratory sheets

A SDDENR Water Quality Data Sheet (see SWQ/FPP QAPP) must be completely filled out and submitted with all laboratory samples. This provides the laboratory with information about the water sample and directs the laboratory on which analyses are requested.

4. Bottle labels

All bottles must be labeled prior to sample collection. At a minimum, the label must include the station identification, sample date, sample time, and bottle identification (Bottle "A"). The bottle will get wet, so ensure that bottle labels and marking pen are water resistant so the label stays affixed and the pen ink does not run.

B. Reporting

Data collected as a result of sampling is recorded in the following ways:

1. Recorded in appropriate database, hard copies of data are also maintained;
2. Recorded in reports;
3. Hard copies filed.

4.0 INSTRUMENT/EQUIPMENT CALIBRATION, CARE, AND OPERATION

Each field instrument must be inspected prior to use, calibrated, and operated according to manufacturer specifications. If problems with any field instrument are encountered, the user should consult the manufacturer's manual, the project manager, and/or call the manufacturer. Calibrations and instrument observations must be recorded in the calibration log book prior to field use.

General calibration procedures and necessary instrument inspections are presented below:

A. Dissolved Oxygen (DO) Meter - YSI 200

Inspect the DO membrane. It should be free of scratches, tarnish, and bubbles. Otherwise the membrane needs to be replaced and/or probe cleaned.

Make sure the sponge in the calibration chamber (Plastic Probe Holder) is moist. If the sponge is dry, wet it with water. Pour excess water out of the

calibration chamber and place over probe. Keep meter from extremes in temperature such as freezing and extreme heat (do not leave in vehicle!).

1. Turn meter on by pressing the Green Button. The display screen will read “ovEr"; this is a self-diagnostic test. Wait for meter readings to stabilize. Stabilization may take up to10 minutes.
2. Write the Date and Time in the meter’s calibration log book.
3. When the meter readings have stabilized Press the “CAL” button. Cal will appear in lower left of screen.
4. Meter prompts for mBar data. Arrow up or down to enter the correct Barometric pressure in mBars. (To get mBars data, use a smartphone or call the SWQP & FPP secretary and ask for the barometric pressure for your location. This can be found on the NOAA internet site, http://www.weather.gov/. When at this site enter the nearest Zip Code and press “Enter”. A weather report for that town with the current conditions will appear which includes the Barometric pressure in inches with the Barometric pressure in mBar following in parenthesis. Convert Barometric pressure from inches Hg to mBars (inches Hg x 33.85=mBars).
5. Press “Enter”. The meter should give you the DO in percent.

   Press “Mode” and you should have a salinity value of 0.0 ppt for deionized (DI) water. (If not 0.0, arrow up or down to 0.0).

   Press “Enter”. “Cal” will no longer be visible on the screen. Write the DO% and temperature in log book. The DO% will typically range between 80-120%. Values above 120% are suspect and the DO membrane should be inspected or changed, or the DO probe may need to be replaced.
6. The DO meter is calibrated and ready for use. Press the Mode key to toggle between DO percentage and ppm. SDDENR uses mg/L or ppm (which are equivalent units).
7. Place the DO probe in the water being measured. Take care that the probe is not placed in mud. Gently swirl the probe and allow the meter time to stabilize. Record the DO reading in mg/L or ppm in the field log book or pre-printed project sheets.
8. To clean the DO probe and replace the membrane, unscrew and discard the blue, black, or yellow membrane cap.
9. Rinse the probe with water. Wet the sandpaper disc provided in the tool kit with water and GENTLY polish the metal anode (only enough to the remove any tarnish). Repeat rinsing the probe.

10. Invert the blue, black, or yellow membrane cap and fill using the potassium chloride solution available in the tool kit. Thread the cap back onto the probe. It is ok for the potassium chloride solution to overspill. Ensure that there are no air bubbles trapped. If there are air bubbles visible, remove the cap, refill with potassium chloride solution, tap the cap to dislodge bubbles, and thread the cap onto the probe.

The YSI 200 DO meter calibration is based on barometric pressure. Recalibrate as often as necessary as the barometric pressure may change over time or distance.
Important: When collecting a DO measurement, the water must be moving past the DO probe at a speed of ½ foot per second to overcome oxygen consumption; otherwise, move the probe in a swirling motion to compensate!

B. pH Meter – YSI 100

Write date and time in the pH meter calibration log book. Connect pH and temperature probes to the meter. Inspect the buffer and electrode solutions for dirt or slime. Change out the buffer and electrode solutions as often as necessary to maintain clean solutions. Keep the meter from extremes in temperature such as freezing and extreme heat (do not leave in your vehicle). For typical field sampling a 2-point calibration is used. You should use calibration solutions that bracket the expected pH of the water you will be testing. If the pH is expected to be acidic, use pH 4.00 and pH 7.00 buffer solution. If the pH is expected to be neutral or basic, use pH 7.00 and pH 10.00 buffer solutions.

1. Turn the meter ON and unscrew the electrode storage solution.
2. Rinse the pH probe in distilled water.***
3. Place the probe in the 7 pH buffer solution.
4. Allow temp readings to stabilize.
   Then press and hold “STAND” for 3 seconds to calibrate.
5. “WAIT” flashes until the meter detects a stable reading. Then “SLOPE” will start flashing. This means the first point has been calibrated.
6. Rinse the pH probe in distilled water.***
7. Place the probe in the 10 pH buffer solution.
8. Allow temp readings to stabilize. Then press “SLOPE”.
9. “WAIT” flashes until the meter detects a stable reading. When the meter calibrates the second point it will beep twice. “STAND” and “SLOPE” display steady.

10. The meter is now dual point calibrated and ready for use.

When done sampling rinse the pH probe with distilled water.***
If taking more than one sample rinse the probe between samples.

Turn meter OFF and return probe to electrode storage solution.

***Failure to rinse probe contaminates pH buffer and electrode storage solution which leads to poor calibration and data!

C. Conductivity Meter – YSI

Write the date and time in the conductivity meter calibration log book. Keep the meter from extremes in temperature such as freezing and extreme heat (do not leave in your vehicle).

1. Turn the instrument on and allow it to complete its self-test procedure.
2. Place at least 3 inches of conductivity calibration solution in clean beaker.
3. Insert the probe into the beaker deep enough to completely cover the oval shaped hole on the side of the probe.

a. DO NOT rest the probe on the bottom of the container - suspend it off the bottom at least ¼ inches.

4. Press the “MODE” button until the instrument is reading specific conductance.
5. Allow at least 60 Seconds for the temperature reading to become stable.

a. Swirl the probe to dislodge any air bubbles from the electrode.

6. Press and release both the UP arrow and DOWN arrow buttons at the same time to enter the calibration mode.
7. Use the UP arrow or DOWN arrow key to adjust the reading on the display until it matches the value of the calibration solution you are using.
8. Once this display reads the exact value of calibration solution being used (the instrument will make the appropriate compensation for temperature variation from 25°C), press the “ENTER” key. The word “SAVE” will flash across the display for a second indicating that the calibration has been accepted.
9. Record the calibration information in the calibration log book.

10. Rinse the probe with water. The meter is calibrated and now ready for use.

11. Place the specific conductance probe in the water being measured. Ensure the probe is not placed in the mud. Allow adequate time for the meter to stabilize. Record the specific conductance value in the field log book or on pre-printed project sheets.

D. Multimeter – YSI 556

Write the date and time in the multimeter calibration log book. The meter should always stay connected to the probe bulkhead. Use fresh calibration solutions with each calibration. Keep the meter from extremes in temperature such as freezing and extreme heat (do not leave in your vehicle).

Accessing the Calibration Screen

1. Press the “ON/OFF” button to display the run screen.
2. Press the “Escape” button to display the main menu screen.
3. Use the arrow keys to highlight the Calibrate selection.
4. Press the “ENTER” button. The calibration screen will be displayed.

Specific Conductance Calibration

This procedure calibrates specific conductance (recommended), conductivity and salinity. Calibrating any conductivity option automatically calibrates the other two options. The specific conductance calibration affects calibration of other parameters and should always be completed first.

1. From the calibration screen, use the arrow keys to highlight the Conductivity selection.
2. Press “ENTER”. The conductivity calibration selection screen is displayed.
3. Use the arrow keys to highlight the Specific Conductance selection.
4. Press “ENTER”. The Conductivity Calibration Entry Screen is displayed.
5. Place a small amount of conductivity solution in the calibration cup. Thread the calibration cup onto the bulkhead and gently swirl to rinse. Discard the used solution.
6. Fill the calibration cup about ¾ full of conductivity solution. If possible, the conductivity standard should be within the same range

as the samples you plan to measure. Conductivity solution is prepared for SDDENR by the Department of Health Laboratory.

7. Carefully immerse the sensor end of the probe module into the solution. Thread the calibration cup onto the bulkhead. Gently swirl to remove any bubbles from the conductivity cell. The sensor must be completely immersed past its vent hole.
8. Use the keypad to enter the calibration value of the standard you are using. The last value used will automatically appear on the screen.
9. Press “ENTER”. The Conductivity Calibration Screen is displayed.
10. Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
11. Observe the reading under Specific Conductance. When the reading shows no significant change for approximately 30 seconds, press “ENTER”. The screen will indicate that the calibration has been accepted and prompt you to press “ENTER” again to continue.
12. Press “ENTER.” If you fail to press “ENTER” the second time, specific conductance will not calibrate. You will be returned to the Conductivity Calibrate Selection Screen.
13. Press “Escape” to return to the calibrate menu.
14. Rinse the probe sensors.

pH Calibration

1. In the calibration menu, use the arrow keys to highlight the pH selection.
2. Press “ENTER.” The pH calibration screen will be displayed.
3. Select the 1-point option only if you are adjusting a previous calibration. If a 2-point or 3-point calibration has been performed previously, you can adjust the calibration by carrying out a one point calibration. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select only one pH buffer.
4. Select the 2-point option to calibrate the pH sensor using only two calibration standards. Use this option if the media being monitored is known to be either basic or acidic. Use two buffers that bracket the expected pH of the media. **You will typically do a 2-point calibration.**
5. Select the 3-point option to calibrate the pH sensor using three calibration solutions. In this procedure, the pH sensor is calibrated with a pH 7 buffer and two additional buffers. The 3-point calibration method assures maximum accuracy when the pH of the media to be monitored cannot be anticipated. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select a third pH buffer.
6. Use the arrow keys to highlight the 2-point selection.
7. Press “ENTER.” The pH entry screen will be displayed.
8. Starting with the lowest pH buffer, pour a small amount of the buffer solution into the calibration cup, thread the calibration cup onto the bulkhead and gently shake to thoroughly rinse the cup and probe. Discard the buffer solution. This buffer is used as a rinse at this step.
9. Fill the calibration cup about half full with the lowest pH buffer solution (pH 4.00 or 7.00). Thread the calibration cup onto the bulkhead. Ensure that there is enough solution that the glass ball on the pH probe is submerged.
10. Gently swirl the probe to remove any bubbles from the pH sensor and to ensure good contact between the pH probe and buffer solution.
11. Use the keypad to enter the value of the buffer (pH 4.00 or 7.00) you are using at the current temperature.
12. Press “ENTER.” The pH calibration screen is displayed.

13. Allow the temperature to stabilize before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
14. Observe the reading under pH, when the reading shows no significant change for approximately 30 seconds, press “ENTER”. The screen will indicate that the calibration has been accepted and prompt you to press “ENTER” again to continue.
15. Press “ENTER”. This returns you to the specified pH calibration screen.
16. Rinse the probe module, transport/calibration cup and sensors in tap or purified water and dry.
17. Repeat steps 5 through 13 above using the second pH buffer (pH 7.00 or 10.00).
18. Press “ENTER”. This returns you to the pH calibration screen.
19. Press “Escape” to return to the calibrate menu.
20. Rinse the probe module and sensors in tap or purified water.
21. To clean the pH probe, place dilute hydrochloric acid solution (10 to 20% - you may need to mix the solution in-house) in the calibration cup for approximately 10 minutes. Using a bottle brush, GENTLY brush the glass probe to dislodge any accumulated debris. Thoroughly rinse with water and calibrate prior to use.

Dissolved Oxygen Calibration

Important: The instrument must be powered on for at least 20 minutes to polarize the DO sensor before calibrating.

1. In the calibration screen, use the arrow keys to highlight the Dissolved Oxygen selection.
2. Press “ENTER”. The dissolved oxygen calibration screen will be displayed.
3. Use the arrow keys to highlight the DO% selection.
4. Press “ENTER.” The DO Barometric Pressure Entry Screen will be displayed.
5. Place approximately 1/4 inch of water in the bottom of the transport/calibration cup.
6. Place the sensor module into the transport/calibration cup. Make sure that the DO sensor is not submerged in the water.

7. Engage only 1 or 2 threads of the transport/calibration cup to ensure the DO sensor is vented to the atmosphere. This is necessary to replenish oxygen as the probe consumes it.

8. Press “ENTER”. The DO% saturation calibration screen will be displayed.

9. Allow sufficient time for the air in the transport/calibration cup to become water saturated and for the temperature to reach equilibrium before proceeding. The current values of the all enabled sensors will appear on the screen and will change with time as they stabilize.

10. Observe the reading under DO%. When the reading shows no significant change for approximately 30 seconds, press “ENTER”. The screen will indicate that the calibration has been accepted and prompt you to press “ENTER” again to continue.

    Important: If you do not press “ENTER” the second time the DO will not be calibrated.

11. Press “ENTER”. This returns you to the DO calibration screen.

12. Press “Escape” to return to the calibration menu and rinse the sensors.

13. To clean the DO probe and replace the membrane, unscrew and discard the blue, black, or yellow membrane cap.

14. Rinse the probe with water. Wet the sandpaper disc provided in the tool kit with water and GENTLY polish the metal anode (only enough to the remove any tarnish). Repeat rinsing the probe.

15. Fill the blue, black, or yellow membrane cap using the potassium chloride solution available in the tool kit. Thread the cap back onto the probe. It is ok for the potassium chloride solution to overspill. Ensure that there are no air bubbles trapped. If there are air bubbles visible, remove the cap, refill with potassium chloride solution, tap the cap to dislodge bubbles, and thread the cap onto the probe. Recalibrate prior to use.

Taking a Measurement

After calibrating all parameters, the YSI 556 is now ready for use. To take a water quality measurement:

1. Press “Escape” to return to the Run Menu or arrow up or down to highlight “Run” on the main screen menu.

2. Place the sensors into the water. Take care to ensure the sensors are not placed in mud and that the flow of water is sufficient to

overcome oxygen consumption by the DO probe (swirl the probe in the water if flow is inadequate).

3. Allow the meter sufficient time to stabilize. You may electronically record the measurements by pressing "ENTER." This will store the measurement in a data file in the YSI 556. Manually record the measurements in the field log book or on pre-printed project sheets. If a water quality sample is also being submitted, record the measurement information on the lab sheet.

E. Flow meter – SonTek FlowTracker

This flow meter is used to calculate stream flow or discharge. This meter uses sonar to detect water velocity. The operator inputs the location (on the tape line) and depth so the unit may calculate discharge. For best results and to reduce errors, select an area of the stream with minimal water turbulence and minimal underwater obstacles (rocks, algae, plants). A slow moving segment of the stream with a flat bottom is ideal. Take care not to disturb sediment on the bottom of the stream bed as this will cause sonar errors. Refer to Figure 1.

1. Attach the sonar probe to the wading rod and tighten the set screw.
2. Set up a tape line. While standing in the water facing downstream, the "right bank" is on your right side. This is the side where you will start.
3. On the right bank, use a stake to place the start of the tape line. Stake the tape line high enough up the bank so that the tape does not get swept by the stream and place in soil secure enough so that the line may be taunt.
4. Cross the stream to the left bank allowing tape to reel out. Secure the end of the tape line to the left bank with a stake. Note the measurement of the tapeline at the edge of the left bank. Subtract the measurement of the starting edge on the right bank to determine the stream width. It is ideal to measure 10 to 20 stations (locations) at equal intervals so that no more than 10% of stream discharge is represented at any one stream location. This may not be possible on very narrow streams. At a minimum, measurements may be made every 3 inches. For example, the tape line measures 6.5 feet at the right bank shore and 32 feet at the left bank shore. Subtracting 6.5 from 32 results in a stream width of 25.5 feet. In order to prevent greater than 10% stream discharge in any one stream location, at least 10 stations should be the measured. 25.5 feet divided by 10 stations would result in increments of 2.5 feet. However to prevent greater than 10% discharge in any one station

measurement, increments of 1.5 or 2 feet may be more appropriate. Determine the station intervals based on stream width.

5. Turn on the FlowTracker meter. The startup screen will appear.
6. Press the “ENTER” button. The Main Menu will display.
7. Press the “3” button to start the data run. This will take you to the data file name screen.
8. Press the “1” button to input the station name (StationID if it fits). Input a unique name. The name can only be 8 characters maximum, so you may need to abbreviate. Press the “ENTER” button once the name is input.
9. Press the “9” button to accept the name.
10. Press the “9” button again to start the data run. At this time the display message will read “Press QC Menu at any time for Gauge data Enter to continue.” Press “ENTER.”
11. The Automatic QC Test will appear. A QC test must be conducted once each day that the flow meter is used. Press “1” to run test or “2” to skip the test. If running the test, a message will display to “Put probe in moving water away from any underwater objects. Press enter to start.” Following those instructions, place the probe/wading rod in the water so that the direction of the flowing water is perpendicular to the direction of the sonar. Make sure there are no underwater objects such as plants, rocks, or debris. Hold the probe/wading rod still and upright. Press the “ENTER” button. The meter will begin a self-diagnostic QC test. Only proceed if the QC test passes.
12. The Starting Edge screen will appear. At the right bank, locate the measurement on the tapeline of the edge of the water. Press the blue “Set Location” button and use the numeric keys to enter the measurement of the tapeline at the edge of the water.
13. Press the gray “Next Station” button. This will take you to Station 1 – which correlates with the location on the tape line. The location of Station 1 may need to be adjusted based on the stream width. The first station (Station 1) and the last station measured on the left bank must be half the interval of the rest of the stations. This is to accommodate for slope of the stream from the stream edge to the first and last station. To adjust the location of Station 1, Press the blue “Set Location” button and manually enter the appropriate location. Go to that location on the tape line.

14. Press the blue “Set Depth” button and use the numeric keys to enter the depth of the water based on the stream depth measurement on the wading rod at Station 1.

15. Holding the meter still and upright, press the blue “Measure” button. The meter will begin taking measurements or “pings.” If there are any errors, correct the source of the error if possible and repeat the measurement. It may take several attempts per station. Press “1” to accept the measurement or “2” to repeat the measurement.

16. Once you accept the measurement, the meter will go to Station 2 and so forth. At each station, you must verify you are at the appropriate location on the tape line and enter the appropriate depth based on the measurement on the wading rod.

17. After the last station has been recorded, press the gray “End Section” button. The screen will display a prompt to press “End Section” again to end the section. The Ending Edge screen will display. Press the blue “Set Location” button and key in the corresponding location of the left edge on the tapeline.

18. Press the gray “Calculate Disch.” button. The screen will display a prompt to press the Calculate Discharge button again to confirm. Press the “Calculate Disch.” button again.

19. The meter will display information. Press the “Enter” button to continue viewing data. Press the “0” button to exit. Important: After viewing the data, you must press the “0” button to exit in order for your data to be saved.

20. Record the flow discharge measurement in cubic feet per second in the field log book or pre-printed project sheet.

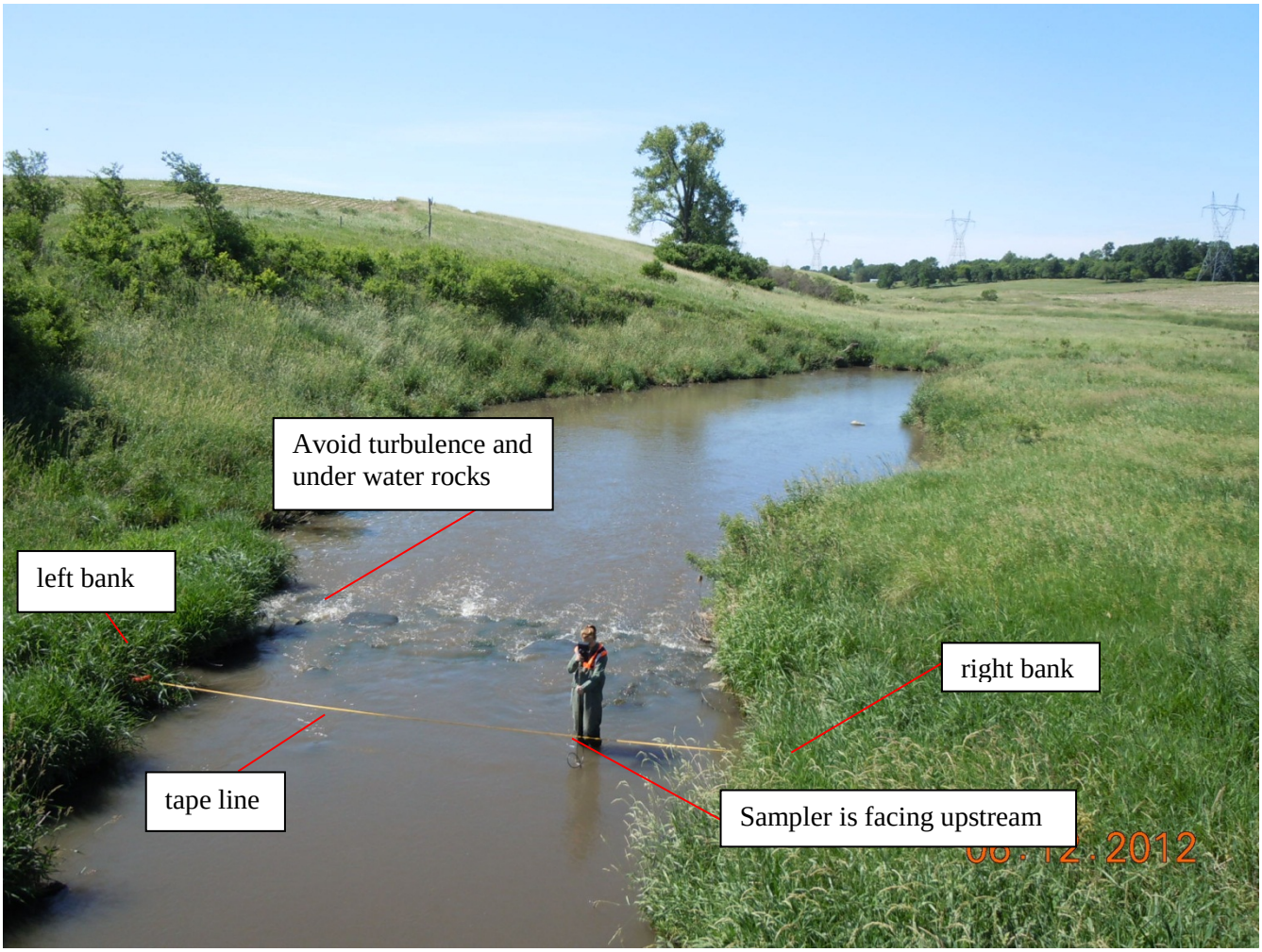


Figure 1. Taking a flow measurement with SonTek FlowTracker.

F. Van Dorn sampler

The Van Dorn sampler may be used to collect water from a lake or wetland. It may be used to collect a grab sample at a specified depth or a composite sample at multiple depths (surface, middle, and bottom). Rinse the sampling apparatus thoroughly with water from the sampling site prior to collection of samples. Surface samples should be collected approximately 1 meter below the surface of the water. Bottom samples should be collected from 0.5 meter above the lake bottom. Care must be taken not to come in contact with the lake bottom, as this may result in suspended bottom sediment in the sampler. Refer to Figure 2.

1. Make sure the pin release mechanism is in good working order.

2. Press down the pin release and pull plunger from the end nearest the trip release and hook the cable loop of the plunger into the appropriate slot in the pin release mechanism.
3. Release the pin release and ensure the cable loop is completely around the pin (not pinched by the pin).
4. Pull the plunger and cable from the opposite end and hook the cable loop to the opposite pin on the pin release. The Van Dorn sampler is now ready to be used to collect a water sample.
5. Lower the sampler into the water and stop the sampler at the appropriate depth. Send the messenger down the line to trip the sampler.
6. Pull the filled sampler up from the lake. When the bottom sample is collected, check for an excessive amount of bottom sediment or turbidity. If the sample appears turbid, discard the sample and repeat steps 2 through 6.
7. Once the sample is acquired, fill the sample bottles appropriately.
8. Before lengthy storage, rinse the Van Dorn sampler with distilled water.

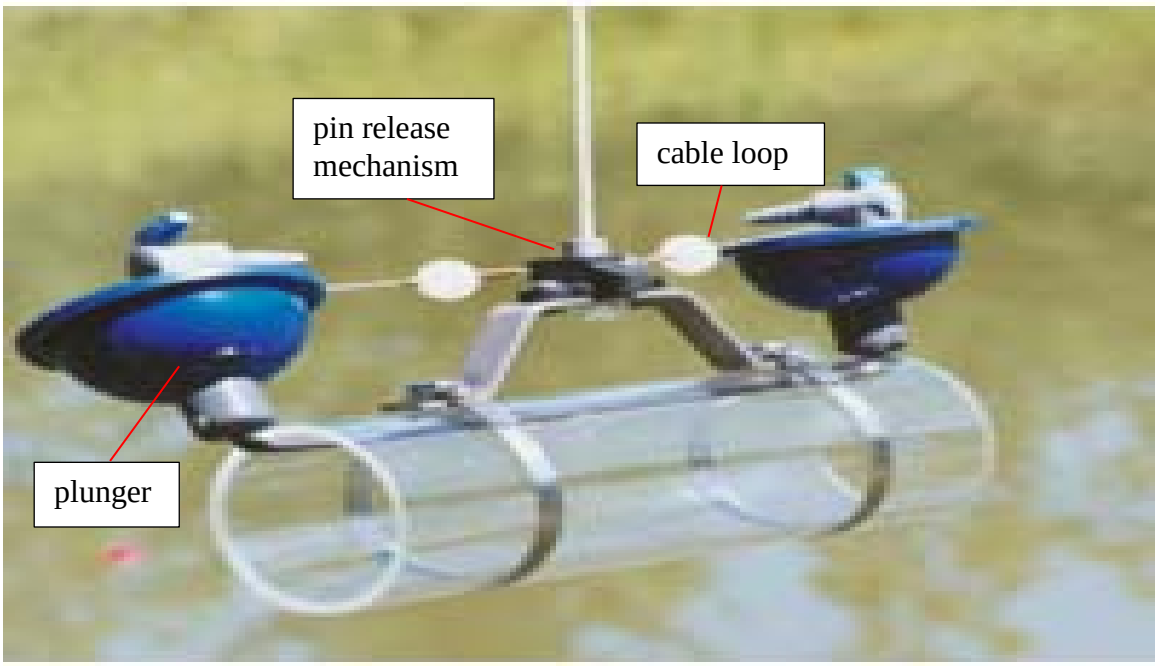


Figure 2. Van Dorn sampler.

5.0 LABORATORY SHEETS AND CHAIN-OF-CUSTODY

The majority of samples collected for ambient monitoring, fish kills, complaints, and other sampling projects do not need complete custody documentation. However, under certain conditions, such as compliance investigations, SDDENR must be able to prove that any analytical data offered into evidence accurately represent environmental conditions existing at the time of sample collection. Due to the evidentiary nature of such samples, possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. It must be clearly demonstrated that none of the involved samples could have been tampered with during collection, transfer, storage, or analysis. SDDENR chain-of-custody protocols and procedures are described below.

Documentation

To maintain and document sample possession, the following chain-of-custody procedures are followed:

1. Sample Custody - A sample is under custody under one of the following conditions:

    a. It is in your direct possession (you are holding it).

    b. It is in your direct line-of-sight after being in your possession (you can see it).

    c. It was in your possession; you locked it up or placed it in a sealed container to prevent tampering (no one can access the sample without leaving evidence of access, e.g. seal broken, tape removed, etc.).

    d. It is in a designated, secure area (typical evidence holding area).

Field Custody

1. The project officer will advise laboratory personnel that a sample requiring chain-of-custody will be collected and will specify the approximate date and time that it will arrive at the laboratory. In instances where date and time are not known in advance of a field trip, the laboratory should be notified as soon as possible about the arrival of such samples.
2. The samples must be collected in accordance with required and established methods set forth in this SOP, the Quality Assurance Project Plan (SWQ/FPP QAPP), and 40 CFR Part 136 (or other applicable section).

Transfer of Custody

1. To establish the documentation necessary to trace sample possession, a Chain-of-Custody Record (refer to SWQ/FPP QAPP) must be filled out and accompany each set of samples. The record should accompany the water quality data form and the samples to the laboratory. This record tracks sample custody transfers between the sampler and laboratory analysts. At a minimum, the record should contain:

    a. The StationID or sample identification;

    b. The signature of the collector and witnesses when present;

    c. The date and time of collection; place and address of collection;

    d. Substances sampled;

    e. Signatures of persons involved in the chain of possession; and, inclusive dates of possession.

All chemical water samples collected using this SOP utilize the SDDENR Water Quality Data Sheet (commonly referred to as the lab sheet), Fish Flesh Chain of Custody, or the SDDENR Chain of Custody form (refer to SWQ/FPP QAPP for all forms) as the laboratory data sheet and chain-of-custody document. When properly signed by all affected personnel, the SDDENR Water Quality Data Sheet and Fish Flesh forms comply with chain of custody requirements. The separate SDDENR Chain of Custody form is not additionally required. The SDDENR Chain of Custody form will only be used in special circumstances or in times when the other forms are not appropriate for the sample.

2. Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis. The samples for each shipping container shall be placed in the large plastic bags provided by the laboratory.

3. If samples are split with a source or government agency, it will be noted in the remarks section of the Chain-of-Custody Record. The note should indicate with whom the samples are being split and be signed by both the sampler and recipient.

4. Each transfer of sample custody must be documented on the Chain-of-Custody Record.

5. The Chain-of-Custody Record identifying its contents will accompany all shipments. The original record will accompany the shipment, and the project officer will retain a copy and place it in the project file.

6. The laboratory should have assigned laboratory custodians who are responsible for overseeing the reception of all controlled custody samples.

7. When the samples are not in the immediate possession of the individual having official custody, they must be kept in a locked enclosure.

8. After the laboratory has completed the sample analysis, the Water Quality Data form and the Chain-of-Custody record will be returned to the appropriate program. These items will be kept on file for at least five years. Access to the Chain-of-Custody file is limited to program personnel.

Delivery or Shipment of Samples

Samples must be packed in coolers on loose ice for shipment or delivery to the laboratory. You must include appropriate paperwork. Make sure the container does not leak and all shipping or delivery labels are legible. Generally, samples need to be chilled to less than 6^{o} Celsius. Make sure there is adequate ice in the cooler to keep samples chilled during transit.

1. Completely fill out a SDDENR Water Quality Data Sheet (see SWQ/FPP QAPP) for each sample station.

2. If the samples are being shipped or sent with the courier, place all sample containers in a large plastic bag. Add loose ice to the bag and tie closed. Place the bag inside the shipping cooler.

3. Make sure that all SDDENR Water Quality Data Sheets are filled out completely. Protect the documents from getting wet by placing them in a plastic bag and putting them in the shipping cooler.

4. Securely seal the cooler with packing tape.

5. Shipping coolers are shipped via mail (USPS, FedEx, etc.), delivered by the courier, or delivered by the sampler to the appropriate laboratory.

6.0 QUALITY ASSURANCE

General Information and Handling Procedures

This section is supplemental to quality activities and requirements outlined in the SWQ/FPP QAPP. Refer to the SWQ/FPP QAPP for specific information on data quality objectives, quality activities, and corrective actions.

1. If several locations are to be sampled during one sample run, which includes both clean and polluted sites, sampling should progress from the clean areas to the polluted areas. This lessens the chance of unintentional contamination of cleaner samples through the use of contaminated sampling equipment (waders, meters).
2. Sampling equipment (meters, graduated cylinders, field bottles, etc.) should be triple rinsed with water from the waterbody being sampled prior to collecting the water sample.
3. The sample container and preservation must be appropriate to the sampled parameter. See figures 3, 5, and 6.
4. A regular schedule of calibration of field instrumentation must be followed. The field instrument calibration frequency is outlined in the SWQ/FPP QAPP. The calibration process is necessary to ensure that the instrument is working properly and within the range of acceptance as determined by the manufacturer. All instrumentation used in field activities must be calibrated prior to field use and as often as necessary thereafter, according to manufacturer instructions. All calibrations must be recorded in the meter's calibration log book.
5. In those instances where field equipment cannot be calibrated or is not functioning properly, the sampler will attempt to repair the affected equipment in the field. For field meters that are assigned to individuals, such as regional staff, that person is responsible for the maintenance and repair of their own equipment. For field meters that are not assigned to individuals and are available for general use, the SWQP designated sampler is responsible for maintenance and repair. The SWQP designated sampler is also responsible for ordering parts or service for all SWQP field equipment. The SWQP designated sampler is identified in the SWQ/FPP QAPP.
6. All SWQP field equipment will be examined for maintenance/repair recommendations and checked for proper operation by the SWQP designated sampler; this information is recorded in the calibration logbook. Any necessary maintenance will be performed immediately to assure instrumentation is in operating condition prior to the next use.

7.0 LABORATORY ANALYTICAL METHODS

Per Surface Water Quality Standards, tests or analytical procedures to determine conformity with surface water quality standards will be made in accordance with methods approved in 40 CFR Part 136. It is the responsibility of the project officer to specify and ensure that the laboratory uses approved analytical methods listed in 40 CFR Part 136 for all SWQP water quality samples.

8.0 SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Appropriate sample containers, preservation techniques, and holding times for water quality samples are listed in 40 CFR Part 136. It is the responsibility of the project officer to ensure that the appropriate sample containers and preservation techniques are used during sample collection. It is the responsibility of the laboratory manager to ensure that the water quality sample is analyzed within the appropriate holding time. However, the project officer should verify that the holding time was met as a part of standard quality control practices (see SWQ/FPP QAPP).

In addition to sample container, preservation, and holding time information, 40 CFR Part 136 places additional requirements on some tests in the form of footnotes. These footnotes are important and are a required step in achieving meaningful results.

Figure 3 displays common test parameter suites used by the SWQP and FPP, and the appropriate container type, preservation requirement, and maximum holding time for the parameter with the shortest holding time in that bottle. For individual parameter holding times, refer to 40 CFR 146. As appropriate, footnotes are included and their action described at the bottom of the table.

Figure 3. Sample Parameter Suites and Information

Bottle		Size & Material	Preservative	Parameters	Holding Time[4]
A	DOH	1000 mL HDPE	Cool to 6°C	Alkalinity, total solids, TSS, volatile solids, TDS, BOD, CBOD, CO_3,Hardness, K, lab pH, lab conductivity, nitrate, chloride, fluoride, HCO_3, SO_4	48 hours
	Midco	1000 mL polypropylene			
B	DOH	1000 mL HDPE	2 mL H_2SO_4 pH <2 Cool to 6°C	Ammonia, Nitrite+Nitrate, TKN, Total P, COD	28 days
	Midco	500 mL polypropylene			
C	DOH	100 mL sterilized polystyrene	Na_2SO_3 if chlorinated Cool to 6°C	Fecal coliform, *E coli*, total coliform, enterococci, fecal PFG	6 hours[1]
	Midco	100 mL sterilized polystyrene			
D	DOH	100 mL polystyrene	Field filter 0.25 mL H_2SO_4 pH <2 Cool to 6°C	Dissolved P, dissolved inorganic nitrogen	28 days
	Midco	250 mL polypropylene			
Metals – Dissolved	DOH	100 mL polystyrene	Field filter 0.25 mL HNO_3 pH <2 Cool to 6°C	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Cu, Hg, Pb, Mg, Mn, Ni, Se, Ag, Na, Ti, U, Vn, Zn, Fe, Mo, fluoride, K, Cl, silica	28 days
	Midco	250 mL polypropylene			
Metals – Total Recov	DOH	100 mL polystyrene	0.25 mL HNO_3 pH <2 Cool to 6°C	Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Cu, Hg, Pb, Mg, Mn, Ni, Se, Ag, Na, Ti, U, Vn, Zn, Fe, Mo	28 days
	Midco	250 mL polypropylene			
Oil & Grease	all	1000 mL amber glass	2 mL HCl pH <2 Cool to 6°C	Oil & Grease	28 days
R	all	1 gal cubitainer polypropylene	Cool to 6°C	Radium-226, radium-228	6 months
CN	DOH	250 mL polypropylene	NaOH pH>10 Cool to 6°C	Total cyanide, WAD cyanide *Mitigate interferences as described in 40 CFR136	48 hours[2]
	Midco	150 mL brown polypropylene			
H	all	1000 mL amber glass	Cool to 6°C	TPH – diesel, caffeine	14 days[3]
V	DOH	40 mL amber glass vial	Cool to 6°C	VOC, TOC, DOC, TPH -gasoline	14 days[3]
	Midco	250 mL amber glass			

If you need to sample for an analyte that is not on this list – contact the laboratory for bottle, preservation, and holding time information.

[1]The holding time for bottle C parameters is 6 hours for compliance samples. Noncompliance samples must be analyzed within 24 hours of collection. [2]The maximum holding time for total and WAD cyanide is 14 days as long as all interferences have been mitigated as described in 40 CFR 136. If interferences are unknown the maximum holding time is 6 hours. 40 CFR 136 may be viewed at http://www.ecfr.gov. [3]The holding time for bottles H and V is 14 days from the time of collection to laboratory extraction. [4]Maximum holding time is based on the analyte with the shortest hold time.

9.0 DECONTAMINATION OF SAMPLE CONTAINERS AND SAMPLING EQUIPMENT

The laboratory will provide new, clean containers or decontaminate previously used sample containers. Sample container decontamination by the laboratory involves detergent washing, rinsing with dilute chromic acid and final rinsing with laboratory-grade distilled water. Decontamination of sampling equipment (probes and instruments) will be accomplished through the use of distilled water by field personnel.

Field personnel do not need to triple rinse clean bottles supplied by the laboratory. However when a field sampler uses a field bottle to collect a sample then transports it to another container, the field bottle must be triple rinsed with the water being sampled prior to filling.

10.0 PROCEDURES FOR SURFACE WATER SAMPLING

A. Field Observations

Comments and observations regarding the weather and sampling site information must be recorded. It is important to record all field observations of conditions at the sampling sites that could influence the water quality of the collected sample. These observations are recorded on pre-printed project sheets or a field log book. Examples of observations recorded under COMMENTS could include: "cloudy, heavy recent rainfall, windy, cattle grazing near sampling site, dense emergent aquatic vegetation present at sampling site, etc."

In addition to comments, specific observations should be recorded on the field data sheets as follows:

Flow	Record in cubic feet per second (CFS)
Air Temperature	Record in degrees Celsius
Specific Conductance	Record in umho/cm
Dissolved Oxygen	Record in milligrams per Liter (mg/L)
Field pH	Record in standard units (su)
Water Temperature	Record in degrees Celsius
Secchi	Record in meters

B. Field Analyses

Calibrate all instruments prior to field use as described in Section 4.0. Record all field analysis data on pre-printed project sheets or field log notebook.

1. pH, DO, and specific conductance
   a. If water is static, provide stirring by gently and continuously agitating the probe.
   b. Allow sufficient time for the probe to stabilize.
   c. Record data in the field log book or on the pre-printed project sheet.

2. Temperature
   a. Air Temperature
      i. Always collect air temperature readings out of direct sunlight (record in °C).

   b. Water Temperature
      i. Water temperature may be measured using a bimetal thermometer or field meter. Do not use a mercury thermometer for field measurements due to the risk of breaking the thermometer and releasing mercury into the environment.
      ii. Place the thermometer into the stream and provide stirring or gentle agitation.
      iii. If you are unable to collect temperature directly from the waterbody, collect water in a field bottle and measure temperature as soon as possible.
      iv. Allow sufficient time for the thermometer to stabilize.
      v. Read the temperature (record in °C).

3. Total Depth and Width
   a. Record total depth at the maximum cross sectional depth (record in feet).
   b. Record width as an average distance between banks (record in feet).

4. Secchi Depth
   a. Lower the Secchi disk with calibrated rope into the waterbody from the shaded side of the boat.
   b. Drop the Secchi down until it is no longer visible.
   c. Bring the Secchi up until you can just barely make out the cross pattern.
   d. Record the depth of the Secchi Disk in meters.

Repeat the above procedure and average the two readings for the final Secchi depth reading.

5. Flow (SonTek)
   a. Calibrate and operate the meter using methods found in Section 4.0 of this manual.
   b. Record the stream discharge in cubic feet per second.

C. Sample Collection

The types of samples collected during sampling activities depend on the parameters that are necessary for the project. Sample parameters must be determined prior to conducting sampling activities. This will ensure that samples are adequately collected, handled, preserved, and that the sampling will address the project objectives. Figure 3 displays the parameter groupings, preservation requirements, and bottle type and size information used by the SWQP and FPP. Figures 5 and 6 are depictions of bottle information and preservation requirements. Figure 4 is a depiction of the disposable filters used to field filter water samples.

In the event a sample needs to be collected and the necessary information is not contained in Figure 3, refer to 40 CFR 136 or other appropriate chapter for approved methods and information.

When collecting a water sample from a river, stream, lake, or wetland, follow these basic principles:

1. Use the appropriate sample bottle as directed in Figure 3. Affix a waterproof label that contains the station identification, sample date, and bottle identification.
2. If sampling a wadeable waterbody, wade into the waterbody to collect the sample. It is only acceptable to use a bucket from a bridge to collect a sample if it is unsafe to wade into the waterbody. Do not endanger yourself by wading into a waterbody with unsafe conditions (ice jams, high flows, etc.). Wade into the thalweg or deepest part of the channel to collect the sample.
3. If sampling a non-wadeable waterbody, access the waterbody by boat, boat dock, or by wading along the shore if possible.
4. Face upstream or into the flow when collecting a sample. Remove the bottle lid and submerge the bottle beneath the surface of the water taking care not to disturb the bottom sediment. It is imperative that surface debris or bottom sediment do not enter the bottle. After filling

the bottle, secure the bottle lid. Preserve according to Figure 3 and place in a cooler of loose ice (even during winter months).

5. If the bottle is pre-preserved, do not overfill the bottle or rinse the bottle prior to filling.

6. If using a field bottle to collect a sample that will be field filtered (dissolved phosphorus or dissolved metals), make sure you triple rinse the field bottle with water from the waterbody being sampled before filling the bottle.

7. For samples that require field filtering, use 45 micron disposable filters. See Figure 4 below. Attach the tube from the hand vacuum pump to the vacuum port on the disposable filter. Remove the filter lid to the filter apparatus and pour an appropriate amount of water into the top of the filter apparatus. Pump the hand vacuum to create negative pressure in the filter apparatus. This will result in water being vacuumed through the 45 micron filter into the receiving bottle. Field filtering must be done on site within 15 minutes of sample collection.

8. Preserve the sample as directed in Figure 3 immediately after sample collection and chemical preservation. If you are unfamiliar with the buffer capacity of the water being sampled (feedlot waste, point source discharges, mining wastewater, etc., may be highly buffered), make sure you verify the pH with pH paper to make sure enough preservative has been added. Place all samples in a cooler with loose ice immediately.



Figure 4. Disposable Filter Apparatus

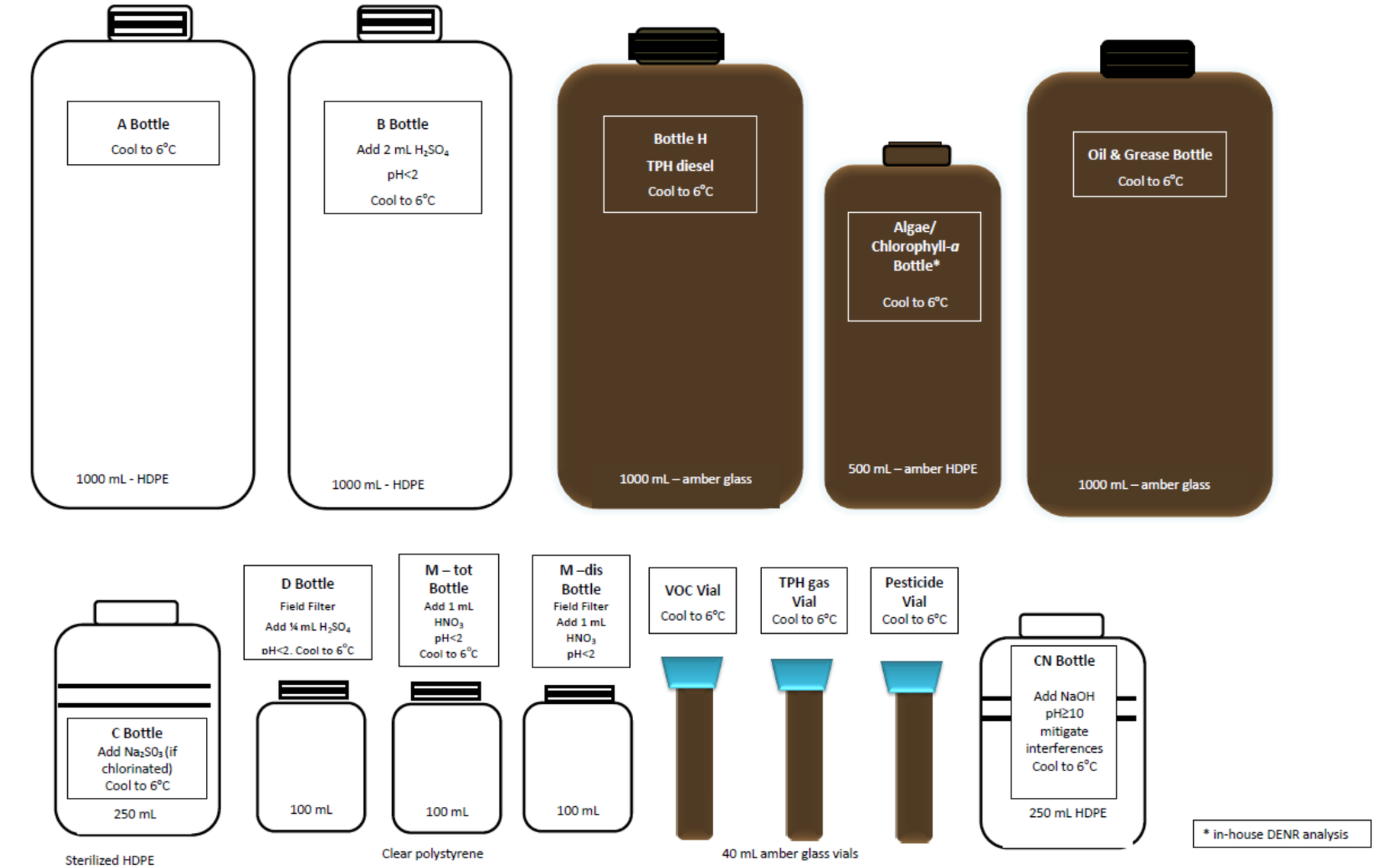


Figure 5. Sample Bottles for DOH laboratory.

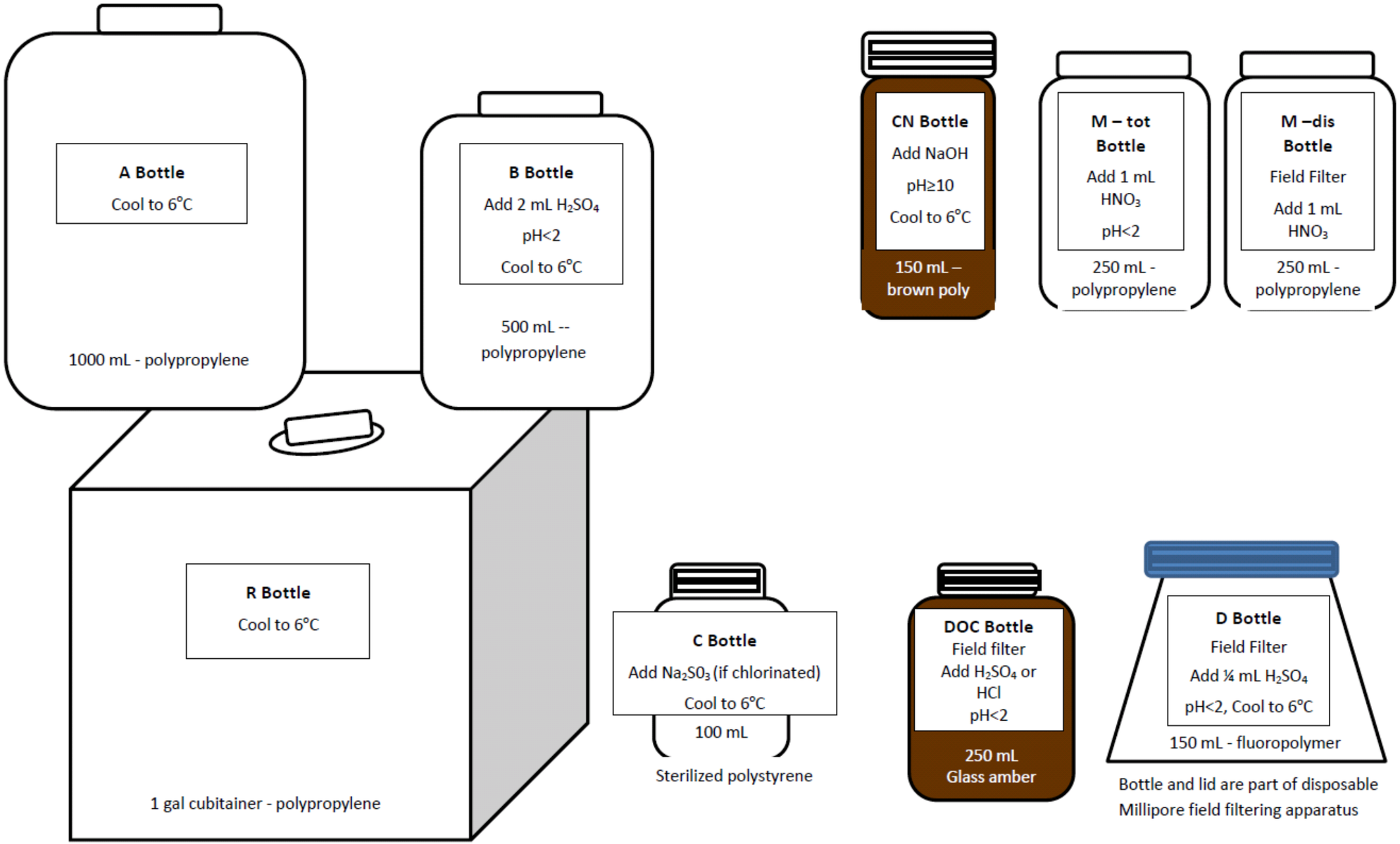


Figure 6. Sample Bottles for Midcontinent laboratory

1. Grab Sampling

Collecting a Sample

Be careful not to contaminate the inside of the lid or mouth of the bottle with your fingers or introduce other sources of contamination.

a. The "A" bottle –one liter bottle

i. Position the open end of the bottle towards the current flow and away from the hand of the collector.

ii. Grasp the bottle securely at the base with one hand and plunge the bottle down into the water to avoid introducing surface scum. The sampling depth should be 6 inches to 1 foot below the water surface, if possible.

iii. Tip the bottle slightly upward to allow air to escape and the bottle to fill.

iv. The "A" sample bottle should be filled to the neck of the bottle and capped immediately.

v. Place sample container in a cooler on loose ice (6°C), no preservative is required for bottle “A.”

vi. Mail or deliver the “A” bottle to the laboratory.

b. The "B" bottle –one liter bottle

Follow collection procedures for filling bottle “A” to fill bottle "B." Preserve the sample using the following procedure below.

i. After the sample has been collected, **preserve this sample with 2 mL of concentrated sulfuric acid (H_2SO_4)** to lower the pH of the sample below 2 standard units. As necessary, use pH paper to verify the pH has been lowered to <2.

ii. After H_2SO_4 has been added, the sample bottle is inverted several times to ensure mixing of the preservative throughout the sample.

iii. Place sample container in a cooler on loose ice (6°C) for shipment or delivery to the laboratory.

c. The “C” bottle -250 mL or 100 mL bacteriological sample

The 250 mL bottle is used when the sample requires more than one bacteriological analysis. If the sample only requires one bacteriological analysis, the 100 mL bottle may be used.

i. The "C" bottle **should not be rinsed** with sampling site water.

ii. Position the open end of the bottle towards the current flow and away from the hand of the collector.

iii. Grasp the bottle securely at the base with one hand and plunge the bottle down into the water to avoid introducing surface scum.

iv. The sampling depth should be 6 inches to 1 foot below the water surface if possible. If it is not possible, the sample depth may be less, but the sampler should avoid surface debris and bottom sediment.

v. Tip the bottle slightly upward to allow air to escape and the bottle to fill. On the initial plunge, the "C" sample bottle should be filled completely. Immediately after obtaining the sample, pour off any excess sample water from the container until the sample volume is 250 mL or 100 mL and cap.

vi. If the sample bottle is not filled at least to the designated mark on the sampling bottle, discard the sample and sample bottle and repeat the process with a new "C" bottle. DO NOT **re-immerse the original bottle to add more sample volume**.

vii. Place sample container in a cooler on ice (6° C); **no preservative is required for bottle "C."**

viii. For compliance samples, bacteriological samples need to arrive at the laboratory within 6 hours after collection and processed within 2 hours. For all other types of samples the holding time is increased to 24 hours.

d. The "CN" bottle – 250 mL or 150 mL

i. Fill the bottle as directed for the "A" bottle.

ii. To preserve, add 1 to 3 pellets of sodium hydroxide (NaOH). Swirl the bottle until the pellets have dissolved.

iii. Using pH paper, verify the pH is greater than 10 but less than 12. If the pH is less than 10, add more pellets. If the pH is greater than 12, discard the sample and collect a new sample.

iv. Cap the bottle and place in a cooler with loose ice.

v. Mail or deliver the "CN" bottle to the laboratory.

e. The "H" bottle – amber glass liter

i. Fill the bottle as directed for the "A" bottle.

ii. The "H" bottle does not require any preservative.

iii. Cap the bottle and place in a cooler on loose ice.

iv. Mail or deliver the "H" bottle to the laboratory.

v. If being used for caffeine sampling, the sampler must abstain from all forms of caffeine for 24 hours prior to

sampling. Ensure your hands are clean and make sure you do not contaminate the inside of the bottle or lid.

f. The "Oil and Grease" bottle – amber glass liter

i. Fill the bottle as directed for the "A" bottle.
ii. Preserve the bottle by adding 2 mL of 50% hydrochloric acid (HCl). Using pH paper, verify the resulting pH is less than 2.
iii. Place the acidified "Oil and Grease" bottle into a cooler on loose ice.
iv. Mail or deliver the "Oil and Grease" bottle to the laboratory.

g. The "V" or "pesticide" bottle – 40 mL amber glass vial or 250 mL amber glass

The 'V" bottle is a 40 mL amber glass vial. It comes from the laboratory pre-preserved with ascorbic acid and hydrochloric acid. Do not rinse the vial. Do not use a marker to write on the vial – use a pencil or preprinted labels and allow the ink to fully cure before opening the vial (due to risk of VOC contamination from marker). Do not allow contamination (even airborne) from organic compounds such as vehicle exhaust or cleaning compounds. Do not allow the bottle cap, bottle threads, or inside of bottle to be touched or contaminated. For VOC analysis, the laboratory will also send 2 trip blanks. Do not open these trip blanks. They must accompany the vials at all times, including return to the laboratory. For pesticide analysis, trip blanks will not be included.

i. Open the vial and completely submerge to fill. Underwater, tip the vial vertically so that it will completely fill and create a convex meniscus.
ii. Gently tap the vial to dislodge any air bubbles.
iii. Cap the vial and invert to mix preservative and visually verify there are no air bubbles.
iv. The glass vials can easily break. Pack the vials in the packing material supplied by the laboratory or wrap each vial in bubble wrap. Securely place the vials in a cooler of loose ice and ship or deliver the vials to the laboratory.

h. The "R" bottle – 1 gal cubitainer

The cubitainer must be expanded before filling. Do not blow into or place fingers inside the cubitainer. To expand,

partially unscrew the lid to allow air to enter the cubitainer and gently pull at the seams.

i. Fill the cubitainer as directed for the "A" bottle.
ii. If you are unable to submerge the cubitainer without disturbing bottom sediment, use the "field" bottle to collect the sample and pour the water into the cubitainer.
iii. The "R" bottle is the only sample bottle that will be filtered and preserved by the laboratory. This is due to the large volume of filtered water that is required and the general difficulty in filtering that amount of water from "R" bottle sites.
iv. Cap the "R" bottle and place in a cooler on loose ice.
v. Mail or deliver the "R" bottle to the laboratory.

i. The "Metals-Tot Recov bottle" – 100 mL or 250 mL

i. Fill the bottle as directed for the "A" bottle.
ii. Preserve the bottle by adding 0.25 to 1 mL of concentrated Nitric Acid (HNO_3) based on bottle size. As needed, use pH paper to verify the resulting pH is less than 2.
iii. Place the acidified "Metals-Tot Recov" bottle into a cooler on loose ice.
iv. Mail or deliver the bottle to the laboratory.

j. Collection of the "field bottle" - one liter bottle

If collecting dissolved phosphorus and/or dissolved metals water to be filtered, the sample can be collected in a one-liter polypropylene "field" bottle. Thoroughly triple rinse the field bottle with water from the waterbody being sampled then follow steps 1(a)(i)-(iv).

k. The "D" bottle -100 mL plastic bottle

Water to be filtered for this sample comes from the field bottle. Procedure for field filtration and preservation of the total dissolved phosphorus sample are described below.

i. Assemble the disposable filters by attaching the filter unit to the receiving bottle. Attach the hand pump hose to the vacuum port.
ii. Pour approximately 120-150 mL of water from the field bottle into the filter unit and cap with the filter lid.
iii. Use the hand pump to create a vacuum in the filter unit. This will cause water to be filtered through the 45

micron filter and accumulate in the lower receiving bottle.

iv. After 100 mL has been filtered, unscrew the receiving bottle. This water may be transferred to the 100 mL "D" bottle (if going to the DOH lab) or it may remain in the receiving bottle (if going to Energy).

v. Add 0.25 mL of concentrated H_2SO_4. As needed, verify the pH with pH paper to ensure the pH is <2.

vi. Place the acidified bottle into a cooler on loose ice.

vii. Mail or deliver the bottle to the laboratory.

l. **The "Metals- Dissolved" bottle -100 mL or 250 mL plastic bottle**

Follow collection procedures for filtering and filling bottle "D" to fill bottle "F." Preserve the sample using the following procedure below.

i. 0.25 mL of concentrated Nitric Acid (HNO_3). As needed, use pH paper to verify the resulting pH is less than 2.

ii. Place the acidified "Metals-Dissolved" bottle into a cooler on loose ice. Mail or deliver the bottle to the laboratory.

m. **"Caffeine" bottle – 1000 mL amber glass with Teflon lid**

Caffeine sampling is conducted to provide information which may correlate contamination with human waste from septic leachate. **NOTE: Sampler must abstain from ingesting caffeine for 24 hours prior to sampling to minimize contamination due to low caffeine detection limits.**

i. Fill the bottle as directed for the "A" bottle taking care not to touch the inside of the lid, the threads of the bottle, or the inside of the bottle.

ii. If residual chlorine is present, add 80 mg of sodium thiosulfate per liter of water collected.

iii. Cap the sample and store in a cooler on loose ice.

iv. If the sample cannot be analyzed by the laboratory within 48 hours, freeze the sample to increase holding time to 7 days.

v. Mail or deliver the bottle to the laboratory.

n. **"Algae/Chlorophyll *a*" bottle – 500 mL amber plastic**

Algae or chlorophyll *a* are samples that may be collected during a complaint or fish kill to provide information on the

water quality. These samples may be analyzed internally or contracted with an outside laboratory.

i. Fill the bottle as directed for the "A" bottle.
ii. Cap the sample and store in a cooler on loose ice.
iii. Ship or deliver the sample to the laboratory or SDDENR personnel.

2. Composite Sampling

Collecting a Sample

The sampling plan or project manager will determine which samples are to be composite samples. Unless specified, most samples will be grab samples.

a. Triple rinse a plastic graduated cylinder with sample site water.
b. Collect a sample in a rinsed Van Dorn sampler or other sampling device.
c. Calculate the amount of water needed from each sub-sample. Divide the size of your container (milliliters), by the number of sampling sites to be composited.

   Example: Compositing three sites and placing them in the "A" bottle (1,000 mL).

   1000 mL/ 3 = 333 mL

d. Pour the previously calculated amount (i.e. 333 mL) from one sub-sample into the graduated cylinder.
e. Pour the water from the graduated cylinder into each sample bottle.
f. Repeat procedures "a" through "e" on the remaining sub-sample sites.
g. Preserve each bottle following the procedures from the Grab sampling section.

11.0 PROCEDURES FOR LAKE SEDIMENT SAMPLING

Lake sediment is sampled and analyzed to provide information and test for contaminants that may affect the benthic community and water quality. When selecting sediment sampling sites, consider known flow patterns through the lake, locations of tributary inputs, and any other sources that may affect the content and distribution of the sediment contaminants.

A. Sampling Equipment

1. Boat or Ice Auger and Chipping Bar
   a. Life jackets (use in boat or on ice)
   b. Other required safety equipment
   c. Waders may be necessary
2. Ponar-Petite sediment sampler with rope (see Figure 7)
3. One (1) 1000 mL glass jar (with Teflon-lined lids) and one (1) 250 mL polypropylene wide-mouth bottle per sampling site
4. One (1) 5 gallon bucket with stainless steel filter screen mesh on bottom
5. One (1) 5 gallon bucket
6. Stainless steel 2 gallon bucket and stainless steel scoop
7. 5 gallon jug waste container with lid
8. 10% nitric acid solution
9. 10% acetone solution

B. Equipment Decontamination Procedure

1. The sampling equipment must be thoroughly cleaned between sample sites. If composite samples are collected, the equipment must be thoroughly cleaned between sampling groups (sets of composites).
2. Rinse the equipment with lake water, removing all sediment and debris.
3. Rinse the equipment with a 10% nitric acid solution. Collect the waste solution and pour into the 5 gallon jug waste container.
4. Rinse the equipment with lake water. Collect the lake water rinsate and pour into the 5 gallon jug waste container.
5. Rinse the equipment with 10% acetone solution. Collect the waste solution and pour into the 5 gallon jug waste container.
6. Rinse the equipment with lake water. Collect the lake water rinsate and pour into the 5 gallon jug waste container.

C. Sampling Site Procedures

1. Grab Sampling

a. Measure the in-lake depth with a depth finder, Secchi disk, or weight, and record the measurement in the field notebook or project sheet.
b. Label one (1) wide-mouth glass jar and one (1) polypropylene bottle (sediment samples) with the station identification and date.
c. Collect sediment samples with the Ponar-petite dredge sampler. Set the pinch-pin tripping mechanism on the dredge. Slowly lower the dredge through the water column. When you near the bottom, let the dredge drop. Upon impact with the bottom, the jaws will clamp shut and grab a sediment sample. Slowly lift the dredge to the surface of the water. Tilt slightly to pour off excess water.
d. Place the sediment into the pre-cleaned 5 gallon bucket (with mesh bottom). Excess water should drain through the mesh.
e. Mix the sediment in the pre-cleaned bucket with the stainless steel scoop to homogenize the sample and drain excess water.
f. Completely fill one (1) 1000 mL wide-mouth glass jar and one (1) 250 mL polypropylene bottle with sediment per sampling site. Make sure that containers are completely filled with sediment and that air bubbles are not trapped in the container. Carefully rinse the glass jar threads and the cap with sample water to clean the threads for a better seal. Securely cap with a Teflon-lined lid.
g. Place sediment samples into the sampling cooler on loose ice.

2. Composite Sediment Sampling

Composite sediment sampling is similar to grab sampling except sediment samples are collected at multiple locations in the lake and composited.

a. Label one (1) 1000 mL wide-mouth glass jar and one (1) 250 mL polypropylene bottle (sediment samples) with the station identification (for all composited sites) and the date.
b. At each sub-sampling site, measure in-lake depth with a depth finder, Secchi disk, or weight, and record each depth measurement in the field book or project sheet.
c. Collect a sediment sub-sample with a Ponar-petite as described above in C.1.c. Place the sediment collected from sampler grabs into the pre-cleaned 5 gallon bucket (with the mesh bottom).
d. With the stainless steel scoop, place approximately 3 large scoops of sediment in the stainless steel bucket.

e. Repeat procedures ‘a’ through ‘d’ at the remaining sub-sampling sites.
f. Mix the sediment composite sample in the stainless steel bucket with the stainless steel scoop to homogenize the sample.
g. Completely fill one (1) 1000 mL wide-mouth glass jar and one (1) 250 mL polypropylene bottle with sediment per sampling site. Make sure that the container is completely filled with sediment and that air bubbles are not trapped in the container. Carefully rinse the glass jar threads and the cap with sample water to clean the threads for a better seal. Securely cap with a Teflon-lined lid.
h. Place sediment samples into the sampling cooler on loose ice.



Figure 7. Ponar petite.

12.0 REFERENCES

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South Dakota Department of Environment and Natural Resources. 2016. Surface Water Quality Program and Feedlot Permit Program Quality Assurance Project Plan.

APPENDIX D

WATER QUALITY RESULTS BY SITE

Table D-1. Water Quality Results at the Annie Creek at USGS Site From January 14, 2015, Through August 6, 2021

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Gold - T (mg/L)	Selenium – T (mg/L)	Bicarbonate (mg/L)	CN, Total (mg/L)	CN, WAD (mg/L)	Fluoride (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TDS (mg/L)	TSS (mg/L)
A.C. @USGS	1/14/15	410	36	11.1	8.62	0.1	220	10	<0.0002	0.012	0.006	<0.005	234	0.012	<0.010	0.238	<0.050	6.86	<0.050	33.6	484	8.33	284	<10.0
A.C. @USGS	4/30/15	280	56	10.6	8.67	6	630	4.9	<0.0002	0.008	0.002	<0.005	136	<0.010	<0.010	0.14	<0.050	1.09	<0.050	<10.0	258	8.35	155	<10.0
A.C. @USGS	5/20/15	230	127	11	8.38	4.3	5170	4.6	<0.0002	0.013	<0.001	<0.005	99.3	<0.010	<0.010	0.125	<0.050	1.82	<0.050	16.6	224	8.16	122	<10.0
A.C. @USGS	8/12/15	480	189	8.8	8.66	12.3		9.41	<0.0002	0.017	0.003	<0.005	234	<0.010	<0.010	0.209	<0.050	4.65	<0.050	25.1	454	8.39	268	26
A.C. @USGS	1/15/16	570	-13	10.3	8.68	3.3	4.06	11.5	<0.0002	0.015	0.005	<0.005	245	0.01	<0.010	0.244	<0.050	7.36	<0.050	38.1	514	8.32	285	<10.0
A.C. @USGS	4/8/16	260	182	10.1	8.72	6.4	4.3	5.29	<0.0002	0.007	0.002	<0.005	106	<0.010	<0.010	0.125	<0.050	1.67	<0.050	<10.0	244	8	132	<10.0
A.C. @USGS	5/11/16	280	71	13.9	8.52	8.2	4.3	5.34	<0.0002	0.007	0.001	<0.005	118	<0.010	<0.010	0.136	<0.050	1.57	<0.050	<10.0	238	8.08	143	<10.0
A.C. @USGS	8/14/16	460	140	12.1	8.77	17	4	8.57	<0.0002	0.017	0.01	<0.005	210	<0.010	<0.010	0.273	<0.050	5.97	<0.050	25.1	452	8.63	259	<10.0
A.C. @USGS	1/31/17	450	164	14.5	8.56	0.8	NR	6.58	<0.0002	0.017	0.011	<0.005	234	<0.010	<0.010	0.282	<0.050	5.65	<0.050	20.3	441	8.2	257	<10.0
A.C. @USGS	4/7/17	350	127	13.98	8.89	8.1	4.04	5.44	<0.0002	0.013	0.007	<0.005	167	<0.010	<0.010	0.216	<0.050	2.62	<0.050	12	340	8.44	196	<10.0
A.C. @USGS	5/21/17	280	83	10.04	8.62	8.6	564.14	5.07	<0.0002	0.01	0.002	<0.005	135	<0.010	<0.010	0.146	<0.050	1.69	<0.050	<10.0	278	8.22	155	11
A.C. @USGS	8/11/17	450	127	9.69	8.74	13	83.48	6.01	<0.0002	0.014	0.008	<0.005	207	<0.010	<0.010	0.273	<0.050	5.6	<0.050	20.3	426	8.59	208	<10.0
A.C. @USGS	1/20/18	500	144	11.58	8.38	1.1	3.9	8	<0.0002	0.018	0.009	<0.005	250	<0.010	<0.010	0.27	<0.050	7.28	<0.050	29.7	500	8.19	239	<10.0
A.C. @USGS	4/8/18	400	31	11.15	8.5	3	4.04	6.19	<0.0002	0.016	0.007	<0.005	211	<0.010	<0.010	0.232	<0.050	4.49	<0.050	16.8	410	8.28	229	<10.0
A.C. @USGS	5/5/18	180	148	10.45	7.66	9.7	1157.9	4.13	<0.0002	0.01	0.002	<0.005	71.5	<0.010	<0.010	0.135	<0.050	0.863	<0.050	<10.0	186	7.89	121	<10.0
A.C. @USGS	8/23/18	390	102	8.65	8.24	12.5	446.56	9.29	<0.0002	0.012	0.004	<0.005	171	<0.010	<0.010	0.21	<0.050	3.35	<0.050	18.9	368	8.4	217	12
A.C. @USGS	1/8/19	450	163	11.87	8.17	0.3	200	6.54	<0.0002	0.016	0.01	<0.005	227	<0.010	<0.010	0.278	<0.050	6.28	<0.050	22	454	8.3	252	<10.0
A.C. @USGS	4/25/19	190	162	10.13	8.22	5	5170	4.24	<0.0002	0.014	<0.001	<0.005	78.5	<0.010	<0.010	0.135	<0.050	1.14	<0.050	10.7	193	7.92	103	17
A.C. @USGS	5/23/19	240	145	8.82	8.43	3.9	4000	4.2	<0.0002	0.012	<0.001	<0.005	113	<0.010	<0.010	0.155	<0.050	1.21	<0.050	13	240	8.13	132	<10.0
A.C. @USGS	8/9/19	410	142	8.38	8.71	14.6	420.08	7	<0.0002	0.015	0.004	<0.005	196	<0.010	<0.010	0.223	<0.050	3.75	<0.050	21.4	414	8.49	224	10
A.C. @USGS	1/10/20	440	171	12.24	8.12	0.4	NR	7.71	<0.0002	0.013	0.007	<0.005	226	0.011	<0.010	0.268	<0.050	5.82	<0.050	26.5	460	8.15	236	
A.C. @USGS	4/28/20	190	219	9.75	7.49	6	7934	3.52	<0.0002	0.018	<0.001	<0.005	84.6	<0.010	<0.010	0.122	<0.050	0.682	<0.050	<10.0	175	7.77	113	37
A.C. @USGS	5/15/20	210	173	10.26	7.93	6.4	2261	3.64	<0.0002	0.009	<0.001	<0.005	114	<0.010	<0.010	0.13	<0.050	0.889	<0.050	<10.0	224	8.12	119	<10.0
A.C. @USGS	8/7/20	410	140	7.54	8.32	19.8	301.14	5.59	<0.0002	0.015	0.005	<0.005	210	<0.010	<0.010	0.242	<0.050	3.6	<0.050	18.3	420	8.36	182	10
A.C. @USGS	1/10/20	440	171	12.24	8.12	0.4	NR	7.71	<0.0002	0.013	0.007	<0.005	226	0.011	<0.010	0.268	<0.050	5.82	<0.050	26.5	460	8.15	236	
A.C. @USGS	4/28/20	190	219	9.75	7.49	6	7934	3.52	<0.0002	0.018	<0.001	<0.005	84.6	<0.010	<0.010	0.122	<0.050	0.682	<0.050	<10.0	175	7.77	113	37
A.C. @USGS	5/15/20	210	173	10.26	7.93	6.4	2261	3.64	<0.0002	0.009	<0.001	<0.005	114	<0.010	<0.010	0.13	<0.050	0.889	<0.050	<10.0	224	8.12	119	<10.0
A.C. @USGS	8/7/20	410	140	7.54	8.32	19.8	301.14	5.59	<0.0002	0.015	0.005	<0.005	210	<0.010	<0.010	0.242	<0.050	3.6	<0.050	18.3	420	8.36	182	10
A.C. @USGS	1/6/21	490	224	10.78	8.47	2.4	frozen	6.74	<0.0002	0.014	0.008	<0.005	250	<0.010	<0.010	0.259	<0.050	6.45	<0.050	25.1	470	8.28	180	<10.0
A.C. @USGS	4/9/21	350	224	10.82	8.34	2.7	564.14	5.35	<0.0002	0.013	0.003	<0.005	149	<0.010	<0.010	0.159	<0.050	3.32	<0.050	12.7	333	8.19	177	<10.0
A.C. @USGS	5/22/21	280	91	10.49	8.49	6.7	703	4.8	<0.0002	0.011	0.004	<0.005	137	<0.010	<0.010	0.158	<0.050	2.03	<0.050	<10.0	281	8.29	138	<10.0
A.C. @USGS	8/6/21	430	174	8.96	8.54	16.2	420	6.73	<0.0002	0.017	0.007	<0.005	210	<0.010	<0.010	0.207	<0.050	4.38	<0.050	19.1	431	8.47	212	<10.0

Notes:
D = dissolved
T = total
TR = total recoverable
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids

Table D-2. Water Quality Results at the Annie Creek II Site From January 5, 2015, Through August 2, 2021

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Gold - T (mg/L)	Selenium – T (mg/L)	Bicarbonate (mg/L)	CN, Total (mg/L)	CN, WAD (mg/L)	Fluoride (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TDS (mg/L)	TSS (mg/L)
ANNIE CREEK II	1/5/15	920	170	9.86	7.77	4.4	100	21.2	<0.0002	0.058	<0.001	0.014	141	0.011	<0.010	0.325	<0.050	23.2	<0.050	244	855	7.83	572	<10.0
ANNIE CREEK II	5/20/15							15.7	<0.0002	0.049	<0.001	0.008	133	<0.010	<0.010	0.377	<0.050	13.5	<0.050	135	590	8.03	366	<10.0
ANNIE CREEK II	8/12/15	940	70	9.63	7.5	7.5		20	<0.0002	0.059	<0.001	0.016	155	0.011	<0.010	0.36	<0.050	22.4	<0.050	253	887	7.78	571	<10.0
ANNIE CREEK II	12/3/15							19.4	<0.0002	0.056	<0.001		149	<0.010	<0.010	0.342	<0.050	23	<0.050	264	914	7.66	613	<10.0
ANNIE CREEK II	1/2/16	990	87	10	7.81	4.3	0.18	17.5	<0.0002	0.07	<0.001	0.014	146	0.013	<0.010	0.305	<0.050	26.5	<0.050	254	891	7.75	614	<10.0
ANNIE CREEK II	4/3/16	710	83	9.8	7.9	8.4	0.25	15.9	<0.0002	0.05	<0.001	0.011	126	<0.010	<0.010	0.312	<0.050	18	<0.050	180	684	7.81	457	<10.0
ANNIE CREEK II	5/2/16	670	12	9.9	8.46	10.1	13	15.4	<0.0002	0.055	<0.001	0.012	129	<0.010	<0.010	0.333	<0.050	19	<0.050	197	691	7.76	461	<10.0
ANNIE CREEK II	8/8/16	890	218	12.4	7.73	9.5	0.175	18.4	<0.0002	0.056	<0.001	0.012	147	<0.010	<0.010	0.339	<0.050	20.4	<0.050	256	852	7.61	590	<10.0
ANNIE CREEK II	1/16/17	870	8	9.88	7.78	4.7	75.62	17.6	<0.0002	0.065	<0.001	0.013	140	0.01	<0.010	0.332	<0.050	23.4	<0.050	263	867	7.8	581	<10.0
ANNIE CREEK II	4/2/17	790	116	12.35	7.92	5.8	75.62	17	<0.0002	0.062	<0.001	0.012	144	<0.010	<0.010	0.339	<0.050	19.7	<0.050	235	807	7.92	529	<10.0
ANNIE CREEK II	5/10/17	790	150	12.44	7.72	7.5	75.62	14.8	<0.0002	0.054	<0.001	0.013	130	<0.010	<0.010	0.315	<0.050	17.1	<0.050	205	729	7.85	501	
ANNIE CREEK II	8/7/17	860	151	9.93	7.58	7.4	75.62	18	<0.0002	0.056	<0.001	0.009	148	0.01	<0.010	0.314	<0.050	19.3	<0.050	252	842	7.93	575	<10.0
ANNIE CREEK II	1/15/18	940	25	10.18	7.71	2.7	41	19.6	<0.0002	0.079	<0.001	0.015	144	<0.010	<0.010	0.347	<0.050	22.6	<0.050	269	927	7.94	636	<10.0
ANNIE CREEK II	4/7/18	880	71	9.47	7.9	6	75.62	16.3	<0.0002	0.081	0.002	0.013	155	<0.010	<0.010	0.405	<0.050	21	<0.050	257	884	7.94	580	<10.0
ANNIE CREEK II	5/3/18	680	107	9.5	7.59	5.4	264.5	14.7	<0.0002	0.053	<0.001	0.011	123	<0.010	<0.010	0.401	<0.050	16.5	<0.050	189	685	7.73	453	<10.0
ANNIE CREEK II	8/5/18	960	167	9.35	7.37	5.8	191.2	19	<0.0002	0.053	<0.001	0.016	158	0.013	<0.010	0.446	<0.050	21.6	<0.050	265	901	7.85	632	<10.0
ANNIE CREEK II	11/1/18	1030	229	8.69	7.95	5.3	95.76	20.1	<0.0002	0.067	<0.001	0.017	164	0.011	<0.010	0.397	<0.050	24	<0.050	299	1010	7.9	682	
ANNIE CREEK II	1/3/19	1010	81	10.28	7.82	4.2	68.04	19	<0.0002	0.078	<0.001	0.016	148	0.01	<0.010	0.358	<0.050	24.1	<0.050	279	951	7.94	652	<10.0
ANNIE CREEK II	4/4/19	820	192	10.18	7.64	4.6	202	16.4	<0.0002	0.065	<0.001	0.013	160	<0.010	<0.010	0.442	<0.050	18	<0.050	226	831	7.92	546	<10.0
ANNIE CREEK II	5/3/19	620	197	10.04	7.72	4.4	326.2	13	<0.0002	0.048	<0.001	0.009	112	<0.010	<0.010	0.377	<0.050	14	<0.050	165	639	7.87	410	<10.0
ANNIE CREEK II	8/7/19	910	204	10.24	7.51	8.7	218.4	17.3	<0.0002	0.063	<0.001	0.016	155	0.01	<0.010	0.421	<0.050	20	<0.050	234	909	7.83	629	<10.0
ANNIE CREEK II	1/8/20	870	246	10.04	7.82	4.4	104.27	17.2	<0.0002	0.057	<0.001	0.012	150	0.01	<0.010	0.354	<0.050	21.3	<0.050	268	888	7.79	602	<10.0
ANNIE CREEK II	4/4/20	750	-0.6	9.8	7.91	5.1	247	14.8	<0.0002	0.058	<0.001	0.011	155	<0.010	<0.010	0.428	<0.050	15.6	<0.050	195	753	7.85	494	<10.0
ANNIE CREEK II	5/10/20	710	159	10.06	7.69	4.9	441	14.3	<0.0002	0.048	<0.001	0.01	140	<0.010	<0.010	0.403	<0.050	11.9	<0.050	190	672	7.79	428	<10.0
ANNIE CREEK II	8/4/20	820	159	8.51	7.46	10.4	140.65	17.6	<0.0002	0.065	<0.001	0.016	161	<0.010	<0.010	0.396	<0.050	16.6	<0.050	236	848	7.81	550	<10.0
ANNIE CREEK II	1/12/21	880	197	10.6	7.66	4.7	75.62	17.8	<0.0002	0.072	<0.001	0.015	145	<0.010	<0.010	0.323	<0.050	19.8	<0.050	249	851	7.83	579	<10.0
ANNIE CREEK II	4/3/21	870	203	9.83	8.08	4.9	95.76	16.9	<0.0002	0.07	<0.001	0.014	153	<0.010	<0.010	0.368	<0.050	14.3	<0.050	248	857	8.03	569	<10.0
ANNIE CREEK II	5/1/21	670	117	9.21	7.9	9.2	264.5	14.1	<0.0002	0.055	<0.001	0.01	137	<0.0100	<0.010	0.374	<0.050	11.8	<0.050	188	650	7.97	440	<10.0
ANNIE CREEK II	8/2/21	830	42	8.39	7.52	11	108.6	16.9	<0.0002	0.059	<0.001	0.012	152	<0.010	<0.010	0.346	<0.050	17	<0.050	236	835	7.9	563	<10.0

Notes:
D = dissolved
T = total
TR = total recoverable
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids and TSS = total suspended solids

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 1 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	1/5/15	630	136	8.49	8.62	1.7	120	63	26.7	<0.0002	0.011	<0.001	<0.001	<0.005		<0.001		0.006	<0.001	<0.050	<3.0	<0.010	<0.050	9.16				267	8.45	325	<10.0
NPDES001	1/19/15	580	195	10.9	8.79	2.1	96				0.011							<0.005			<3.0	<0.010	<0.050						8.55		<10.0
NPDES001	2/3/15							60.6	26.5	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	6.19				260	8.51	302	<10.0
NPDES001	2/18/15	450	-19	11.3	8.76	0.5	120				0.012							<0.005			<3.0	<0.010	<0.050						8.6		<10.0
NPDES001	3/4/15	500	96	11.4	8.69	0.4	100	57.4	25.9	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	5.54				250	8.42	260	<10.0
NPDES001	3/18/15	240	-15	10.8	8.47	3.6	383				0.027							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001	4/1/15	280	95	10.2	8.5	5	324	30.5	13.4	<0.0002	0.017	<0.001		<0.005		0.003		<0.005		0.069	<3.0	<0.010	<0.050	2.18				131	8.31	177	<10.0
NPDES001	4/15/15										0.013							<0.005			<3.0	<0.010	<0.050						8.59		<10.0
NPDES001	4/30/15										0.012							<0.005			<3.0	<0.010	<0.050						8.48		<10.0
NPDES001	5/6/15	700	92	9.5	8.67	8.6	163	34.5	15.4	<0.0002	0.013	<0.001	<0.001	<0.005		0.001		<0.005	<0.001	0.06	<3.0	<0.010	<0.050	1.46				149	8.51	167	<10.0
NPDES001	5/20/15	380	127	10.5	8.37	4.7	1440				0.03							<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES001	6/2/15	460	181	9.57	8.45	8.6	1060	51.9	17.7	<0.0002	0.028	<0.001		<0.005		0.001		<0.005		0.087	<3.0	<0.010	<0.050	7.15				203	8.34	274	<10.0
NPDES001	6/16/15	590	74	9.72	8.47	7.6	570				0.028							0.007			<3.0	<0.010	<0.050						8.39		<10.0
NPDES001	7/1/15	600	104	9.59	8.22	7.2	383	64	22.5	<0.0002	0.028	<0.001		<0.005		<0.001		0.007		0.272	<3.0	<0.010	<0.050	10.7				252	8.19	367	<10.0
NPDES001	7/13/15	270	71	8.95	8.33	11.1	203				0.02							<0.005			<3.0	<0.010	<0.050						8.27		<10.0
NPDES001	7/29/15	520	61	9.54	8.47	7.8	127				0.018							<0.005			<3.0	<0.010	<0.050						8.42		<10.0
NPDES001	8/12/15							67.3	26.7	<0.0002	0.013	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	0.058	<3.0	<0.010	<0.050	9.29				278	8.52	332	<10.0
NPDES001	8/26/15										0.013							<0.005			<3.0	<0.010	<0.050						8.63		<10.0
NPDES001	9/10/15	610	-5	9.55	8.4	9.7	127	70.6	29.5	<0.0002	<0.005	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	9.5				297	8.52	332	<10.0
NPDES001	9/22/15										0.012							<0.005			<3.0	<0.010	<0.050						8.6		<10.0
NPDES001	10/8/15	620	23	10.2	8.58	8.3	127				0.011							<0.005			<3.0	<0.010	<0.050						8.51		<10.0
NPDES001	10/19/15	600		9.77	8.62	7.7	127	70.5	29.1	<0.0002	0.016	<0.001		<0.005		<0.001		<0.005		0.06	<3.0	<0.010	<0.050	8.93			591	296	8.52	338	<10.0
NPDES001	11/4/15	610		9.2	8.56	7.7	114.4	68.3	29.1	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		0.055	<3.0	<0.010	<0.050	9.47			582	308	8.55	320	<10.0
NPDES001	11/17/15	660		10.6	8.7	2.9	111				0.015							<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES001	12/2/15	640		10.2	8.72	4.2	111	69.1	30.3	<0.0002	0.012	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	0.056	<3.0	<0.010	<0.050	9.67			612	297	8.39	344	<10.0
NPDES001	12/14/15										0.013							<0.005			<3.0	<0.010	<0.050						8.53		<10.0
NPDES001	12/29/15	630		0.87	8.76	13.8	111				0.014							<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES001	1/11/16	640		10.3	8.82	4.4	285	68.1	29.1	<0.0002	0.013	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	11.1			606	290	8.42	358	<10.0
NPDES001	1/25/16	630		11.5	8.67	1.5	111				0.013							<0.005			<3.0	<0.010	<0.050						8.43		<10.0
NPDES001	2/8/16	620		9.3	8.81	9.3	114.4	71.9	30.1	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		0.061	<3.0	<0.010	<0.050	9.31			607	303	8.33	353	<10.0
NPDES001	2/22/16	630	116	10.9	8.87	3.3	127				0.013							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	3/7/16	580		10.6	8.02	4.9	127	68.1	27.6	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	8.54			573	284	8.36	330	<10.0
NPDES001	3/21/16	530		10.1	8.71	5.9	141				0.005							<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES001	4/4/16	420		10.7	8.65	5.3	203.8	51.4	20.9	<0.0002	0.012	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	5.35			435	214	8.32	241	<10.0
NPDES001	4/18/16	290		10.9	8.25	4.3	301.6				0.013							<0.005			<3.0	<0.010	<0.050						8.29		<10.0
NPDES001	5/2/16	320		10.4	8.71	10.6	203.8	36	16.1	<0.0002	0.012	<0.001		<0.005		0.002		<0.005		0.054	<3.0	<0.010	<0.050	3.51			331	156	8.43	196	<10.0
NPDES001	5/16/16	390		11.4	8.79	10.4	162.9				0.013							<0.005			<3.0	<0.010	<0.050						8.52		<10.0
NPDES001	6/1/16	390		12.5	8.69	6.9	144	45.6	19.2	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	4.12			393	193	8.39	214	<10.0
NPDES001	6/13/16	450		10.7	8.64	14.4	96.49				0.011							<0.005			<3.0	<0.010	<0.050						8.53		<10.0

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 2 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	6/27/16	490		10.8	8.68	17.2	96.49				0.01							<0.005			<3.0	<0.010	<0.050						8.55		<10.0
NPDES001	7/13/16	510		11	8.71	13.9	70.46	56.3	27.3	<0.0002	0.01	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.7			506	253	8.48	308	<10.0
NPDES001	7/25/16	530		10.1	8.61	17.1	59				0.011							<0.005			<3.0	<0.010	<0.050						8.51		<10.0
NPDES001	8/8/16	540		11	8.56	14.4	70.46	61.5	27	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	6.69	0.022		531	265	8.49	301	<10.0
NPDES001	8/19/16	440		11.8	8.56	9	102.3	48.5	20.7	<0.0002	0.014	<0.001		<0.005		<0.001		<0.005		<0.050	3.6	<0.010	<0.050	5.44			436	206	8.32	250	<10.0
NPDES001	8/24/16	490		8.79	8.69	12.1	75.4																								<10.0
NPDES001	8/29/16	510		11.4	8.75	15.4	75.4				0.011							<0.005			<3.0	<0.010	<0.050						8.56		<10.0
NPDES001	9/12/16	520		12.1	8.64	7.9		61.5	27.5	<0.0002	0.01	<0.001	<0.001	<0.005	<0.050	<0.001	<0.005	<0.005	<0.001	<0.050	3.5	<0.010	<0.050	6.29	0.025		536	267	8.44	293	<10.0
NPDES001	9/26/16	470		12.3	8.76	10.5	75.4				0.011							<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES001	10/10/16	480		12	8.66	11	59	55.7	25.4	0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.53			484	243	8.45	273	<10.0
NPDES001	10/24/16	480		12.9	8.78	10.5	61.53	58.2	25.2		0.011		<0.001					<0.005	<0.001		<3.0	<0.010	<0.050					249	8.49		<10.0
NPDES001	11/7/16	480		13.6	8.74	5.6	59	57.5	27.2	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		0.192	<3.0	<0.010	<0.050	2.95			492	256	8.54	256	<10.0
NPDES001	11/21/16	450		14.4	8.82	3.9	61.53				0.01							<0.005			<3.0	<0.010	<0.050						8.57		<10.0
NPDES001	12/5/16	490		14.2	8.71	1.2	59	57.6	26.2	<0.0002	0.014	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.75			489	252	8.44	262	<10.0
NPDES001	12/21/16	500		13.3	8.65	2.6					0.012							<0.005			<3.0	<0.010	<0.050						8.4		<10.0
NPDES001	1/3/17	350		13.1	8.51	1.2	60	62.5	27.7	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.11			517	270	8.32	270	<10.0
NPDES001	1/16/17	510		11.9	8.49	2.8		58.7	27.6		0.013		<0.001					<0.005	<0.001		<3.0	<0.010	<0.050					260	8.4		<10.0
NPDES001	1/30/17	490		14.3	7.59	1.8	100				0.015							<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES001	2/7/17	490		14.4	8.4	2.2	100	60.2	27.2	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.87			493	262	8.44	260	<10.0
NPDES001	2/13/17	500		14.4	8.42	0.6					0.014							<0.005			<3.0	<0.010	<0.050						8.4		<10.0
NPDES001	2/27/17	500		15.8	8.79	0.9					0.013							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	3/14/17	530		14	8.76	1.7	70.46	59.8	26.5	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.26			494	258	8.5	259	<10.0
NPDES001	3/27/17	460		13.5	8.79	4.8	70.46				0.012							<0.005			<3.0	<0.010	<0.050						8.58		<10.0
NPDES001	4/11/17	440		13.1	8.85	3.4	70.46	50.9	23	<0.0002	0.013	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.27			424	222	8.47	231	<10.0
NPDES001	4/19/17	360		12.3	8.9	6.8	114.4	40.8	18.1	<0.0002	0.014	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.7			350	176	8.59	173	<10.0
NPDES001	4/27/17				8.71	6.6	83																<0.050								
NPDES001	5/1/17	400		13.4	8.72	5.9		47.4	21.9	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.3			397	208	8.58	210	<10.0
NPDES001	5/17/17	370		12.2	8.68	7.6					0.015							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	5/29/17	360		11.1	8.61	12.2					0.014							<0.005			<3.0	<0.010	<0.050						8.54		<10.0
NPDES001	6/12/17	380		8.65	8.69	17	70.46	44.4	20.2	<0.0002	0.014	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.02			379	194	8.63	181	<10.0
NPDES001	6/26/17	520		9.86	8.59	7.5	70.46				0.012							<0.005			<3.0	<0.010	<0.050						8.45		10
NPDES001	7/10/17	550		9.04	8.54	12.7	70.46	63.7	27.8	<0.0002	0.012	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.82			549	273	8.47	269	<10.0
NPDES001	7/24/17	480		13.4	8.35	15.4	57.22				0.011							<0.005			<3.0	<0.010	<0.050						8.48		<10.0
NPDES001	8/7/17	440		9.52	8.71	12.6	49.14	62.7	27.5	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		0.073	<3.0	<0.010	<0.050	2.25			460	270	8.55	237	<10.0
NPDES001	8/21/17	460		8.97	8.65	12.7	49.14				0.016							<0.005			<3.0	<0.010	<0.050						8.55		<10.0
NPDES001	9/6/17	470		9.18	8.69	10.2	35.01	55.4	27.1	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.74			449	250	8.55	256	<10.0
NPDES001	9/7/17																				<3.0										
NPDES001	9/18/17	470		9.16	8.73	9.3	23.47				0.017							<0.005			<3.0	<0.010	<0.050						8.54		<10.0
NPDES001	10/2/17	470		9.8	8.66	5.4	40	53.3	25.5	<0.0002	0.018	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.38			462	238	8.45	248	<10.0

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 3 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	10/16/17	500		10.5	8.72	7.3	49.14				0.012							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	10/30/17	550		12.4	8.65	3.1	59				0.013							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	11/13/17	560		11.1	8.69	2.4	61.53	62.4	29.9	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	5.71		29.9	573	279	8.46	324	<10.0
NPDES001	11/27/17	560		10.7	8.68	6	70.46				0.013							<0.005			<3.0	<0.010	<0.050						8.5		<10.0
NPDES001	12/4/17	580		11.4	8.6	2.2	96.49	65.2	31.2	<0.0002	0.019	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	5.95			575	291	8.46	280	<10.0
NPDES001	12/18/17	590		11.2	8.61	3.4	96.49				0.014							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001	1/4/18	590		11.5	8.58	1.7	100	64.6	30.6	<0.0002	<0.005	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.42			582	287	8.37	302	<10.0
NPDES001	1/15/18	620		11.8	8.53	-0.6	100				0.014							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001	1/29/18	580		10.5	8.62	1.1	53				0.014							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	2/12/18	550		10.6	8.53	1.5	100	60.5	28.8	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.32			531	270	8.45	285	<10.0
NPDES001	2/26/18	510		10.9	8.63	1.5	58				0.014							<0.005			<3.0	<0.010	<0.050						8.4		<10.0
NPDES001	3/12/18	500		11.7	8.64	4	58	60.5	28	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.4			514	266	8.45	279	<10.0
NPDES001	3/26/18	520		11.4	8.26	1.2	59				0.013							<0.005			<3.0	<0.010	<0.050						8.59		<10.0
NPDES001	4/11/18	550		10.5	8.51	4.2	70.46	60.4	27.6	<0.0002	0.014	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.08			494	265	8.51	251	<10.0
NPDES001	4/25/18	120		10.5	8.03	5.5	127				0.035							<0.005			<3.0	<0.010	<0.050						8.12		<10.0
NPDES001	5/10/18	80		10.3	7.87	5.9	162.9	11.3	3.26	<0.0002	0.023	<0.001		<0.005		0.004		<0.005		<0.050	<3.0	<0.010	<0.050	0.105			84.4	41.6	7.83	109	<10.0
NPDES001	5/21/18	340		10.1	7.87	7.5	183				0.019							<0.005			<3.0	<0.010	<0.050						8.33		<10.0
NPDES001	6/4/18	290		8.51	8.23	13.6	162.9	27.4	12.1	<0.0002	0.02	<0.001		<0.005		0.003		<0.005		<0.050	<3.0	<0.010	<0.050	3.7			291	118	8.33	191	<10.0
NPDES001	6/18/18	510		9.37	8.34	9.7	111	43.5	20.5	<0.0002	0.025	<0.001	0.002	<0.005		0.002		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.69			481	193	8.43	284	<10.0
NPDES001	7/3/18	350		9.4	8.12	9.6	182	33	14.6	<0.0002	0.018	<0.001	0.002	<0.005		0.002		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	4.28			357	142	8.29	222	<10.0
NPDES001	7/16/18	580		8.99	8.15	10.3	111				<0.005							<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES001	7/31/18	510		9.41	8.27	8.7	108.2				0.014							<0.005			<3.0	<0.010	<0.050						8.41		<10.0
NPDES001	8/13/18	640		8.49	8.43	13.4	75.4	55.7	25	<0.0002	0.013	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	0.015	<0.050	9.26			613	242	8.5	354	<10.0
NPDES001	8/27/18																					<0.010									
NPDES001	8/28/18	510	166	9.33	8.34	8.2		46.8	20.9	<0.0002	0.015	<0.001	0.001	<0.005	0.268	<0.001	<0.005	<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.68	0.035			203	8.47	289	<10.0
NPDES001	9/10/18	700		8.95	8.66	11.1	40.46	61.4	28.6	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	0.016	<0.050	10.5			675	271	8.63	386	<10.0
NPDES001	9/18/18																					0.016									
NPDES001	9/19/18																					0.013									
NPDES001	9/20/18																					<0.010									
NPDES001	9/24/18										0.007							<0.005			<3.0	<0.010	<0.050						8.5		<10.0
NPDES001	9/25/18																					<0.010									
NPDES001	9/26/18																					<0.010									
NPDES001	9/26/18																					<0.010									
NPDES001	9/27/18																					<0.010									
NPDES001	9/28/18																														
NPDES001	9/29/18																														
NPDES001	9/30/18																														
NPDES001	10/10/18	690		11.4	8.39	0.8	28.95	67.9	30.3	<0.0002	0.01	<0.001	0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	11	0.022		701	294	8.46	418	<10.0
NPDES001	10/24/18	500	150	10.2	8.55	4.7	203.8				0.014							<0.005			<3.0	<0.010	<0.050						8.41		<10.00
NPDES001	11/5/18	460		11	8.44	1.8	31.91	50	23.3	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.65			457	220	8.52	214	<10.0

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 4 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	11/20/18	500		11.2	8.19	0	49.14				0.011							<0.005			<3.0	<0.010	<0.050						8.58		<10.0
NPDES001	12/10/18	440	0.83	0.91	8.37	-0.4	60	58.3	27.6	<0.0002	0.014	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.3			518	259	8.35	259	<10.0
NPDES001	12/26/18	510	133	11.6	8.47	-0.3	60				0.011							<0.005			<3.0	<0.010	<0.050						8.54		<10.0
NPDES001	1/7/19	490	187	11.3	8.52	0	60	59.6	28	<0.0002	0.012	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.18			509	264	8.43	274	<10.0
NPDES001	1/21/19	520		10.9	8.45	1.5	60				0.012							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	2/4/19	520		10.9	8.45	1.5	60	61	28.3	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.38			518	269	8.43	257	<10.0
NPDES001	2/19/19	530	199	11.1	8.3	-4	65				0.014							<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES001	3/6/19	510	115	11.8	8.27	-0.3	65	55.1	26.7	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.97			508	247	8.4	243	<10.0
NPDES001	3/19/19	500	148	11.3	7.87	0.6	60				0.019							<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES001	4/1/19	370	183	11.2	8.1	1.6	90	41.8	18.5	<0.0002	0.02	<0.001		<0.005		0.001		<0.005		<0.050	<3.0	<0.010	<0.050	1.99			377	180	8.33	186	<10.0
NPDES001	4/17/19	200		10.3	7.88	4.7	359				0.025		0.004					<0.005	<0.001		<3.0	<0.010	<0.050						8.18		<10.0
NPDES001	4/30/19	180	183	11.4	8.3	2.1	383.7				0.02							<0.005			<3.0	<0.010	<0.050						8.15		<10.0
NPDES001	5/14/19	160		9.93	8.17	6.7	492.3	18.6	7.11	<0.0002	0.017	<0.001		<0.005		0.002		<0.005		<0.050	<3.0	<0.010	<0.050	0.87			166	75.6	8.08	120	<10.0
NPDES001	5/27/19	160	224	9.85	8.13	6.3	2070	19.1	7.12	<0.0002	0.03	<0.001	0.003	<0.005		0.004		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.75			174	76.9	7.89	131	<10.0
NPDES001	6/14/19	370		9.33	8.3	7.1	120.7	37.3	15.7	<0.0002	0.015	<0.001		<0.005		0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.32			350	158	8.3	209	<10.0
NPDES001	6/26/19	370		8.75	8.49	10.2	127				0.015							<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES001	7/8/19	200	176	8.44	8.29	11.7	359	21.8	9.15	<0.0002	0.02	<0.001	0.004	<0.005		0.004		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.844			195	92	8.14	161	<10.0
NPDES001	7/23/19	390	159	8.29	8.54	14.2	111				0.016							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	8/5/19	510		8.82	8.66	16.3	96.49	61.8	23.7	<0.0002	0.016	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	0.056	6.69			532	252	8.52	301	<10.0
NPDES001	8/19/19	570		9.05	8.66	10.2	102.3				0.014							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001 - BIO	9/5/19	510	187	8.36	8.7	14.2	80.34	50.7	27.5	<0.0002	0.014	<0.001	<0.001	<0.005	0.107	<0.001	<0.005	<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	4.39	0.028		504	240	8.53	285	<10.0
NPDES001	9/16/19	540	191	9.19	8.67	9.6	109				0.013							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	10/2/19	670	206	10.5	8.73	5.1	61.53	61.1	28.6	<0.0002	0.012	<0.001	0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	0.013	<0.050	9.62			662	270	8.57	398	<10.0
NPDES001	10/15/19																					<0.010									
NPDES001	10/16/19																					<0.010									
NPDES001	10/23/19	540	156	11.4	8.65	1.6	102.3				0.01							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	10/31/19	560		13.9	8.58	1	127				0.013							<0.005			<3.0	<0.010	<0.050						8.3		<10.0
NPDES001	11/13/19	560		10.9	8.45	1.5	83	60.9	24.9	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	4.91			551	254	8.51	287	<10.0
NPDES001	11/25/19	520	200	11.1	8.26	1.1	96.49				0.012							<0.005			<3.0	<0.010	<0.050						8.56		<10.0
NPDES001	12/9/19	530	174	11.2	8.67	-0.5	96.49	63.1	25.9	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	4.99			534	264	8.48	289	<10.0
NPDES001	12/22/19	560	230	10.7	8.36	1.7	49.14				0.012							<0.005			<3.0	<0.010	<0.050						8.62		<10.0
NPDES001	1/6/20	560	204	11.8	8.63	-0.5	85	65.8	27.3	<0.0002	0.011	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	5.24			548	277	8.46	313	<10.0
NPDES001	1/21/20	540	220	10.8	8.56	1.9	83				0.01							<0.005			<3.0	<0.010	<0.050						8.55		<10.0
NPDES001	2/3/20	400	190	11.5	8.6	-0.5	70.46	66.7	28.5	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	6.17			567	284	8.46	312	<10.0
NPDES001	2/19/20	170	212	11.5	8.93	-0.6					0.011							<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES001	3/4/20	500	160	10.9	8.13	5.5	65.97	59.3	28.2	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	5.43			555	264	8.59	297	<10.0
NPDES001	3/17/20	510		11	8.52	1.2	96.49				0.013							<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES001	3/31/20	350	157	11.3	8.33	1.7	111				0.02							<0.005			<3.0	<0.010	<0.050						8.35	179	<10.0
NPDES001	4/13/20	460	219	10.6	8.21	1.7	686.7	50.7	18.5	<0.0002	0.038	<0.001		<0.005		0.002		0.006		<0.050	<3.0	<0.010	<0.050	6.84			455	203	8.18	293	<10.0

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 5 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	4/16/20																	<0.005													
NPDES001	4/29/20	150	209	11.1	8.01	2.9	2432				0.026		0.004					<0.005	<0.001		<3.0	<0.010	<0.050						7.97		<10.0
NPDES001	5/11/20	180	218	10.9	7.9	2.9	312.8	20	8.07	<0.0002	0.019	<0.001		<0.005		0.003		<0.005		<0.050	<3.0	<0.010	<0.050	0.667			180	83.1	8.05	79	<10.0
NPDES001	5/25/20	210	160	10.1	8.38	6.2	212.3				0.017							<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES001	6/8/20	340		9.45	8.51	13.9	16.38	39.4	17.3	<0.0002	0.016	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	1.69			336	170	8.62	137	<10.0
NPDES001	6/22/20	410	116	8.76	8.52	11.7	53.09				0.015							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001	7/6/20	450		7.57	8.43	13.3	75.4	47	22.7	<0.0002	0.018	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.3			434	211	8.39	198	<10.0
NPDES001	7/21/20	460	168	9.05	8.43	10.2	75.4				0.014							<0.005			<3.0	<0.010	<0.050						8.43		<10.0
NPDES001	8/3/20	430		7.72	8.52	17.4	70.46	51.5	26	<0.0002	0.014	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.77			452	236	8.55	219	<10.0
NPDES001	8/18/20	470		8.79	8.62	13.4	70.46				0.013							<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES001 - BIO	8/26/20				8.46	12.2	49.14	54.1	26.2	<0.0002	0.012	<0.001	<0.001	<0.005	<0.050	<0.001	<0.005	<0.005	<0.001	<0.050		<0.010		3.09	<0.010			243		242	<10.0
NPDES001	8/31/20	420	182	9.29	8.71	11.2	70.46				0.012							<0.005			<3.0	<0.010	<0.050						8.68		<10.0
NPDES001	9/8/20	470	155	9.52	8.32	7.6	85.72	52.4	25.4	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.75			467	235	8.49	222	<10.0
NPDES001	9/21/20	460	157	9.36	8.62	9.9	70.46				0.012							<0.005			<3.0	<0.010	<0.050						8.48		<10.0
NPDES001	10/5/20	460	160	9.47	8.89	9.6	70.46	50.9	26.8	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.79			481	238	8.45	235	<10.0
NPDES001	10/19/20	480	124	10.8	8.76	3.3	70.46				0.011		<0.001					<0.005	<0.001		<3.0	<0.010	<0.050						8.43		<10.0
NPDES001	11/2/20	510	229	10.7	8.74	3.7	70.46	57.5	25.8	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.27			501	250	8.5	254	<10.0
NPDES001	11/16/20	530	167	11.6	8.7	0.9	75.4				0.01							<0.005			<3.0	<0.010	<0.050					506		8.45		<10.0
NPDES001	11/30/20	520		11.9	8.69	0.1	75.4				0.01							<0.005			<3.0	<0.010	<0.050						8.42		<10.0
NPDES001	12/14/20	510		11.2	8.72	1	49.14	59.3	27.9	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.04			495	263	8.48	143	<10.0
NPDES001	12/29/20	520		11.1	8.63	1.6	49.14				0.009							<0.005			<3.0	<0.010	<0.050						8.42		<10.0
NPDES001	1/12/21							61.1	28.4	<0.0002	0.01	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.11			508	269	8.44	257	<10.0
NPDES001	1/26/21	530	190	11.3	8.54	0.7					0.008							<0.005			<3.0	<0.010	<0.050						8.43		<10.0
NPDES001	2/8/21	500		11.1	8.45	-0.3		61	27.6	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.07			516	266	8.27	253	11
NPDES001	2/23/21	500	228	10.1	8.4	3.3	80				0.013							<0.005			<3.0	<0.010	<0.050						8.43		<10.0
NPDES001	3/9/21	480		9.9	8.68	4.1		58.3	25.1	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.9			495	249	8.44	250	<10.0
NPDES001	3/23/21	480		11.2	8.56	3.9					0.011							<0.005			<3.0	<0.010	<0.050						8.54		<10.0
NPDES001	4/5/21	460		9.81	8.66	5.2	53.09	55.4	25.1	<0.0002	0.014	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.55			474	242	8.5	225	<10.0
NPDES001	4/20/21	480		11.9	8.78	1.2	57.22				0.012							<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES001	5/3/21	200		11.5	8.47	6.3	330	22.5	9.4	<0.0002	0.021	<0.001		0.009		0.004		<0.005		<0.050	<3.0	<0.010	<0.050	0.736			197	94.9	8.22	142	<10.0
NPDES001	5/18/21	300		8.39	8.62	16	148.1				0.015							<0.005			<3.0	<0.010	<0.050						8.61		<10.0
NPDES001	5/31/21	290		9.4	8.73	12.8	162.9				0.017							<0.005			<3.0	<0.010	<0.050						8.66		<10.0
NPDES001	6/14/21	390		8.69	8.7	19.7	85.71	47.1	22.5	<0.0002	0.015	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.18			399	210	8.59	190	<10.0
NPDES001	6/28/21	440		9.82	8.7	12.1	75.4				0.012							<0.005			<3.0	<0.010	<0.050						8.6		<10.0
NPDES001	7/15/21	450		9.54	8.5	16.4	70.46	53.2	22.2	<0.0002	0.026	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.44			471	224	8.56	250	<10.0
NPDES001	7/26/21	450		8.68	8.63	17.2	70.46				0.013							<0.005			<3.0	<0.010	<0.050						8.56	223	<10.0
NPDES001	8/11/21	470		9.09	8.46	10.1	70.46	58.7	28.4	<0.0002	0.011	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.92			487	263	8.33	228	<10.0
NPDES001 - BIO	8/23/21	480		8.79	8.6	10.9	70.46	51.9	26.3	<0.0002	0.011	<0.001	<0.001	<0.005	<0.050	<0.001	<0.005	<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.91	0.015		484	238	8.5	242	<10.0
NPDES001	9/6/21	500		9.1	8.61	13.1	70.46	54.8	27.1	<0.0002	0.01	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.65			494	248	8.54	227	<10.0

Table D-3. Water Quality Results at the CP001/NPDES001 Site From January 5, 2015, Through December 28, 2021 (Page 6 of 6)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES001	9/21/21	480	119	9.28	8.62	9.1	70.46				0.01							<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES001	10/4/21	490		9.73	8.6	9.2	70.46	62.3	26.8	<0.0002	0.01	<0.001	<0.001	<0.005		<0.001		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.22			515	266	8.42	242	<10.0
NPDES001	10/18/21	460		10	8.65	7.7	102.3				0.013							<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES001	11/2/21	520		11.7	8.48	1.1	85	62.7	26.8	<0.0002	0.008	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	2.84			514	267	8.37	244	<10.0
NPDES001	11/15/21	460		10.8	8.58	5.4	49.14				0.012							<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES001	12/2/21	480		10.5	8.62	4.9	49	55.7	27.5	<0.0002	0.012	<0.001		<0.005		<0.001		<0.005		<0.050	<3.0	<0.010	<0.050	3.05			507	252	8.45	246	<10.0
NPDES001	12/13/21	470		11.4	8.46	1.6	3				0.01							<0.005			<3.0	<0.010	<0.050						8.45		<10.0
NPDES001	12/28/21	470			8.55	-0.5					0.009							<0.005			<3.0	<0.010	<0.050						8.17		<10.0

Notes:
D = dissolved
T = total
TR = total recoverable
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids

Table D-4. Water Quality Results at the CP005/NPDES005 Site From January 5, 2015, Through December 28, 2021 (Page 1 of 5)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – T (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES005	1/5/15	550	151	10.9	8.34	0.6	200	59.3	22.5	<0.0002		0.009	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	6.43	0.035			241	8.44	278	<10.0
NPDES005	1/19/15	430	194	11	8.71	1.6	360					0.011								<0.005			<3.0	<0.010	<0.050						8.53		<10.0
NPDES005	2/3/15							51.5	21.2	<0.0002		0.007	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	3.81	0.032			216	8.4	245	<10.0
NPDES005	2/18/15	240	-50	11.6	8.64	0.5	850					0.008								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	3/4/15	380	97	11.3	8.48	0.5	300	40.9	16.9	<0.0002		0.007	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.65	0.035			172	8.38	194	<10.0
NPDES005	3/18/15	150	-32	10.9	8.43	3	3300					0.013								<0.005			<3.0	<0.010	<0.050						8.2		10
NPDES005	4/1/15	180	93	10.4	8.2	4.2	3670	20.5	6.51	<0.0002		0.008	<0.001		<0.005		0.002			<0.005		0.05	<3.0	<0.010	<0.050	0.606	0.038			77.9	8	115	<10.0
NPDES005	4/15/15											0.007								<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES005	4/30/15											0.006								<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES005	5/6/15	230	92	9.4	8.51	8.2	590	25.8	9.38	<0.0002		0.006	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.526	0.038			103	8.37	134	10
NPDES005	5/20/15	210	118	10.6	8.37	4.7	5100					0.012								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005	6/2/15	240	164	8.2	8.56	10.5	5810	28.6	9.15	<0.0002		0.012	<0.001		<0.005		0.003			<0.005		<0.050	<3.0	<0.010	<0.050	2.11	0.039			109	8.25	147	14
NPDES005	6/16/15	300	36	7.82	8.48	8.5	4750					0.014								<0.005			<3.0	<0.010	<0.050						8.31		<10.0
NPDES005	7/1/15	330	57	9.28	8.28	8.6	2770	37.2	12.8	<0.0002		0.012	<0.001		<0.005		0.002			<0.005		0.213	<3.0	<0.010	<0.050	3.29	0.037			146	8.14	206	<10.0
NPDES005	7/13/15	250	65	8.41	8.42	14	1720	29.2	10.8			0.012								<0.005		0.349	<3.0	<0.010	<0.050					117	8.4		10
NPDES005	7/29/15	390	38	9.16	8.38	9.1	430	40.8	16.4			0.009								<0.005		<0.050	<3.0	<0.010	<0.050					169	8.41		<10.0
NPDES005	8/12/15							59.1	22.4	<0.0002		0.01	<0.001	<0.001	<0.005		0.002			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	5.17	0.039			240	8.49	275	<10.0
NPDES005	8/26/15											0.012								<0.005			<3.0	<0.010	<0.050						8.59		14
NPDES005	9/10/15	440	-55	9.25	8.52	9.1	390	60.9	26	<0.0002		0.01	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	6.58	0.03			259	8.48	283	<10.0
NPDES005	9/22/15											0.011								<0.005			<3.0	<0.010	<0.050						8.53		<10.0
NPDES005	10/8/15	590	16	9.62	8.47	9	365					0.011								<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES005	10/19/15	570		9.3	8.32	8.5	355	65.2	27.6	<0.0002		0.015	<0.001		<0.005		<0.001			<0.005		0.052	<3.0	<0.010	<0.050	6.93	0.024		558	277	8.48	328	<10.0
NPDES005	11/4/15	570		8.78	8.31	9.6	360	59.1	27.3	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		0.058	<3.0	<0.010	<0.050	6.9	0.025		545	260	8.48	290	<10.0
NPDES005	11/17/15	630		10	8.61	3.7	360					0.011								<0.005			<3.0	<0.010	<0.050						8.45		<10.0
NPDES005	12/2/15	620		10	8.69	4.5	350	65.1	28.6	<0.0002		0.012	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	0.067	<3.0	<0.010	<0.050	7.5	0.02		587	281	8.33	323	<10.0
NPDES005	12/14/15											0.012								<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES005	12/29/15	620	220	9.71	8.47	5.2	350					0.012								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005	1/11/16	640		10.4	8.6	4.5	310	66.7	28.3	<0.0002		0.012	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	8.49	0.016		584	283	8.38	333	<10.0
NPDES005	1/25/16	620		10.2	8.31	4.1	300					0.012								<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES005	2/8/16	610		11.3	8.79	1.9	290	67.8	29.4	<0.0002		0.012	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	7.51	0.021		586	290	8.45	337	<10.0
NPDES005	2/22/16	560	5	10.4	8.78	3.5	310					0.012								<0.005			<3.0	<0.010	<0.050						8.42		<10.0
NPDES005	3/7/16	530		10.2	8.74	5.5	350	55.5	21.9	<0.0002		0.012	<0.001		<0.005		<0.001			<0.005		0.061	<3.0	<0.010	<0.050	5.38	0.026		472	229	8.34	254	<10.0
NPDES005	3/21/16	340		8.9	7.87	9.4	375					0.008								<0.005			<3.0	<0.010	<0.050						8.2		<10.0
NPDES005	4/4/16	250		11.1	8.77	5.5	1100	28.4	10.3	<0.0002		0.006	<0.001	<0.001	<0.005		0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.51	0.032		252	113	8.1	149	<10.0
NPDES005	4/18/16	200		10	8.27	5.2	1000					0.007								<0.005			<3.0	<0.010	<0.050						8.17		<10.0
NPDES005	5/2/16	190		9.8	8.56	9.5	1550	21.7	7.53	<0.0002		0.007	<0.001		<0.005		0.001			<0.005		0.057	<3.0	<0.010	<0.050	0.971	0.038		195	85.2	8.24	102	<10.0
NPDES005	5/16/16	230		11.8	8.68	10.8	400					0.007								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	6/1/16	260		12.7	8.56	7.4	404	30.6	11.1	<0.0002		0.007	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.35	0.032		267	122	8.26	112	<10.0
NPDES005	6/13/16	330		10.1	8.55	16.3	359					0.008								<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES005	6/27/16	400		10.5	8.59	18.4	350					0.009								<0.005			<3.0	<0.010	<0.050						8.55		<10.0
NPDES005	7/13/16	450		10.8	8.65	14.7	305	49.6	22.8	<0.0002		0.01	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.56	0.028		447	218	8.54	246	<10.0

Table D-4. Water Quality Results at the CP005/NPDES005 Site From January 5, 2015, Through December 28, 2021 (Page 2 of 5)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – T (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES005	7/25/16	490		10.3	8.52	17.7	290					0.01								<0.005			<3.0	<0.010	<0.050						8.5		<10.0
NPDES005	8/8/16	510		10.8	8.43	15.4	175	59.7	26.3	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	4.71	0.028		501	258	8.46	288	<10.0
NPDES005	8/19/16	370		11.3	8.42	11	450	42.1	42.5	<0.0002		0.018	<0.001		<0.005		0.005			<0.005		<0.050	3.6	<0.010	<0.050	2.76	0.05		363	280	8.14	227	300
NPDES005	8/24/16	460		8.95	8.72	12.1	400																									<10.0
NPDES005	8/29/16	470		10.1	8.69	17.2	400					0.012								<0.005			<3.0	<0.010	<0.050						8.51		<10.0
NPDES005	9/12/16	510		11.8	8.53	8.4	135	56.6	25	<0.0002		0.011	<0.001	<0.001	<0.005	0.061	<0.001	<0.005		<0.005	<0.001	0.058	3.6	<0.010	<0.050	5.2	0.029		505	244	8.4	266	24
NPDES005	9/26/16	460		12.4	8.67	11.3	180					0.01								<0.005			<3.0	<0.010	<0.050						8.44		<10.0
NPDES005	10/10/16	480		12.3	8.62	10.3	100	53.9	24.2	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.96	0.024		478	234	8.39	255	<10.0
NPDES005	10/24/16	480		13.4	8.74	10.3	120	54.8	24.4			0.011		<0.001						<0.005	<0.001		<3.0	<0.010	<0.050					237	8.43		<10.0
NPDES005	11/7/16	490		13	8.72	7.3	90	55.5	27	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		0.141	<3.0	<0.010	<0.050	3.98	0.026		493	250	8.53	262	<10.0
NPDES005	11/21/16	470		13.4	8.8	4.9	100					0.011								<0.005			<3.0	<0.010	<0.050						8.46		<10.0
NPDES005	12/5/16	460		13.5	8.57	3.7	80	54.1	25.3	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.41	0.031		478	239	8.34	263	<10.0
NPDES005	12/19/16	470	164	10.3	10.3	2.8	80					0.012								<0.005			<3.0	<0.010	<0.050						8.27		<10.0
NPDES005	1/3/17	510		14.3	8.56	1.6	80	60.3	26.6	<0.0002		0.013	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.67	0.042		506	260	8.31	262	<10.0
NPDES005	1/16/17	500		10.9	8.49	6.8	80	58.7	27.1			0.014		<0.001						<0.005	<0.001		<3.0	<0.010	<0.050					258	8.33		<10.0
NPDES005	1/30/17	480		13.2	7.74	3.7	100					0.017								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005	2/7/17	470		11.7	8.2	4.3	90	59.3	26.4	<0.0002		0.014	<0.001		<0.005		<0.001			<0.005		0.058	<3.0	<0.010	<0.050	2.43	0.049		482	257	8.42	259	<10.0
NPDES005	2/13/17	480		12.3	8.54	1.6	110					0.015								<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES005	2/27/17	480		14.4	8.59	1.5	100					0.014								<0.005			<3.0	<0.010	<0.050						8.29		<10.0
NPDES005	3/14/17	490		14.1	8.63	1	120	58	24.3	<0.0002		0.013	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.32	0.037		462	245	8.43	244	<10.0
NPDES005	3/27/17	270		13.7	8.63	3.1	375					0.007								<0.005			<3.0	<0.010	<0.050						8.27		<10.0
NPDES005	4/11/17	310		14.1	8.77	2.3	450	34.9	13.7	<0.0002		0.007	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.08	0.08		297	144	8.32	159	<10.0
NPDES005	4/19/17	240		12.6	8.86	6.6	600	27.6	9.54	<0.0002		0.007	<0.001	<0.001	<0.005		<0.001			<0.005	0.001	<0.050	<3.0	<0.010	<0.050	0.739	0.03		240	108	8.3	108	12
NPDES005	4/27/17	260		13.4	8.44	7.8	315	30	11.3	<0.0002		0.008	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.893	0.018		263	121	8.41	127	<10.0
NPDES005	5/1/17	280		13.4	8.51	5.2	325	34.2	12.1	<0.0002		0.008	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.07	<0.010		277	135	8.42	144	<10.0
NPDES005	5/17/17	260		11.8	8.29	8.6	350					0.008								<0.005			<3.0	<0.010	<0.050						8.25		10
NPDES005	5/29/17	240		10.9	8.38	11.6	540					0.008								<0.005			<3.0	<0.010	<0.050						8.33		20
NPDES005	6/12/17	260		9.02	8.56	17.5	225	30.9	10.9	<0.0002		0.008	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.675	0.04		260	122	8.37	139	16
NPDES005	6/26/17	390		9.55	8.54	8.6	225					0.008								<0.005			<3.0	<0.010	<0.050						8.34		10
NPDES005	7/10/17	470		9.1	8.46	13.1	95	53.8	22.2	<0.0002		0.011	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	0.068	<3.0	<0.010	<0.050	4.2	0.038		457	226	8.42	247	<10.0
NPDES005	7/24/17	420		8.2	8.3	16.6	100					0.012								<0.005			<3.0	<0.010	<0.050						8.43		<10.0
NPDES005	8/7/17	420		8.65	8.63	14.6	90	56	24.2	<0.0002		0.015	<0.001		<0.005		<0.001			<0.005		0.077	<3.0	<0.010	<0.050	1.57	0.104		422	240	8.48	243	16
NPDES005	8/21/17	450		8.5	8.57	13.8	110					0.018								<0.005			<3.0	<0.010	<0.050						8.51		<10.0
NPDES005	9/6/17	470		8.6	8.59	10.3	89	56.4	26	<0.0002		0.017	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.24	0.03		448	248	8.54	238	<10.0
NPDES005	9/7/17																						<3.0										
NPDES005	9/18/17	460		8.29	8.61	9.5	100					0.02								<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES005	10/2/17	380		9.64	8.53	5.8	180	44.6	20.5	<0.0002		0.016	<0.001	<0.001	<0.005		0.003			<0.005	<0.001	<0.050	3.3	<0.010	<0.050	1.27	0.046		386	196	8.26	223	75
NPDES005	10/16/17	480		9.3	8.68	7.1	190					0.013								<0.005			<3.0	<0.010	<0.050						8.45		<10.0
NPDES005	10/30/17	560		11.1	8.53	1.4	150					0.014								<0.005			<3.0	<0.010	<0.050						8.39		10
NPDES005	11/13/17	560		10.2	8.64	1.6	120	64.6	29.3	<0.0002		0.015	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	4.8	0.031	29.2	559	282	8.42	307	<10.0
NPDES005	11/27/17	540		9.79	8.6	5.6	80					0.013								<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES005	12/4/17	570		11.9	8.64	3.2	150	62.4	30	<0.0002		0.021	<0.001		<0.005		0.002			<0.005		<0.050	<3.0	<0.010	<0.050	5.29	0.047		558	279	8.35	271	60

Table D-4. Water Quality Results at the CP005/NPDES005 Site From January 5, 2015, Through December 28, 2021 (Page 3 of 5)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – T (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES005	12/18/17	600		11.6	8.61	4.5	150					0.016								<0.005			<3.0	<0.010	<0.050						8.4		15
NPDES005	1/4/18	590		11	8.38	1.4	130	64.7	29.6	<0.0002		0.006	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	5.66	0.037		572	283	8.31	277	<10.0
NPDES005	1/15/18	600		10.5	8.57	-0.2	95					0.015								<0.005			<3.0	<0.010	<0.050						8.42		<10.0
NPDES005	1/29/18	600		10.7	8.59	1.8	110					0.015								<0.005			<3.0	<0.010	<0.050						8.41		<10.0
NPDES005	2/12/18	580		10.8	8.52	1.4	110	37	28.5	<0.0002		0.014	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	3.04	0.036		527	210	8.4	274	12
NPDES005	2/26/18	510		11.2	8.48	2.4	95					0.016								<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES005	3/12/18	500		11.8	8.54	4	120	58.7	26.1	<0.0002		0.014	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.98	0.035		507	254	8.4	272	<10.0
NPDES005	3/26/18	430		11	7.18	-0.7	179					0.011								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	4/11/18	400		10.5	7.45	4.6	448	43.2	16.9	<0.0002		0.01	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.72	0.026		366	178	8.25	192	<10.0
NPDES005	4/25/18	190		10.8	7.7	4.4	710					0.012								<0.005			<3.0	<0.010	<0.050						8.04		<10.0
NPDES005	5/10/18	160		10.5	7.8	5.4	1570	18.9	4.74	<0.0002		0.008	<0.001		<0.005		0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.392	0.031		155	66.7	7.86	110	<10.0
NPDES005	5/21/18	190		9.76	7.23	5.8	1000					0.008								<0.005			<3.0	<0.010	<0.050						8.07		<10.0
NPDES005	6/4/18	200		8.74	8.04	14.1	1600	20.7	6.52	<0.0002		0.012	<0.001		<0.005		0.004			<0.005		<0.050	<3.0	<0.010	<0.050	0.783	0.048		186	78.6	8.04	121	16
NPDES005	6/12/18			8.94	8.38			28.1	9.8								0.001												110			
NPDES005	6/14/18							31.4	10.7								<0.001												122			
NPDES005	6/18/18	250		9.14	7.49	9.6	400	28.6	10.7	<0.0002		0.032	<0.001	0.022	0.009		0.009			<0.005	<0.001	0.071	<3.0	<0.010	<0.050	1.31	0.058		238	115	8.1	188	266
NPDES005	6/27/18							19.4	5.79								0.002												72.4			
NPDES005	6/28/18							20.1	5.93								0.002												74.5			
NPDES005	7/3/18	210		9.41	7.84	9.4	1400	23.9	7.68	<0.0002		0.008	<0.001	0.001	<0.005		0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.781	0.038		221	91.2	8.17	124	<10.0
NPDES005	7/16/18	330		8.79	7.8	10.6	590					0.009								<0.005			<3.0	<0.010	<0.050						8.26		<10.0
NPDES005	7/31/18	280		9.55	7.88	8.1	600					0.008								<0.005			<3.0	<0.010	<0.050						8.22		10
NPDES005	8/13/18	390		8.18	8.22	13.6	400	38.3	14.6			0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.75	0.038		373	156	8.38	212	<10.0
NPDES005	8/28/18	320	193	9.28	7.96	8.4	400	34.9	11.7	<0.0002		0.007	<0.001	<0.001	<0.005	0.388	<0.001	<0.005		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.49	0.038			136	8.37	152	10
NPDES005	9/10/18	500		8.34	8.4	11.3	71.8	45.6	18.8	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	4.99	0.041		471	191	8.56	252	12
NPDES005	9/24/18											0.006								<0.005			<3.0	<0.010	<0.050						8.5		<10.0
NPDES005	10/10/18	530		10.9	8.44	0.8	125	56.5	23.7	<0.0002		0.008	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	5.98	0.028		540	239	8.44	285	<10.0
NPDES005	10/24/18	420	205	9.84	8.06	4.1	70					0.01								<0.005			<3.0	<0.010	<0.050						8.27		<10.00
NPDES005	11/5/18	360		11	8.15	1.2	75	40.6	16.2	<0.0002		0.01	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.14	0.039		356	168	8.37	172	<10.0
NPDES005	11/20/18	430		11	7.72	1	100					0.009								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	12/10/18	480	220	0.92	7.93	-0.5	100	54.1	24.1	<0.0002		0.014	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.42	0.036		475	234	8.32	245	<10.0
NPDES005	12/26/18	470	144	11.1	8.25	0.4	100					0.012								<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES005	1/7/19	470	211	10.8	8.19	0.5	95	53.8	25.2	<0.0002		0.012	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.47	0.042		475	238	8.32	236	<10.0
NPDES005	1/21/19	510		10.9	8.3	1.7	95					0.012								<0.005			<3.0	<0.010	<0.050						8.36		<10.0
NPDES005	2/4/19	510	212	11.4	8.24	-0.6	100	58.9	26.5	<0.0002		0.013	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.71	0.031		506	256	8.34	249	<10.0
NPDES005	2/19/19	510	231	10.7	7.85	-3	100					0.014								<0.005			<3.0	<0.010	<0.050						8.48		<10.0
NPDES005	3/6/19	500	218	11.4	7.72	-0.3	100	53	24.7	<0.0002		0.014	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.56	0.032		492	234	8.31	215	<10.0
NPDES005	3/19/19	470	204	9.72	7.8	2.4	100					0.015								<0.005			<3.0	<0.010	<0.050						8.22		<10.0
NPDES005	4/1/19	230	214	11.1	7.66	1.3	235	27.3	8.76	<0.0002		0.008	<0.001	0.002	<0.005		0.002			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.833	0.034		235	104	8.01	100	<10.0
NPDES005	4/17/19	180		10.4	7.5	4	4730					0.009		0.002						<0.005	<0.001		<3.0	<0.010	<0.050						8		31
NPDES005	4/30/19	160	202	11.4	8.08	1.5	3580					0.007								<0.005			<3.0	<0.010	<0.050						7.98		<10.0
NPDES005	5/14/19	170		9.78	7.8	6.9	3860	19.2	5.45	<0.0002		0.008	<0.001		<0.005		0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.379	0.036		164	70.4	8.01	122	14
NPDES005	5/27/19	140	234	9.59	8.27	6.9	18600	17.9	5.29	<0.0002		0.016	<0.001	0.004	<0.005		0.004			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.628	0.043		149	66.6	7.95	108	44

Table D-4. Water Quality Results at the CP005/NPDES005 Site From January 5, 2015, Through December 28, 2021 (Page 4 of 5)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – T (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES005	6/14/19	250		9.69	8.13	6.3	800	26.3	8.78	<0.0002		0.007	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.514	0.027		239	102	8.17	124	<10.0
NPDES005	6/26/19	240		9.9	8.38	10.3	1200					0.009								<0.005			<3.0	<0.010	<0.050						8.4		21
NPDES005	7/8/19	200	158	8.6	8.33	11.7	2630	23.5	6.95	<0.0002		0.011	<0.001	0.002	<0.005		0.003			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.315	0.039		194	87.3	8.24	138	15
NPDES005	7/23/19	270	0.94	8.27	8.46	14.5	800	33.8	10.3			0.009					<0.001			<0.005			<3.0	<0.010	<0.050					127	8.35		<10.0
NPDES005	8/5/19	360		8.65	8.53	17	725	44.7	15.2	<0.0002		0.012	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.42	0.043		369	174	8.4	192	<10.0
NPDES005	8/19/19	430	220	8.95	8.54	9.7	540					0.012								<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES005 - BIO	9/5/19	420	208	8.2	8.58	13.9	320	42.3	20.1	<0.0002		0.013	<0.001	0.001	<0.005	0.437	<0.001	<0.005		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.31	0.039		410	188	8.42	232	12
NPDES005	9/16/19	450	205	8.94	8.56	9.2	205					0.011								<0.005			<3.0	<0.010	<0.050						8.34		<10.0
NPDES005	10/2/19	490	245	10.1	8.57	4.6	290	45.8	20	<0.0002		0.009	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	4.38	0.034		474	196	8.46	259	<10.0
NPDES005	10/23/19	460	177	11.2	8.5	0.6	280					0.009								<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES005	10/31/19	420		15.6	8.35	1.9	270					0.009								<0.005			<3.0	<0.010	<0.050						8.23		<10.0
NPDES005	11/13/19	450		11.1	7.78	0.7		47.6	18.9	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.64	0.031		435	197	8.35	194	<10.0
NPDES005	11/25/19	370		10.7	7.24	1.3	260					0.007								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	12/9/19	430	184	11.1	8.18	-0.3	250	49.7	18.9	<0.0002		0.008	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.89	0.034		421	202	8.38	189	<10.0
NPDES005	12/22/19	440	224	10.7	7.54	3.3	250					0.009								<0.005			<3.0	<0.010	<0.050						8.49		<10.0
NPDES005	1/6/20	470	212	11.4	8.32	-0.4	130	55.5	21.8	<0.0002		0.009	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	3.29	0.037		461	229	8.41	203	<10.0
NPDES005	1/21/20	470	251	9.94	8.52	1.7						0.01								<0.005			<3.0	<0.010	<0.050						8.47		<10.0
NPDES005	2/3/20	500	195	10.9	8.43	-0.4		57.3	23.3	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	4.15	0.033		487	239	8.28	272	<10.0
NPDES005	2/19/20	520	209	11.4	8.38	-0.6						0.01								<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES005	3/4/20	490	191	12	7.49	2.2		52.8	22.7	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	3.78	0.03		470	225	8.46	228	<10.0
NPDES005	3/17/20	320		11	8.62	3.1	300					0.009								<0.005			<3.0	<0.010	<0.050						8.19		<10.0
NPDES005	3/31/20	220	199	11	7.92	1.3	350					0.01								<0.005			<3.0	<0.010	<0.050						8.07	136	14
NPDES005	4/13/20	260	262	10.6	7.77	0.4	555	32.8	9.18	<0.0002		0.019	<0.001		<0.005		0.003			<0.005		<0.050	<3.0	<0.010	<0.050	2.22	0.035		259	120	8.12	133	14
NPDES005	4/29/20	170	248	10.5	7.29	2.8	5800	18.8	4.98			0.011		0.003						<0.005	<0.001		<3.0	<0.010	<0.050					67.4	7.91		15
NPDES005	5/11/20	228	226	10.5	7.98	2.5	2000	20.6	5.86	<0.0002		0.008	<0.001		<0.005		0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.456	0.059		172	75.5	8.12	102	<10.0
NPDES005	5/25/20	180	177	9.98	8.01	5.9	2130					0.009								<0.005			<3.0	<0.010	<0.050						8.35		13
NPDES005	6/8/20	230		8.81	8.14	14.7	316	32.6	11.1	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	0.658	0.036		256	127	8.54	97	<10.0
NPDES005	6/22/20	320	131	8.53	8.34	12	380					0.009								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	7/6/20	360		8.16	8.15	14.3	897	42.6	14.7	<0.0002		0.015	<0.001	0.002	<0.005		0.003			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.08	0.039		328	167	8.29	173	42
NPDES005	7/21/20	360	200	8.85	8.28	10.4	375					0.01								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005	8/3/20	350		8.08	8.38	18.2	350	42.5	16.2	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.42	0.038		370	173	8.42	167	<10.0
NPDES005	8/18/20	430	197	7.95	8.46	16.2	250					0.012								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005 - BIO	8/26/20				8.35	12.7	150	50.3	22.7	<0.0002		0.012	<0.001	<0.001	<0.005	0.128	<0.001	<0.005		<0.005	<0.001	<0.050		<0.010		1.96	0.013			219		220	<10.0
NPDES005	8/31/20	410	208	8.7	8.54	12.3	250					0.01								<0.005			<3.0	<0.010	<0.050						8.57		<10.0
NPDES005	9/8/20	420	141	10.2	8.61	4.7	285	45.7	20.8	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.91	0.027		417	200	8.43	153	<10.0
NPDES005	9/21/20	420	189	8.91	8.44	9.6	150					0.008								<0.005			<3.0	<0.010	<0.050						8.4		<10.0
NPDES005	10/5/20	440	225	9.13		10.1	145	54.4	23.3	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.06	0.094		456	232	8.41	231	<10.0
NPDES005	10/19/20	470	143	9.34	8.72	2.6	130	51.5	22.9			0.009		<0.001						<0.005	<0.001		<3.0	<0.010	<0.050					223	8.4		<10.0
NPDES005	11/2/20	480	264	10.9	8.12	2.8	125	51.1	21.8	<0.0002		0.009	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.1	0.025		456	217	8.46	222	<10.0
NPDES005	11/16/20	500	189	10.4	8.62	0.8	125					0.009								<0.005			<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	11/30/20	550	233	11.4	8.43	1.2	125					0.011								<0.005			<3.0	<0.010	<0.050						8.33		<10.0

Table D-4. Water Quality Results at the CP005/NPDES005 Site From January 5, 2015, Through December 28, 2021 (Page 5 of 5)

Sample Name	Date Sampled	Cond, Field µmhos/cm	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Calcium – D (mg/L)	Magnesium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Arsenic – TR (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Iron - TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – T (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc - TR (mg/L)	BOD, 5-Day (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	Phosphorus – D (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	Hardness (mg/L)	pH (SU)	TDS (mg/L)	TSS (mg/L)
NPDES005	12/14/20	520		10.8	8.54	1	100	58.5	27.6	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.58	0.026		506	260	8.39	270	<10.0
NPDES005	12/29/20	520		10	8.51	3.8	100					0.01								<0.005			<3.0	<0.010	<0.050		0.026				8.35		<10.0
NPDES005	1/12/21	530		10.9	8.26	0.1	100	57.6	26	<0.0002		0.01	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.63	0.015		506	251	8.35	363	<10.0
NPDES005	1/26/21	540	201	11.5	8.43	0.5	100					0.01								<0.005			<3.0	<0.010	<0.050						8.33		<10.0
NPDES005	2/8/21	520		10.7	8.6	0.4	100	60.8	28.3	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.73	0.022		527	268	8.22	246	11
NPDES005	2/23/21	480	240	11	8.16	2	90					0.014								<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES005	3/9/21	470		9.82	8.57	4	130	57.1	24.5	<0.0002		0.015	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.33	0.028		490	244	8.39	243	<10.0
NPDES005	3/23/21	400		10.7	8.03	3.3	160					0.01								<0.005			<3.0	<0.010	<0.050						8.32		<10.0
NPDES005	4/5/21	340		10.9	8.4	3.8	450	39.5	14.9	<0.0002		0.008	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	1.87	0.027		342	160	8.28	173	<10.0
NPDES005	4/20/21	330		11.5	8.32	1.7	380					0.007								<0.005			<3.0	<0.010	<0.050						8.19		<10.0
NPDES005	5/3/21	210		9.7	8.73	5	1800	23.6	6.3	<0.0002		0.009	<0.001		<0.005		0.002			<0.005		<0.050	<3.0	<0.010	<0.050	1.22	0.023		208	84.9	8	130	11
NPDES005	5/18/21	230		8.77	7.82	13.8	707					0.009								<0.005			<3.0	<0.010	<0.050						8.38		<10.0
NPDES005	5/31/21	220		10.2	8.57	12.6	525					0.008								<0.005			<3.0	<0.010	<0.050						8.37		<10.0
NPDES005	6/14/21	300		8.16	8.46	19.8	500	34	13.1	<0.0002		0.01	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.02	0.035		294	139	8.42	131	<10.0
NPDES005	6/28/21	350		8.36	8.59	14	300					0.009								<0.005			<3.0	<0.010	<0.050						8.52		<10.0
NPDES005	7/15/21	320		8.12	8.47	18.4	220	38.4	14.5	<0.0002		0.024	<0.001	<0.001	<0.005		0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	0.87	0.034		329	156	8.4	164	20
NPDES005	7/26/21	360		7.68	8.57	17.3	250					0.011								<0.005			<3.0	<0.010	<0.050						8.43	189	<10.0
NPDES005	8/11/21	420		8.8	7.46	10.5	200	51.6	22.8	<0.0002		0.01	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	1.9	0.026		437	222	8.36	195	<10.0
NPDES005 - BIO	8/23/21	450		9.26	8.55	11.8	175	54.1	23.1	<0.0002		0.01	<0.001	<0.001	<0.005	0.061	<0.001	<0.005		<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.05	0.026		455	230	8.52	231	<10.0
NPDES005	9/6/21	460		8.77	8.46	13.3	165	52.1	24.2	<0.0002		0.011	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.12	0.01		466	230	8.45	215	<10.0
NPDES005	9/23/21	480		9.19	8.43	6.6	150				0.01								<0.005				<3.0	<0.010	<0.050						8.39		<10.0
NPDES005	10/4/21	490		9.86	8.37	8.7	145	58.1	25.3	<0.0002		0.011	<0.001	<0.001	<0.005		<0.001			<0.005	<0.001	<0.050	<3.0	<0.010	<0.050	2.59	0.014		504	249	8.37	240	<10.0
NPDES005	10/18/21	380		9.7	8.33	6.3	200					0.029								<0.005			<3.0	<0.010	<0.050						8.27		12
NPDES005	11/2/21	440		11.8	8.25	0.8	200	55.1	18.7	<0.0002		0.01	<0.001		<0.005		0.002			<0.005		<0.050	<3.0	<0.010	<0.050	2.12	0.037		420	215	8.23	192	<10.0
NPDES005	11/15/21	400		11.2	8.52	4.1	150					0.015								<0.005			<3.0	<0.010	<0.050						8.35		<10.0
NPDES005	12/2/21	430		10.4	8.56	5	130	48.5	22.2	<0.0002		0.01	<0.001		<0.005		<0.001			<0.005		<0.050	<3.0	<0.010	<0.050	2.08	<0.050		440	212	8.33	213	<10.0
NPDES005	12/13/21	460		10.9	8.35	1.6	125					0.011								<0.005			<3.0	<0.010	<0.050						8.29		<10.0
NPDES005	12/28/21	490		11.4	8.58	0.8	115					0.011								<0.005			3.1	<0.010	<0.050						8.25		<10.0

Notes:
D = dissolved
T = total
TR = total recoverable
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids

Table D-5. Water Quality Results at the 46MN31 Site From February 10, 2015, Through August 23, 2021

Sample Name	Date Sampled	Cond, Field µmhos/cm	Field Depth (ft)	Field Width (ft)	DO, Field (mg/L)	pH, Field (SU)	Temp water, Field (°C)	Temp air, Field (°C)	Arsenic – D (mg/L)	Cadmium – D (mg/L)	Calcium – D (mg/L)	Chromium – D (mg/L)	Copper – D (mg/L)	Lead - D (mg/L)	Magnesium – D (mg/L)	Mercury – D (mg/L)	Nickel – D (mg/L)	Selenium – D (mg/L)	Silver – D (mg/L)	Zinc – D (mg/L)	Mercury – T (mg/L)	Aluminum – TR (mg/L)	Arsenic - T (mg/L)	Cadmium – TR (mg/L)	Chromium – TR (mg/L)	Copper – TR (mg/L)	Lead – TR (mg/L)	Nickel – TR (mg/L)	Selenium – TR (mg/L)	Silver – TR (mg/L)	Zinc – TR (mg/L)	CN, WAD (mg/L)	N, Ammonia (mg/L)	N, Nitrate+Nitrite (mg/L)	Kjeldahl nitrogen – T (mg/L)	Phosphorus – T (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Organic Carbon – D (mg/L)	TDS (mg/L)	TSS (mg/L)
46MN31	2/10/15	417	0.5	8	11.5	8.4	2	8	11.29	0.001	49.67	0.001	0.005	0.0001	20.23	0.0002	0.005	0.0005	0.001	0.05	0.0002		0.01262	0.001	0.0001	0.0005	0.00102	0.0005	0.005	0.001	0.05	0.01	0.05	5.1	0.5	0.052	170	207		230	0
46MN31	5/18/15	187	1.2	10	11	8.2	5	6	10.24	0.001	22.97	0.001	0.005	0.0001	7.32	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	1.17	0.5	0.083		87		139	0
46MN31	8/17/15	427	0.8	8	9	8.4	11	14	11.24	0.001	53.05	0.001	0.005	0.0001	20.56	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	4.38	0.67	0.136		217	2.12	255	39
46MN31	11/9/15	494	0.5	7	11.2	8.7	2	8	10	0.001	59.6	0.001	0.005	0.0001	24.7	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	6.6	0.5	0.039		251	1.84	259	0
46MN31	2/1/16	530	0.6	7	11.7	8.5	0	-4	10	0.001	61.9	0.001	0.005	0.0001	24.7	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	7.21	0.5	0.042		256	2.07	286	10
46MN31	5/4/16	226	1	7	11.3	8.4	5	19	6	0.001	25.1	0.001	0.005	0.0001	9.2	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	1.39	0.5	0.048		101	2.89	131	10
46MN31	8/16/16	451	0.1	4	10.1	8.8	13	26	10	0.001	56.2	0.001	0.005	0.0001	23.2	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.76	0.5	0.049		236	1.56	259	10
46MN31	11/8/16	348	0.2	4	12.5	8.4	2	20	10	0.001	55.4	0.001	0.005	0.0001	23.7	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.66	0.5	0.040		236	1.48	259	10
46MN31	2/6/17	452	0.2	4	10.7	8.7	0	8	20	0.001	54.9	0.001	0.005	0.0001	22	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.65	0.5	0.059		228	1.32	228	10
46MN31	5/15/17	318	0.2	5	11.1	8.7	9	16	10	0.001	39.1	0.001	0.005	0.0001	13.9	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	2.47	0.5	0.051		155	2.48	171	10
46MN31	8/29/17	434	0.2	4	10	8.2	12	24	20	0.001	54.8	0.001	0.005	0.0001	21.3	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.9	0.5	0.054		224	1.52	221	10
46MN31	11/16/17	482	0.3	5	12.2	8.1	1	11	20	0.001	60	0.001	0.005	0.0001	24.1	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	6.77	0.5	0.046		249	1.90	266	10
46MN31	2/14/18	482	0.3	3	12	8.4	0	4	20	0.001	55.5	0.001	0.005	0.0001	22.9	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	6.05	0.5	0.061		233	1.09	220	10
46MN31	5/24/18	248	0.3	7	10.6	8.4	9	18	8	0.001	28.9	0.001	0.005	0.0001	9.29	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	1.82	0.5	0.055		110	3.19	137	10
46MN31	8/22/18	344	0.3	7	10.1	8.5	11	17	10	0.001	39.6	0.001	0.005	0.0001	13.7	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	2.81	0.5	0.060		155	2.51	174	10
46MN31	11/20/18	444	0.4	7	12.1	8.5	0	-1	10	0.001	49.7	0.001	0.005	0.0001	20.4	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.58	0.5	0.043		208	1.41	204	10
46MN31	2/20/19	395	0.3	5	12.9	8.4	0	-6	20	0.001	54.6	0.001	0.005	0.0001	21.4	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	6.83	0.5	0.048		225	1.03	273	10
46MN31	5/24/19	245	1	7	11.4	8.1	4	3	10	0.001	29	0.001	0.005	0.0001	9.44	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	1.43	0.5	0.057		111	2.96	141	10
46MN31	8/15/19	396	0.5	7	9.4	8.6	11		10	0.001	50.3	0.001	0.005	0.0001	17.7	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	3.94	0.5	0.197		198	2.82	242	70
46MN31	11/4/19	446	0.4	8	12.3	8.8	4		10	0.001	52.7	0.001	0.005	0.0001	18.2	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	5.01	0.5	0.044		207	1.54	221	10
46MN31	2/21/20	491	0.4	5	13.3	8.2	0		10	0.001	58.2	0.001	0.005	0.0001	20.3	0.0002	0.005	0.0005	0.001	0.05	0.0002											0.01	0.05	6.8	0.5	0.041		229	1.31	258	10
46MN31	5/18/20	198	0.8	8	10.3	7.9	8		7	0.001	24.5	0.001	0.005	0.0001	7.43	0.0002	0.005	0.0005	0.001	0.05	0.0002	1190										0.01	0.05	0.754	0.5	0.033		91.8	3.41	118	10
46MN31	8/25/20	442	0.3	6	8.3	8.5	16		20	0.001	55.2	0.001	0.005	0.0001	20	0.0002	0.005	0.0005	0.001	0.05	0.0002	200										0.01	0.05	4.96	0.5	0.050		220	2.39	240	10
46MN31	11/18/20	462	0.4	7	12.4	8.6	2		13	0.001	53.9	0.001	0.005	0.0001	20.5	0.0002	0.005	0.0005	0.001	0.05	0.0002	28.7										0.01	0.05	5.66	0.5	0.048		219	1.81	215	10
46MN31	2/3/21	491	0.3	6	12.1	8.6	0		16	0.001	60.3	0.001	0.005	0.0001	24	0.0000	0.000	0.0000	0.000	0.00	0.0000	44.1										0.00	0.00	6.01		0.056		249	1.54	252	0
46MN31	5/12/21	254	0.4	9	11	8.4	4		8.67	0.001	29.2	0.001	0.005	0.0001	9.44	0.0000	0.000	0.0000	0.000	0.00	0.0000	639										0.00	0.00	1.71		0.047		112	3.14	133	0
46MN31	8/23/21	447	0.3	8	9.6	8.8	12		14.9	0.001	55.6	0.001	0.005	0.0001	22.6	0.0000	0.000	1.31	0.000	0.00	0.0000	79.7										0.00	0.00	4.62	0	0.047		232	1.79	237	0

Notes:
D = dissolved
T = total
TR = total recoverable
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids

Table D-6. Water Quality Results at the Lost Camp Site From August 12, 2015, Through August 11, 2021 (Page 1 of 2)

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium–D (mg/L)	Mercury–T (mg/L)	Arsenic–T (mg/L)	Gold-T (mg/L)	Selenium–T (mg/L)	Bicarbonate (mg/L)	CN, Total (mg/L)	CN, WAD (mg/L)	Fluoride (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TDS (mg/L)	TSS (mg/L)
LOST CAMP	8/12/15	590	33	9.28	8.61	11.8	30	16.6	<0.0002	0.02	0.004	<0.005	261	0.018	<0.010	0.139	<0.050	7.31	<0.050	43.6	564	8.5	305	<10.0
LOST CAMP	8/8/16	280	193	9.94	8.18	15.6	75	3.96	<0.0002	<0.005	<0.001	<0.005	157	<0.010	<0.010	0.118	<0.050	0.209	<0.050	<10.0	272	8.12	151	<10.0
LOST CAMP	8/24/16	290		8.47	8.37	11.8																		<10.0
LOST CAMP	8/30/16	540	48	11.2	8.63	12.1	60															8.45	332	<10.0
LOST CAMP	10/10/16	320	184	11.3	8.18	8.4		4.68	<0.0002				185		<0.010	0.141	<0.050	0.262	0.11	<10.0	317	7.98	183	
LOST CAMP	10/24/16	280	55	14.2	8.41	7.8	25	3.6	<0.0002	<0.005	<0.001	<0.005	175	<0.010	<0.010	0.114	<0.050	0.072	<0.050	<10.0	296	8.15	158	<10.0
LOST CAMP	11/7/16	310	110	13.5	8.24	4.4	25	3.66	<0.0002	<0.005	<0.001	<0.005	183	<0.010	<0.010	0.117	<0.050	0.165	<0.050	<10.0	308	7.98	144	<10.0
LOST CAMP	11/21/16	330	125	15.1	8.33	5.3	20	4.55	<0.0002	<0.005	0.001	<0.005	192	<0.010	<0.010	0.127	<0.050	0.458	<0.050	<10.0	325	8.02	154	<10.0
LOST CAMP	12/5/16	340	154	14.1	8.16	1.7	20	4.67	<0.0002	<0.005	<0.001	<0.005	192	<0.010	<0.010	0.136	<0.050	0.485	<0.050	<10.0	326	7.87	182	<10.0
LOST CAMP	12/19/16	350		11.3	7.99	1.3	1	4.88	<0.0002	0.006	0.001	<0.005	203	<0.010	<0.010	0.147	<0.050	0.726	<0.050	<10.0	344	7.9	172	117
LOST CAMP	1/3/17	180	145	13.5	8.59	1.3	20	3.87	<0.0002	<0.005	0.001	<0.005	187	<0.010	<0.010	0.136	<0.050	0.31	<0.050	<10.0	313	7.92	155	77
LOST CAMP	1/16/17	350	60	8.78	8.03	8.6	15	5.85	<0.0002	0.006	<0.001	<0.005	206	<0.010	<0.010	0.119	<0.050	0.779	<0.050	<10.0	344	7.87	177	93
LOST CAMP	1/30/17	340	116	12.5	7.59	2.4	20	5.4	<0.0002	0.006	<0.001	<0.005	196	<0.010	<0.010	0.128	<0.050	0.716	<0.050	<10.0	332	7.9	171	<10.0
LOST CAMP	2/13/17	340	147	13.4	8.19	1.8	10	4.77	<0.0002	0.006	<0.001	<0.005	197	<0.010	<0.010	0.135	<0.050	0.672	<0.050	<10.0	338	7.92	178	15
LOST CAMP	2/27/17	300	148	13.61	8.24	1.2	20	3.26	<0.0002	<0.005	<0.001	<0.005	176	<0.010	<0.010	0.124	<0.050	0.498	<0.050	<10.0	305	7.94	133	<10.0
LOST CAMP	3/14/17	290	172	13.71	8.23	0.1	20	3.07	<0.0002	<0.005	<0.001	<0.005	152	<0.010	<0.010	0.122	<0.050	0.56	<0.050	<10.0	271	8	140	<10.0
LOST CAMP	3/27/17	170	135	12.52	8.28	6.8	100	3.69	<0.0002	<0.005	<0.001	<0.005	80.7	<0.010	<0.010	0.09	<0.050	0.865	<0.050	<10.0	192	7.77	115	<10.0
LOST CAMP	4/11/17	200	131	14.06	8.31	6.5	150	3.49	<0.0002	<0.005	0.002	<0.005	78.1	<0.010	<0.010	0.088	<0.050	0.506	<0.050	<10.0	195	7.98	112	<10.0
LOST CAMP	5/24/17	180	172	10.06	7.82	5.2	450	4.24	<0.0002	<0.005	<0.001	<0.005	57.9	<0.010	<0.010	0.077	<0.050	0.605	<0.050	<10.0	180	7.9	107	<10.0
LOST CAMP	6/12/17	190	64	7.83	8.4	15.6	90	4.02	<0.0002	<0.005	<0.001	<0.005	73.9	<0.010	<0.010	0.092	<0.050	0.164	<0.050	<10.0	189	8	107	22
LOST CAMP	8/7/17	250	101	7.79	8.25	13.8	20	4.06	<0.0002	0.017	<0.001	<0.005	138	<0.010	<0.010	0.124	<0.050	0.079	<0.050	<10.0	255	8.13	198	41
LOST CAMP	1/4/18	440	226	5.29	7.69	7	30	9.63	<0.0002	<0.005	<0.001	<0.005	236	<0.010	<0.010	0.174	<0.050	1.73	<0.050	18.4	437	7.81	208	<10.0
LOST CAMP	4/11/18	260	118	10.9	7.65	2.5	50	7.77	<0.0002	<0.005	0.001	<0.005	93	<0.010	<0.010	0.088	<0.050	0.786	<0.050	<10.0	238	7.76	135	<10.0
LOST CAMP	5/10/18	160	151	10.37	7.86	5.6	1300	4.34	<0.0002	<0.005	<0.001	<0.005	50.6	<0.010	<0.010	0.09	<0.050	0.455	<0.050	<10.0	157	7.62	112	<10.0
LOST CAMP	8/13/18	240	165	8.43	8.15	14.2	360	4.2	<0.0002	0.007	<0.001	<0.005	104	<0.010	<0.010	0.103	<0.050	<0.050	<0.050	<10.0	227	8.22	122	<10.0
LOST CAMP	10/24/18	260	168	10.06	7.82	2.4	25	4.08	<0.0002	<0.005	<0.001	<0.005	140	<0.010	<0.010	0.096	<0.050	0.198	<0.050	<10.0	264	8.11	107	<10.0
LOST CAMP	11/5/18	240	202	11.08	7.82	0.9	30	3.82	<0.0002	<0.005	<0.001	<0.005	119	<0.010	<0.010	0.098	<0.050	0.244	<0.050	<10.0	243	8.18	108	<10.0
LOST CAMP	12/10/18	250	195	11.17	7.57	-0.6	30	4.73	<0.0002	<0.005	<0.001	<0.005	152	<0.010	<0.010	0.103	<0.050	0.505	<0.050	<10.0	297	7.93	143	<10.0
LOST CAMP	1/7/19	300	195	11.09	7.71	-0.3	30	4.91	<0.0002	0.005	<0.001	<0.005	161	<0.010	<0.010	0.112	<0.050	0.583	<0.050	<10.0	304	7.99	157	<10.0
LOST CAMP	4/1/19	170	200	11.04	7.37	0.3	70	4.1	<0.0002	0.005	<0.001	<0.005	68.2	<0.010	<0.010	0.088	<0.050	0.692	<0.050	<10.0	184	7.67	97	<10.0
LOST CAMP	5/14/19	140	204	10.45	8.05	6.9	3000	3.51	<0.0002	<0.005	<0.001	<0.005	65.5	<0.010	<0.010	0.096	<0.050	0.28	<0.050	<10.0	148	7.91	115	13
LOST CAMP	8/5/19	220	182	7.86	8.38	16.2	600	3.63	<0.0002	0.007	<0.001	<0.005	108	<0.010	<0.010	0.105	<0.050	<0.050	0.161	<10.0	224	8.19	124	<10.0
LOST CAMP	1/6/20	250	213	11.72	8.12	-0.5	30	4.29	<0.0002	<0.005	<0.001	<0.005	124	<0.010	<0.010	0.092	<0.050	0.976	<0.050	<10.0	257	7.91	134	<10.0
LOST CAMP	4/13/20	140	250	11.58	7.75	-5	225	4.11	<0.0002	0.007	<0.001	<0.005	58.6	<0.010	<0.010	0.107	<0.050	0.665	<0.050	<10.0	147	7.67	102	<10.0
LOST CAMP	5/11/20	150	231	10.86	7.59	2.9	1000	3.2	<0.0002	0.006	<0.001	<0.005	69.3	<0.010	<0.010	0.104	<0.050	1.23	<0.050	<10.0	152	7.85	90	<10.0
LOST CAMP	8/3/20	260	178	8.01	8.1	17.9	170	4.24	<0.0002	0.007	<0.001	<0.005	114	<0.010	<0.010	0.085	<0.050	0.697	<0.050	<10.0	264	8.16	128	12
LOST CAMP	1/12/21	420	225	10.25	7.61	0.3	<5	8.47	<0.0002	0.012	<0.001	<0.005	241	<0.010	<0.010	0.172	<0.050	1.13	<0.050	12.9	407	8.03	188	<10.0

Table D-6. Water Quality Results at the Lost Camp Site From August 12, 2015, Through August 11, 2021 (Page 2 of 2)

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium–D (mg/L)	Mercury–T (mg/L)	Arsenic–T (mg/L)	Gold-T (mg/L)	Selenium–T (mg/L)	Bicarbonate (mg/L)	CN, Total (mg/L)	CN, WAD (mg/L)	Fluoride (mg/L)	N, Ammonia (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TDS (mg/L)	TSS (mg/L)
LOST CAMP	1/12/21	420	225	10.25	7.61	0.3	<5	8.47	<0.0002	0.012	<0.001	<0.005	241	<0.010	<0.010	0.172	<0.050	1.13	<0.050	12.9	407	8.03	188	<10.0
LOST CAMP	4/5/21	230	120	11.85	8.06	2.3	150	3.67	<0.0002	<0.005	<0.001	<0.005	84	<0.010	<0.010	0.078	<0.050	1.69	<0.050	<10.0	240	7.86	122	<10.0
LOST CAMP	5/3/21	200	235	10.12	8.24	4.4	1400	5.37	<0.0002	0.006	<0.001	<0.005	65.8	<0.010	<0.010	0.077	<0.050	1.36	<0.050	<10.0	201	7.92	128	<10.0
LOST CAMP	8/11/21	290	222	8.89	7.97	10.6	50	6.31	<0.0002	<0.005	<0.001	<0.005	135	<0.010	<0.010	0.091	<0.050	0.702	<0.050	<10.0	293	8.27	146	<10.0

Notes:
ORP = oxygen reduction potential
D = dissolved
T = total
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids

Table D-7. Water Quality Results at the SS-20 Site From January 10, 2015, Through August 14, 2021

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Selenium – T (mg/L)	Bicarbonate (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TSS (mg/L)
SS20	1/10/15				DRY											
SS20	4/30/15	390	7.25	6.1	45	22.4	<0.0002	0.014	<0.005	95	1.65	<0.050	12	362	7.46	<10.0
SS20	5/21/15	440	7.52	6.6	95	30.2	<0.0002	0.019	<0.005	67.1	4.01	<0.050	11.2	415	7.21	<10.0
SS20	8/21/15	490	7.97	13.8	7	43.1	<0.0002	0.012	<0.005	104	2.7	<0.050	14.4	491	7.92	<10.0
SS20	1/21/16				FROZEN											
SS20	4/13/16	510	7.73	8.7	40	30.4	<0.0002	0.016	<0.005	108	2.9	<0.050	16.5	507	7.15	<10.0
SS20	5/4/16	570	7.4	8.3	50	43.7	<0.0002	0.016	<0.005	74.6	2.71	<0.050	13.3	546	7.2	<10.0
SS20	8/18/16				DRY											
SS20	1/19/17				FROZEN											
SS20	4/14/17	900	7.64	10	30	69	<0.0002	0.013	<0.005	97.7	4.2	<0.050	23.2	864	7.82	28
SS20	5/19/17	690	6.76	5.5	35	46.8	<0.0002	0.017	<0.005	99.3	4.52	<0.050	25.4	640	7.07	<10.0
SS20	8/22/17				DRY											
SS20	1/12/18				DRY											
SS20	4/17/18	820	7.52	5	50	68.3	<0.0002	0.014	<0.005	72.7	3.26	<0.050	19.1	786	7.6	<10.0
SS20	5/25/18	570	7.42	10.5	45	47.8	<0.0002	0.036	<0.005	88.5	1.72	<0.050	16.6	565	7.85	30
SS20	8/24/18	590	6.86	10	15	47.2	<0.0002	0.013	<0.005	113	2.28	<0.050	19.1	567	7.62	<10.0
SS20	1/23/19				DRY											
SS20	4/20/19	500	7.36	10.9	35	44.3	<0.0002	0.017	<0.005	73.2	2.02	<0.050	15.7	527	7.74	<10.0
SS20	5/21/19	600	7.34	3.3	40	47.1	<0.0002	0.019	<0.005	72.4	2.05	<0.050	15	569	7.44	<10.0
SS20	8/10/19				DRY											
SS20	1/10/20				DRY											
SS20	4/15/20	400	7.33	2.5	40	38	<0.0002	0.018	<0.005	62.8	0.92	<0.050	<10.0	408	7.74	<10.0
SS20	5/18/20	550	7.65	12.9	30	40.6	<0.0002	0.022	<0.005	90	1.29	<0.050	13.7	531	7.82	<10.0
SS20	8/13/20				DRY											
SS20	1/8/21				DRY											
SS20	4/2/21				DRY											
SS20	5/7/21	750	7.43	7.7	30	63.1	<0.0002	0.024	<0.005	93.1	2.14	<0.050	21.5	733	7.65	<10.0
SS20	8/14/21				DRY											

Notes:
No samples were taken on 1/21/2016 and 1/17/2017 because the creek was frozen and on 1/10/2015, 8/22/2017, 1/12/2018, 1/23/2019, 8/10/2019, and 1/10/2020 because the creek was dry.
D = dissolved
T = total
N = nitrogen
TSS = total suspended solids

Table D-8. Water Quality Results at the SS-04 Site From January 14, 2015, Through August 14, 2021

Sample Name	Date Sampled	Cond, Field (µmhos/cm)	ORP, Field (mV)	DO, Field (mg/L)	pH, Field (SU)	Temp, Field (°C)	Flow, Field (gpm)	Sodium – D (mg/L)	Mercury – T (mg/L)	Arsenic – T (mg/L)	Selenium – T (mg/L)	Bicarbonate (mg/L)	N, Nitrate (mg/L)	N, Nitrite (mg/L)	Sulfate (mg/L)	Conductivity (µmhos/cm)	pH (SU)	TSS (mg/L)
SS04	1/14/15	680	150	9.72	6.96	2.7	44	17.9	<0.0002	0.015	<0.005	48.2	0.673	<0.050	179	612	6.86	<10.0
SS04	4/30/15	220	-24	9.28	7.49	7.4	290	9.93	<0.0002	0.014	<0.005	36.2	0.809	<0.050	28.5	202	7.37	<10.0
SS04	5/21/15	230	-28	9.16	7.41	8.6	1510	13.2	<0.0002	0.026	<0.005	38.3	1.02	<0.050	24.4	217	7.43	25
SS04	8/25/15	570	-48	8.31	7.24	13.2	50	24.5	<0.0002	0.017	<0.005	66.1	1.03	<0.050	122	536	7.42	<10.0
SS04	1/20/16	890	-19	12.8	7.22	3.2	10	28.5	<0.0002	0.03	<0.005	55.3	0.18	<0.050	283	848	6.61	19
SS04	4/13/16	330	-36	9.2	7.62	9.8	110	20.3	<0.0002	0.02	<0.005	50	1.28	<0.050	37.1	319	7.06	<10.0
SS04	5/4/16	370	-16	9.5	7.41	7.1	300	26	<0.0002	0.017	<0.005	44.8	1.06	<0.050	28.9	359	7.24	<10.0
SS04	8/18/16	1140	-20	10.1	6.92	14.1	44	20.8	<0.0002	0.007	<0.005	77.2	0.331	<0.050	473	1190	7.04	<10.0
SS04	1/18/17	1000	-31	14.04	7.18	5.7	18	32.2	<0.0002	0.017	<0.005	90.6	0.114	<0.050	337	1030	6.98	16
SS04	4/14/17	430	-48	10.43	7.51	8.4	90	20.9	<0.0002	0.012	<0.005	52.5	1.29	<0.050	52.5	404	7.41	12
SS04	5/23/17	440	49	9.65	7.8	8.8	100	21.9	<0.0002	0.019	<0.005	61	1.15	<0.050	53.8	414	7.51	28
SS04	8/22/17	1040	3	7.99	7.03	16.3	20	20.6	<0.0002	0.009	<0.005	67.6	0.196	<0.050	417	1050	6.96	14
SS04	1/12/18	1170	-33	9.79	6.9	2.6	10	23.7	<0.0002	0.027	<0.005	70.8	0.249	<0.050	451	1090	6.98	25
SS04	4/17/18	770	2	9.99	7.35	3.9	200	48.9	<0.0002	0.02	<0.005	71.2	2.21	<0.050	53.3	723	7.5	13
SS04	5/25/18	360	-48	8.26	7.11	11.2	250	17.3	<0.0002	0.035	<0.005	53.8	0.776	<0.050	50	355	7.44	32
SS04	8/24/18	630	-63	8.3	7.14	11	45	29.3	<0.0002	0.071	<0.005	94.7	0.867	<0.050	118	627	7.56	234
SS04	1/23/19	830	27	10.05	7.05	1.4	25	21.2	<0.0002	0.018	<0.005	63.3	0.626	<0.050	241	811	6.98	11
SS04	4/20/19	290	22	9.38	6.99	6.7	300	19.5	<0.0002	0.028	<0.005	48.7	0.929	<0.050	27.7	296	7.48	19
SS04	5/23/19	320	124	9.93	7.5	4.3	600	18.2	<0.0002	0.02	<0.005	44.1	0.856	<0.050	35.7	308	7.31	<10.0
SS04	8/10/19	630	5	8.5	7.2	12.5	40	23.9	<0.0002	0.015	<0.005	68.9	0.545	<0.050	169	640	7.38	<10.0
SS04	1/9/20	880	51	9.71	6.99	3.4	55	24.4	<0.0002	0.014	<0.005	57	1.04	<0.050	287	860	6.97	32
SS04	4/15/20	430	172	10.32	7.02	2.2	225	26.1	<0.0002	0.016	<0.005	54.5	0.976	<0.050	57.1	424	7.41	<10.0
SS04	5/19/20	200	99	7.69	7.3	15.8	1400	10	<0.0002	0.031	<0.005	37.4	0.717	<0.050	25.4	196	7.57	19
SS04	8/13/20	790	4	7.73	7.08	14.5	35	25.4	<0.0002	0.01	<0.005	67.5	0.474	<0.050	263	856	7.15	<10.0
SS04	1/8/21	900	68	10.11	7.44	3.2	15	32.5	<0.0002	0.008	<0.005	57.3	1.83	<0.050	260	852	7.33	<10.0
SS04	4/8/21	670	163	10.45	7.53	3.1	100	34	<0.0002	0.013	<0.005	66	3.3	<0.050	77.3	631	7.35	<10.0
SS04	5/7/21	340	31	9.42	7.3	10.6	525	20	<0.0002	0.016	<0.005	44.8	1.53	<0.050	33.1	317	7.42	<10.0
SS04	8/14/21	990	17	7.46	6.75	15.7	15	36.3	<0.0002	0.012	<0.005	59.8	0.317	<0.050	340	1110	7.16	<10.0

Notes:
No samples were taken on 1/21/2016 and 1/17/2017 because the creek was frozen and on 1/10/2015, 8/22/2017, 1/12/2018, 1/23/2019, 8/10/2019, and 1/10/2020 because the creek was dry.
D = dissolved
T = total
N = nitrogen
TSS = total suspended solids

APPENDIX E

WATER QUALITY STATISTICS BY SITE

Table E-1. Statistics for the Water Quality Parameters at the Annie Creek at USGS Site (January 2015 Through August 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	32	NA	NA	353.44	112.07	180	255	395	447.5	570
ORP, Field	32	NA	NA	138.91	57.70	-13	120.75	144.5	173	224
DO, Field	32	NA	NA	10.56	1.69	7.54	9.735	10.375	11.4725	14.5
pH, Field	32	NA	NA	8.37	0.36	7.49	8.2075	8.45	8.65	8.89
Temp water, Field	32	NA	NA	7.23	5.74	0.1	2.925	6.2	11.65	19.8
Flow, Field	27	NA	NA	1510.01	2383.54	3.9	43.89	420.08	2261	7934
Sodium - D	32	0.02	0	6.15	2.03	3.52	4.75	5.59	7.5325	11.5
Mercury - T	32	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Arsenic - T	32	0.0005	0	0.01	0.00	0.007	0.01175	0.0135	0.016	0.018
Gold - T	32	0.001	0.03125	0.00	0.00	0.0005	0.00175	0.004	0.007	0.011
Selenium - T	32	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Bicarbonate	32	0.513	0	170.58	59.09	71.5	114	183.5	226	250
CN, Total	32	0.00037	0	0.01	0.00	0.005	0.005	0.005	0.005	0.012
CN, WAD	32	0.00055	0	0.01	0.00	0.005	0.005	0.005	0.005	0.005
Fluoride	32	0.004	0	0.20	0.06	0.122	0.13575	0.2095	0.25525	0.282
N, Ammonia	32	0.007	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
N, Nitrate	32	0.056	0	3.53	2.24	0.682	1.48	3.475	5.7775	7.36
N, Nitrite	32	0.005	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
Sulfate	32	0.679	0	14.85	11.37	0.5	0.5	17.55	24.325	38.1
Conductivity	32	0.153	0	349.72	112.38	175	239.5	389	453.5	514
pH	32	NA	0	8.23	0.21	7.77	8.1275	8.25	8.36	8.63
TDS	32	17.6	0	187.13	57.09	103	132	182	236	285
TSS	30	3.49	0	9.17	8.85	5	5	5	10	37

Table E-2. Statistics for the Water Quality Parameters at the Annie Creek II Site (January 2015 Through August 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	27	NA	NA	840.00	111.22	620	770	870	920	1030
ORP, Field	27	NA	NA	128.16	73.14	-0.6	76	150	197	246
DO, Field	27	NA	NA	10.02	1.00	8.39	9.565	9.9	10.18	12.44
pH, Field	27	NA	NA	7.76	0.22	7.37	7.615	7.73	7.9	8.46
Temp water, Field	27	NA	NA	6.34	2.27	2.7	4.65	5.4	8.4	11
Flow, Field	26	NA	NA	129.85	109.55	0.175	75.62	95.76	206.1	441
Sodium - D	29	0.02	0	17.10	2.02	13	15.7	17.2	18.7	21.2
Mercury - T	29	0.000035	0	0.00	0.00	0.00005	0.00005	0.00005	0.00005	0.00005
Arsenic - T	29	0.0005	0	0.06	0.01	0.048	0.055	0.058	0.066	0.081
Gold - T	29	0.001	0	0.00	0.00	0.00028	0.00028	0.00028	0.00028	0.00028
Selenium - T	28	0.001	0	0.01	0.00	0.008	0.011	0.013	0.015	0.017
Bicarbonate	29	0.513	0	144.83	12.36	112	140	147	155	164
CN, Total	29	0.00037	0	0.01	0.00	0.005	0.005	0.005	0.01	0.013
CN, WAD	29	0.00055	0	0.00	0.00	0.002	0.002	0.002	0.002	0.002
Fluoride	29	0.004	0	0.36	0.04	0.305	0.333	0.358	0.399	0.446
N, Ammonia	29	0.007	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N, Nitrate	29	0.056	0	19.16	3.86	11.8	16.6	19.7	22.5	26.5
N, Nitrite	29	0.005	0	0.25	0.00	0.25	0.25	0.25	0.25	0.25
Sulfate	29	0.679	0	232.10	38.36	135	197	244	260	299
Conductivity	29	0.153	0	817.24	106.44	590	729	851	889.5	1010
pH	29	NA	0	7.85	0.10	7.61	7.79	7.85	7.925	8.03
TDS	29	17.6	0	547.41	79.63	366	494	571	607.5	682
TSS	27	3.49	0	0.00	0.00	0	0	0	0	0

Table E-3. Statistics for the Water Quality Parameters at the Lost Camp Site (August 2015 Through August 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	41	NA	NA	279.51	100.50	140	200	260	335	590
ORP, Field	39	NA	NA	158.92	56.74	33	122.5	168	202	250
DO, Field	41	NA	NA	10.91	2.16	5.29	9.94	11.04	12.51	15.1
pH, Field	41	NA	NA	8.05	0.32	7.37	7.82	8.12	8.265	8.63
Temp water, Field	41	NA	NA	5.65	5.64	-5	1.3	4.4	9.6	17.9
Flow, Field	39	NA	NA	249.38	564.03	1	20	30	150	3000
Sodium - D	39	0.02	0	5.00	2.44	3.07	3.755	4.24	4.91	16.6
Mercury - T	39	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Arsenic - T	38	0.0005	0	0.01	0.00	0.0025	0.0025	0.0025	0.006	0.02
Gold - T	38	0.001	0.11	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.004
Selenium - T	38	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Bicarbonate	39	0.513	0	141.55	60.10	50.6	82.35	140	192	261
CN, Total	38	0.00037	0	0.01	0.00	0.005	0.005	0.005	0.005	0.018
CN, WAD	39	0.00055	0	0.01	0.00	0.005	0.005	0.005	0.005	0.005
Fluoride	39	0.004	0	0.11	0.03	0.077	0.0915	0.107	0.128	0.174
N, Ammonia	39	0.007	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
N, Nitrate	39	0.056	0	0.78	1.15	0.025	0.271	0.583	0.786	7.31
N, Nitrite	39	0.005	0	0.03	0.03	0.025	0.025	0.025	0.025	0.161
Sulfate	39	0.679	0	2.70	7.77	0.5	0.5	0.5	0.5	43.6
Conductivity	39	0.153	0	275.82	87.10	147	212.5	271	325	564
pH	40	NA	0	7.98	0.19	7.62	7.8925	7.96	8.1175	8.5
TDS	40	17.6	0	150.70	49.60	90	115	141.5	175.75	332
TSS	40	3.49	0	13.75	24.91	5	5	5	5	117

Table E-4. Statistics for the Water Quality Parameters at the SS-20 Site (April 2015 Through August 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	15	NA	NA	584.67	148.75	390	495	570	690	900
pH, Field	15	NA	NA	7.41	0.31	6.76	7.335	7.42	7.64	7.97
Temp water, Field	15	NA	NA	8.12	3.32	2.5	5.8	8.3	10.5	13.8
Flow, Field	15	NA	NA	39.13	19.51	7	30	40	45	95
Sodium - D	15	0.02	0	45.47	13.31	22.4	39.3	44.3	47.8	69
Mercury - T	15	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Arsenic - T	15	0.0005	0	0.02	0.01	0.012	0.014	0.017	0.019	0.036
Selenium - T	15	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Bicarbonate	15	0.513	0	87.43	15.87	62.8	72.95	90	99.3	113
N, Nitrate	15	0.056	0	2.56	1.07	0.92	1.87	2.28	3.26	4.52
N, Nitrite	15	0.005	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
Sulfate	15	0.679	0	15.81	5.89	0.5	13.5	15.7	19.1	25.4
Conductivity	15	0.153	0	567.40	139.43	362	499	546	640	864
pH	15	NA	0	7.55	0.28	7.07	7.325	7.62	7.82	7.92
TSS	15	3.49	0	8.20	8.45	5	5	5	5	30

Table E-5. Statistics for the Water Quality Parameters at the SS-04 Site (April 2015 Through August 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	28	NA	NA	626.43	300.45	200	355	630	887.5	1170
ORP, Field	28	NA	NA	20.46	66.90	-63	-28.75	3.5	50.5	172
DO, Field	28	NA	NA	9.55	1.42	7.46	8.4525	9.575	10.0875	14.04
pH, Field	28	NA	NA	7.23	0.25	6.75	7.0275	7.21	7.4325	7.8
Temp water, Field	28	NA	NA	8.12	4.75	1.4	3.35	7.9	12.175	16.3
Flow, Field	28	NA	NA	229.50	378.82	10	32.5	72.5	280	1510
Sodium - D	28	0.02	0	23.84	8.14	9.93	19.875	22.8	27.9	48.9
Mercury - T	28	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Arsenic - T	28	0.0005	0	0.02	0.01	0.007	0.01375	0.017	0.0245	0.071
Selenium - T	28	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Bicarbonate	28	0.513	0	58.84	14.55	36.2	48.575	57.15	67.575	94.7
N, Nitrate	28	0.056	0	0.94	0.68	0.114	0.52725	0.8615	1.1275	3.3
N, Nitrite	28	0.005	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
Sulfate	28	0.679	0	161.60	145.72	24.4	36.75	97.65	278	473
Conductivity	28	0.153	0	617.04	309.12	196	346	619.5	855	1190
pH	28	NA	0	7.25	0.25	6.61	7.025	7.34	7.4275	7.57
TSS	28	3.49	0	20.32	42.86	5	5	8	19	234

Table E-6. Statistics for the Water Quality Parameters at the 46MN31 Site (February 2015 Through August 2021) (Page 1 of 2)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	27	NA	NA	390.78	101.96	187	331	434	462	530
Field Depth	27	NA	NA	0.45	0.28	0.1	0.3	0.4	0.5	1.2
Field Width	27	NA	NA	6.41	1.74	3	5	7	8	10
DO, Field	27	NA	NA	11.11	1.23	8.3	10.2	11.2	12.1	13.3
pH, Field	27	NA	NA	8.45	0.23	7.9	8.4	8.4	8.6	8.8
Temp water, Field	27	NA	NA	5.30	5.04	0	0.5	4	11	16
Temp air, Field	18	NA	NA	10.61	9.33	-6	4.5	9.5	18.25	26
Arsenic - D	27	0.01	0	12.46	4.56	6	10	10	16	20
Cadmium - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium - D	27	1	0	47.77	12.67	22.97	39.35	53.9	55.6	61.9
Chromium - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Copper - D	27	0.005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Lead - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Magnesium - D	27	0.5	0	18.23	5.88	7.32	13.8	20.4	22.9	24.7
Mercury - D	27	0.005	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Nickel - D	27	0.005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium - D	27	0.0005	0	0.00	0.00	0.00131	0.0025	0.0025	0.0025	0.0025
Silver - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc - D	27	0.0005	0	0.25	0.00	0.25	0.25	0.25	0.25	0.25
Mercury - T	27	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Aluminum - TR	6	0.0001	0	363.58	464.84	28.7	53	139.85	776.75	1190
Arsenic - T	1	0.0005	0	0.01		0.01262	0.01262	0.01262		0.01262
Cadmium - TR	1	0.0001	0	0.00		0.0005	0.0005	0.0005		0.0005
Chromium - TR	1	0.0001	0	0.00		0.0005	0.0005	0.0005		0.0005
Copper - TR	1	0.0009	0	0.00		0.0025	0.0025	0.0025		0.0025
Lead - TR	1	0.000026	0	0.00		0.00102	0.00102	0.00102		0.00102
Nickel - TR	1	0.0005	0	0.00		0.0025	0.0025	0.0025		0.0025
Selenium - TR	1	0.001	0	0.00		0.0025	0.0025	0.0025		0.0025
Silver - TR	1	0.0002	0	0.00		0.0005	0.0005	0.0005		0.0005
Zinc - TR	1	0.006	0	0.03		0.025	0.025	0.025		0.025
CN, Total	3	0.00037	0	0.01	0.00	0.005	0.005	0.005	0.005	0.005
CN, WAD	27	0.00055	0	0.01	0.00	0.005	0.005	0.005	0.005	0.005
N, Ammonia	27	0.007	0	0.03	0.00	0.025	0.025	0.025	0.025	0.025
N, Nitrate+Nitrite	27		0	4.52	2.04	0.754	2.64	5.1	6.01	7.21
Kjeldahl nitrogen - T	25	0.5	0	0.05	0.13	0.025	0.025	0.025	0.025	0.67
Phosphorus - T	27	0.01	0	0.06	0.03	0.033	0.045	0.049	0.057	0.197

Table E-6. Statistics for the Water Quality Parameters at the 46MN31 Site (February 2015 Through August 2021) (Page 2 of 2)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Alkalinity	1	NA	0	170.00		170	170	170		170
Hardness	27	5	0	194.36	55.61	87.49985	155	219	233	256
D - Organic Carbon	25	0.2	0	2.04	0.71	1.03	1.52	1.84	2.665	3.41
TDS	27	17.6	0	213.67	51.21	118	172.5	228	258	286
TSS	27	3.49	0	8.67	13.89	5	5	5	5	70

Notes:
N/A = Not Available
D = dissolved
TR = total recoverable
T = total
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
All units are milligram per liter (mg/L) with the following exceptions: conductivity (micromhos per cm); depth and width (feet); pH (standard units); temperature (degrees Celsius)

Table E-7. Summary Statistics for the Water Quality Parameters at the CP001/NPDES001 (January 2015 Through December 2021)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	178	NA	NA	469.49	117.84	80	440	490	530	700
ORP, Field	58	NA	NA	149.03	63.37	-19	116.75	160	192	230
DO, Field	177	NA	NA	10.54	1.79	0.87	9.47	10.7	11.4	15.8
pH, Field	180	NA	NA	8.53	0.23	7.59	8.43	8.6	8.69	8.93
Temp water, Field	180	NA	NA	6.37	5.06	-4	1.7	5.5	10.2	19.7
Flow, Field	165	NA	NA	152.96	283.05	3	61.53	83	123.85	2432
Calcium - D	93	1	0	53.61	13.01	11.3	50	57.5	61.65	71.9
Magnesium - D	93	0.5	0	23.95	6.07	3.26	21.9	26.5	27.65	31.2
Mercury - T	91	0.000035	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0002
Arsenic - TR	187	0.0006	0	0.01	0.01	0.0025	0.011	0.013	0.015	0.038
Cadmium - TR	91	0.0001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium - TR	36	0.0001	0	0.00	0.00	0.0005	0.0005	0.0005	0.000875	0.004
Copper - TR	91	0.0009	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.009
Iron - TR	5	0.00056	0	0.08	0.12	0.0005	0.0005	0.0005	0.1875	0.268
Lead - TR	91	0.000026	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.004
Nickel - TR	5	0.0005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium - TR	188	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.007
Silver - TR	36	0.0002	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc - TR	91	0.006	0	0.03	0.03	0.025	0.025	0.025	0.025	0.272
BOD, 5-Day	187	NA	0	1.52	0.21	1.5	1.5	1.5	1.5	3.6
CN, WAD	197	0.00055	0	0.01	0.00	0.005	0.005	0.005	0.005	0.016
N, Ammonia	187	0.007	0	0.03	0.00	0.025	0.025	0.025	0.025	0.056
N, Nitrate	91	0.056	0	4.56	2.77	0.105	2.695	3.27	6.44	11.1
Phosphorus - D	7	0.004	0	0.02	0.01	0.005	0.0185	0.022	0.028	0.035
Sulfate	1	0.679	0	29.90		29.9	29.9	29.9		29.9
Conductivity	81	0.153	0	472.13	116.29	84.4	436	494	533	701
Hardness	93	5	0	232.58	56.99	41.6	210	252	267	308
pH	186	NA	0	8.44	0.13	7.83	8.39	8.46	8.52	8.68
TDS	93	17.6	0	254.81	64.85	79	222	256	295	418
TSS	188	3.49	0	5.06	0.57	5	5	5	5	11

Notes:
N/A = Not Available
D = dissolved
TR = total recoverable
T = total
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
All units are milligram per liter (mg/L) with the following exceptions: conductivity (micromhos per cm); depth and width (feet); pH (standard units); temperature (degrees Celsius)

Table E-8. Summary Statistics for the Water Quality Parameters at the CP005/NPDES005 (January 2015 Through December 2021) (Page 1 of 2)

Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
Cond, Field	277	NA	NA	476.71	206.07	140	340	460	555	1170
Field Depth	27	NA	NA	0.45	0.28	0.1	0.3	0.4	0.5	1.2
Field Width	27	NA	NA	6.41	1.74	3	5	7	8	10
ORP, Field	117	NA	NA	121.77	95.50	-63	31	151	204	264
DO, Field	263	NA	NA	10.30	1.56	0.92	9.3	10.2	11.1	15.6
pH, Field	278	NA	NA	8.14	0.53	6.75	7.7475	8.335	8.54	10.3
Temp water, Field	278	NA	NA	6.60	4.92	-3	2.525	5.5	10.3	19.8
Temp air, Field	18	NA	NA	10.61	9.33	-6	4.5	9.5	18.25	26
Flow, Field	245	NA	NA	541.06	1472.84	0.175	95.76	180	375	18600
Arsenic - D	27	0.01	0	12.46	4.56	6	10	10	16	20
Cadmium - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium - D	130	1	0	45.14	13.94	17.9	32.65	50	56.25	67.8
Chromium - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Copper - D	27	0.005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Lead - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Magnesium - D	130	0.5	0	18.54	7.57	4.74	11.1	20.5	24.225	42.5
Mercury - D	27	0.005	0	0.00	0.00	0.0001	0.0001	0.0001	0.0001	0.0001
Nickel - D	27	0.005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium - D	27	0.0005	0	0.00	0.00	0.00131	0.0025	0.0025	0.0025	0.0025
Silver - D	27	0.001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Sodium - D	72	0.02	0	25.63	13.26	9.93	17.275	20.2	30.35	69
Zinc - D	27	0.0005	0	0.25	0.00	0.25	0.25	0.25	0.25	0.25
Mercury - T	190	0.000035	0	0.00	0.00	0.00005	0.0001	0.0001	0.0001	0.0001
Aluminum - TR	6	0.0001	0	363.58	464.84	28.7	53	139.85	776.75	1190
Arsenic - T	74	0.0005	0	0.04	0.02	0.007	0.016	0.025	0.05625	0.081
Arsenic - TR	187	0.0006	0	0.01	0.00	0.006	0.009	0.01	0.012	0.032
Cadmium - TR	93	0.0001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium - TR	39	0.0001	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.022
Copper - TR	93	0.0009	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.009
Gold - T	29	0.001	0	0.00	0.00	0.00028	0.00028	0.00028	0.00028	0.00028
Iron - TR	5	0.00056	0	0.22	0.18	0.061	0.061	0.128	0.4125	0.437
Lead - TR	98	0.000026	0	0.00	0.00	0.0005	0.0005	0.0005	0.001	0.009
Nickel - TR	6	0.0005	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Selenium - T	72	0.001	0	0.01	0.01	0.0025	0.0025	0.0025	0.012	0.017
Selenium - TR	188	0.001	0	0.00	0.00	0.0025	0.0025	0.0025	0.0025	0.0025
Silver - TR	39	0.0002	0	0.00	0.00	0.0005	0.0005	0.0005	0.0005	0.001
Zinc - TR	95	0.006	0	0.04	0.04	0.025	0.025	0.025	0.025	0.349
Bicarbonate	72	0.513	0	99.43	41.38	36.2	63.175	93.9	144	164

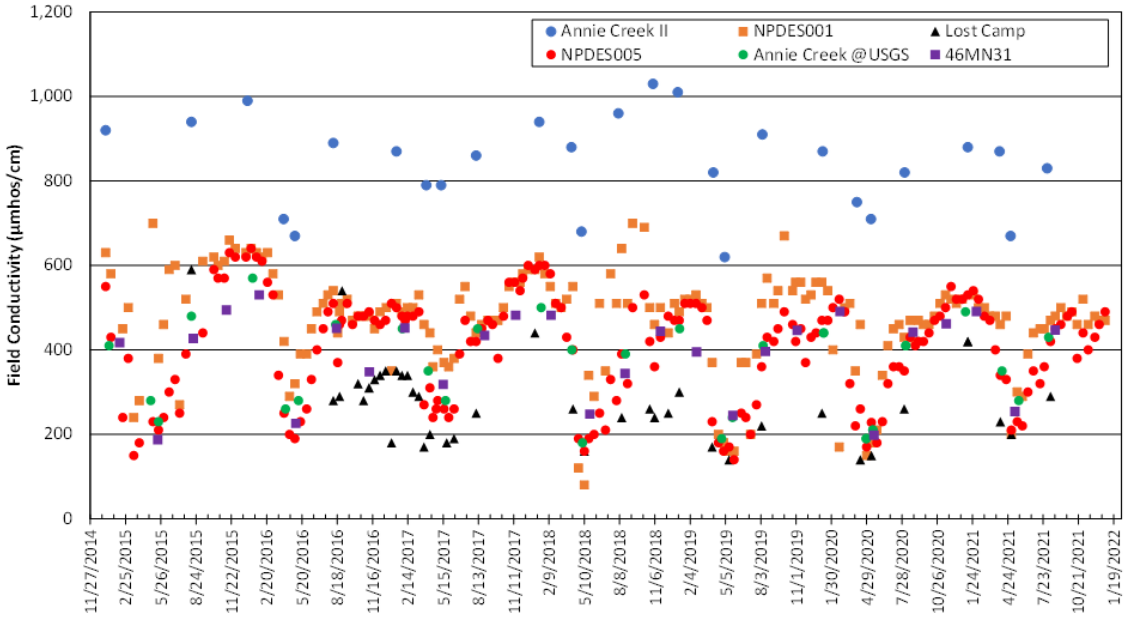
Table E-8. Summary Statistics for the Water Quality Parameters at the CP005/NPDES005 (January 2015 Through December 2021) (Page 2 of 2)

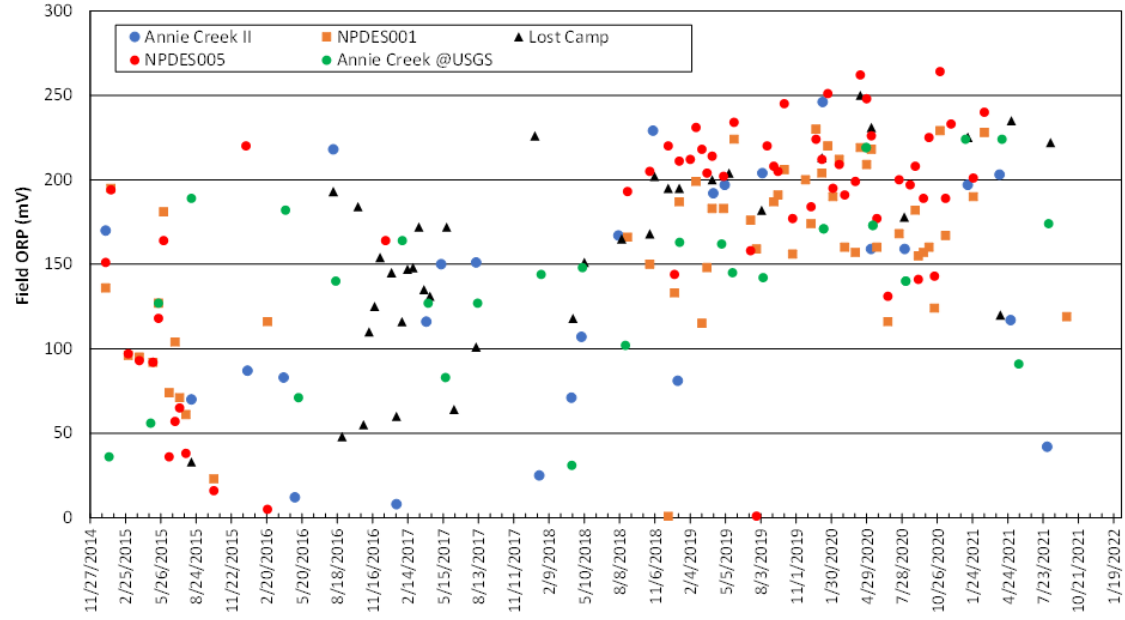
Parameter	Count	MDL	Percent Below MDL	Average	Standard Deviation	Minimum	25th Percentile	50th Percentile (Median)	75th Percentile	Maximum
CN, Total	32	0.00037	0	0.01	0.00	0.005	0.005	0.005	0.01	0.013
BOD, 5-Day	188	NA	0	1.54	0.28	1.5	1.5	1.5	1.5	3.6
CN, WAD	244	0.00055	0	0.00	0.00	0.002	0.005	0.005	0.005	0.005
Fluoride	29	0.004	0	0.36	0.04	0.305	0.333	0.358	0.399	0.446
N, Ammonia	243	0.007	0	0.02	0.01	0	0.025	0.025	0.025	0.025
N, Nitrate+Nitrite	27		0	4.52	2.04	0.754	2.64	5.1	6.01	7.21
N, Nitrate	164	0.056	0	5.29	6.83	0.114	1.0775	2.325	5.1925	26.5
N, Nitrite	72	0.005	0	0.12	0.11	0.025	0.025	0.025	0.25	0.25
Kjeldahl nitrogen - T	25	0.5	0	0.05	0.13	0.025	0.025	0.025	0.025	0.67
Phosphorus - T	27	0.01	0	0.06	0.03	0.033	0.045	0.049	0.057	0.197
Phosphorus - D	93	0.004	0	0.03	0.01	0.005	0.027	0.034	0.038	0.104
Sulfate	73	0.679	0	157.84	123.29	0.5	28.5	180	255	473
Alkalinity	1	NA	0	170.00		170	170	170		170
Conductivity	154	0.153	0	535.70	233.28	149	369.25	491.5	684.25	1190
Hardness	130	5	0	189.04	64.60	66.6	123.25	213.5	239.25	290
D - Organic Carbon	25	0.2	0	2.04	0.71	1.03	1.52	1.84	2.665	3.41
pH	259	NA	0	8.13	0.41	6.61	7.92	8.32	8.4	8.59
TDS	150	17.6	0	275.29	148.83	97	173	241	286.5	682
TSS	286	3.49	0	10.22	28.09	0	5	5	5	300

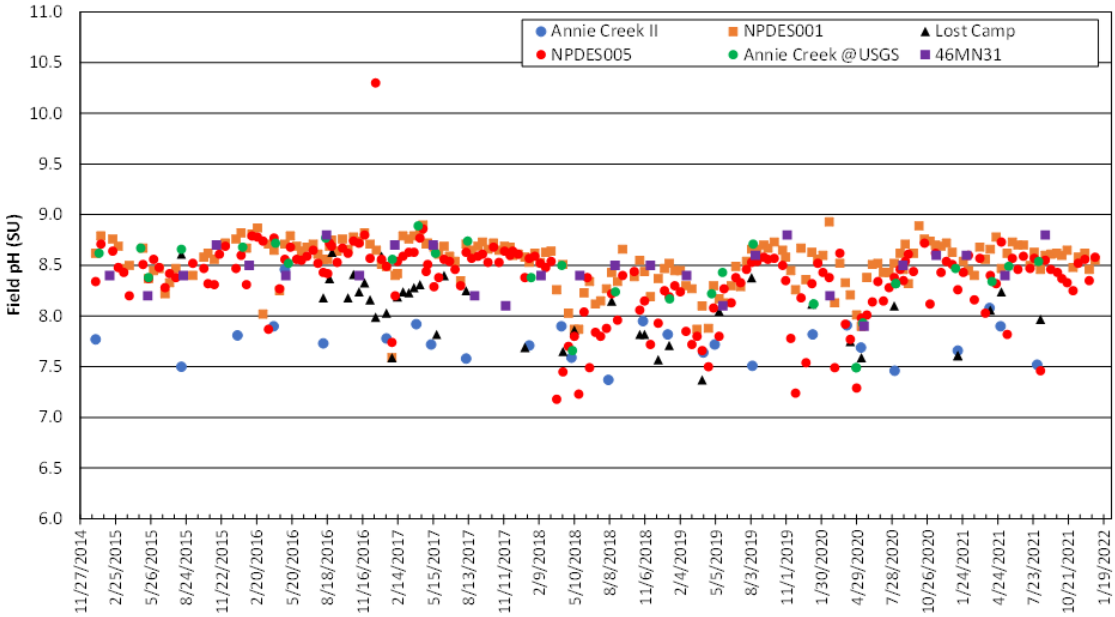
Notes:
N/A = Not Available
D = dissolved
TR = total recoverable
T = total
CN = cyanide
WAD = Weak Acid Dissociable
N = nitrogen
TDS = total dissolved solids
TSS = total suspended solids
All units are milligram per liter (mg/L) with the following exceptions: conductivity (micromhos per cm); depth and width (feet); pH (standard units); temperature (degrees Celsius)

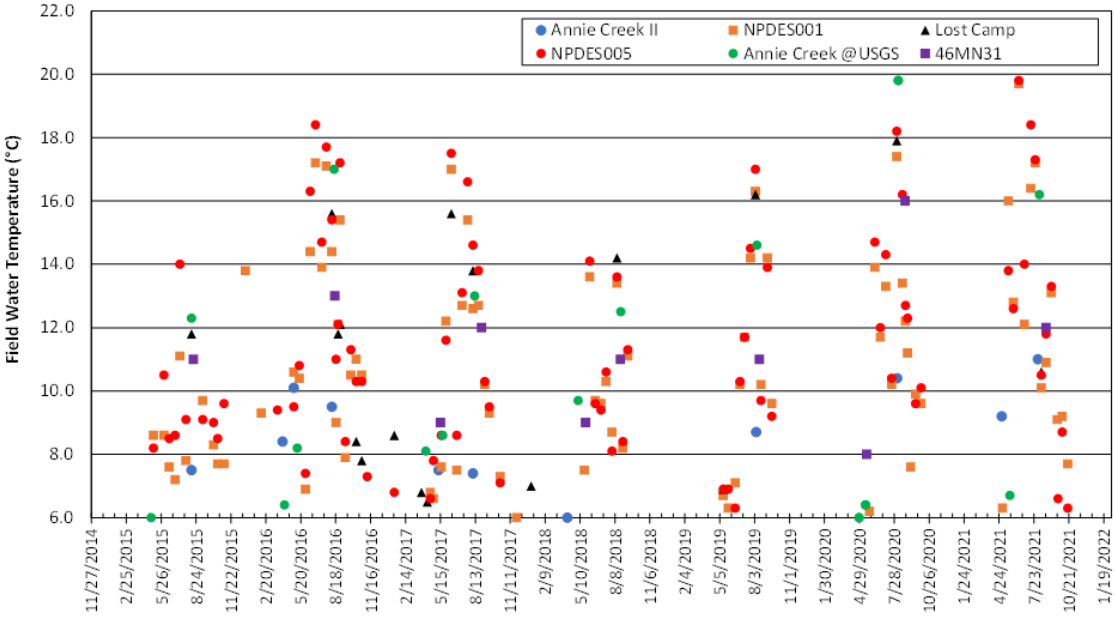
APPENDIX F

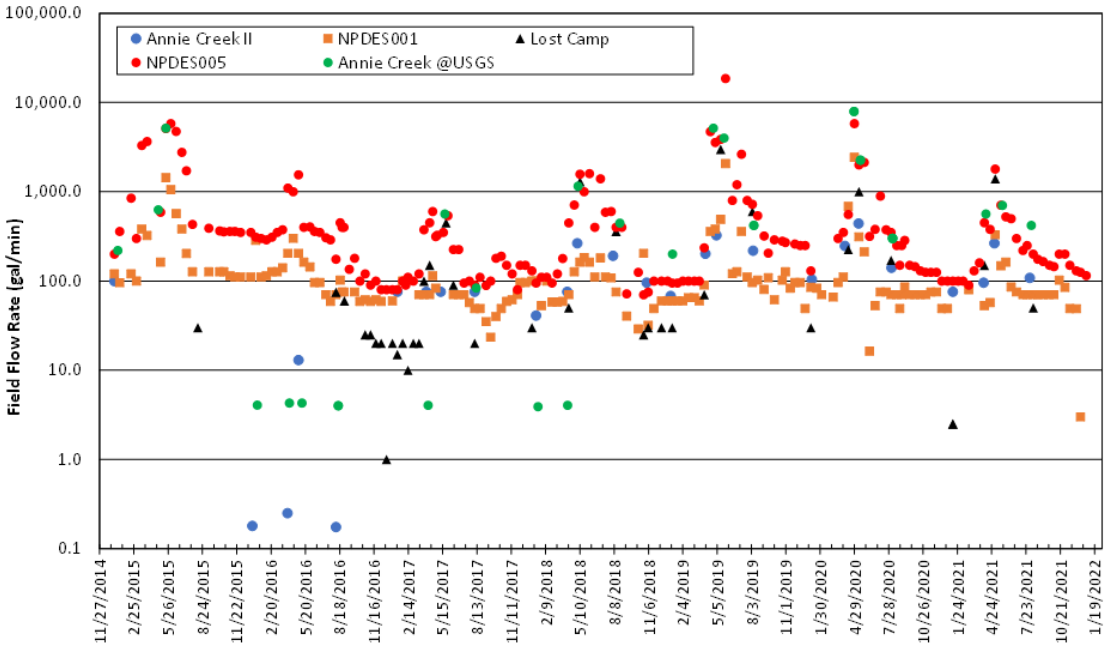
TIME SERIES FOR BASELINE SURFACE WATER SITES

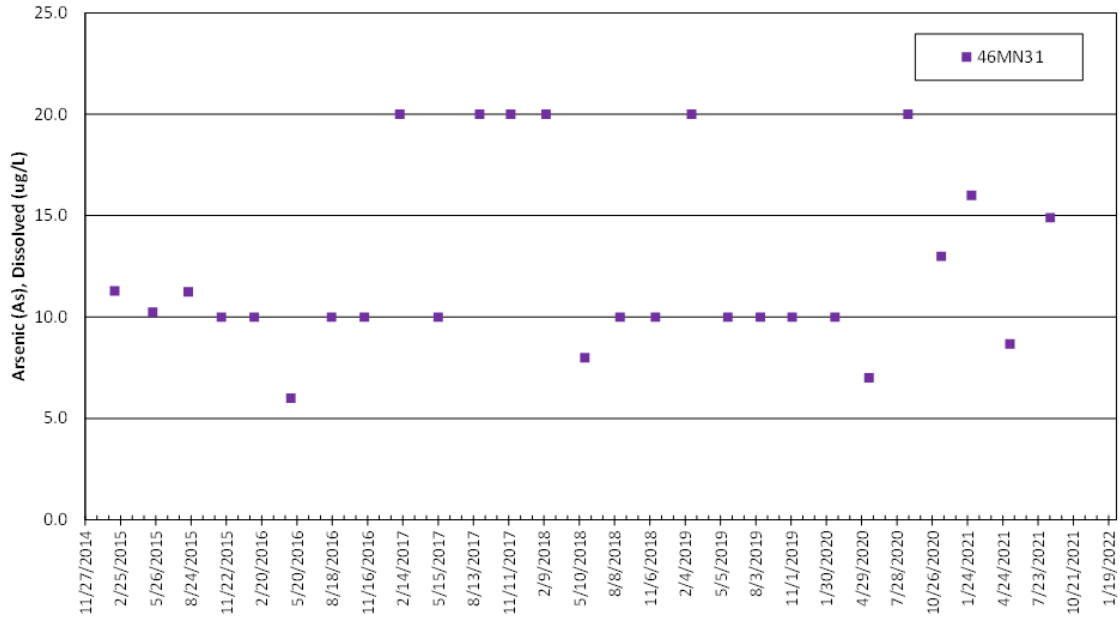

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Field Conductivity (µmhos/cm)
1,200
1,000
800
600
400
200
0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

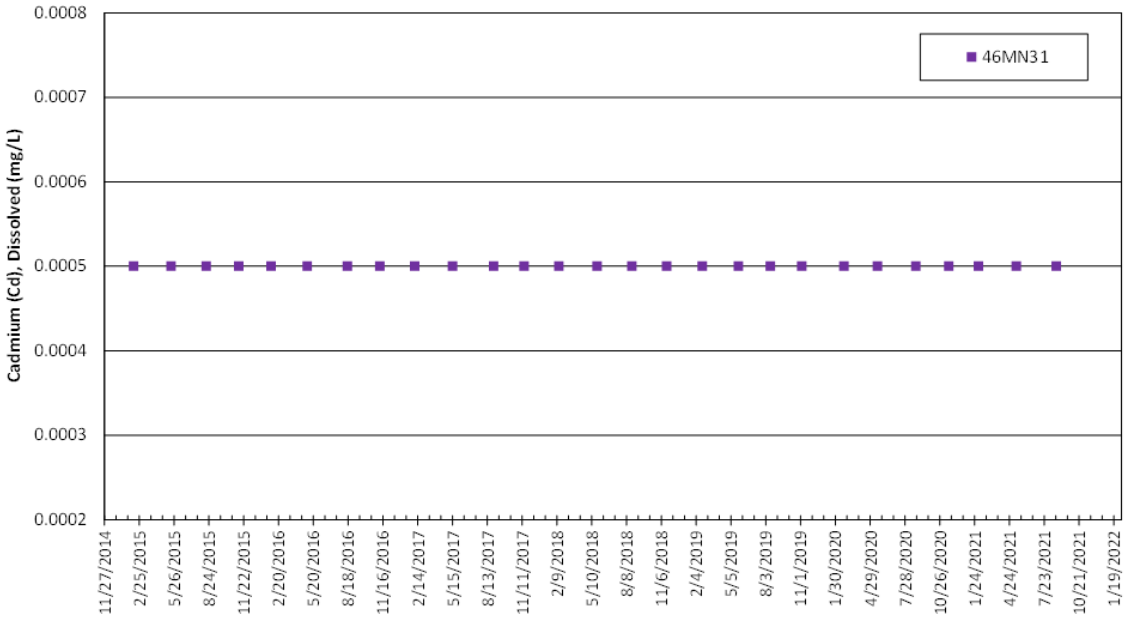

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
Field ORP (mV)
300
250
200
150
100
50
0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

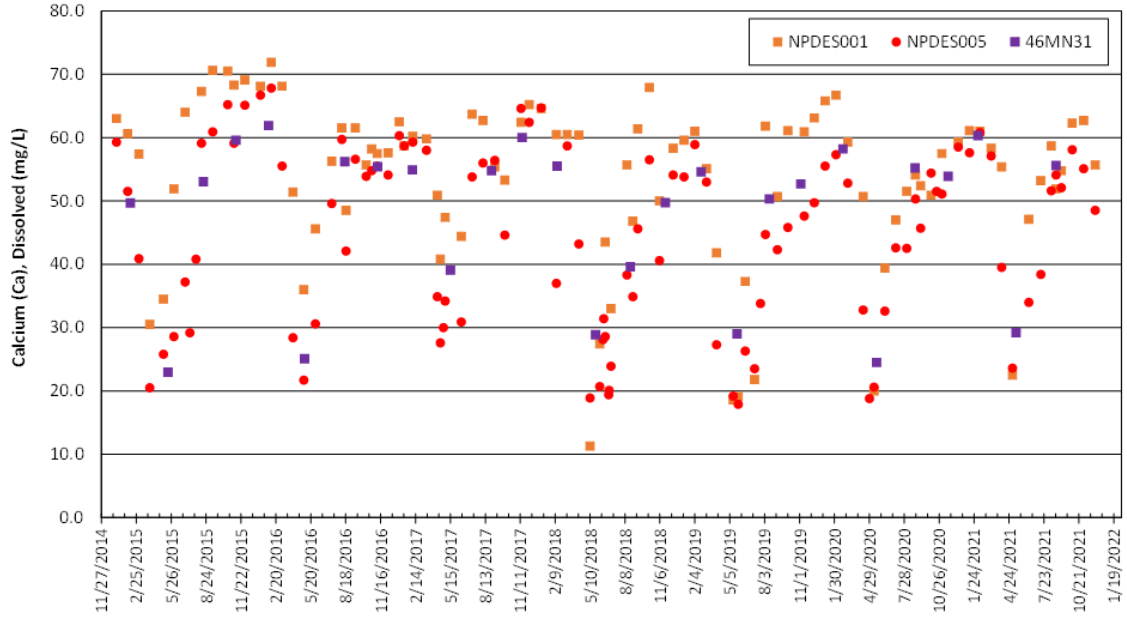

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Field pH (SU)
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

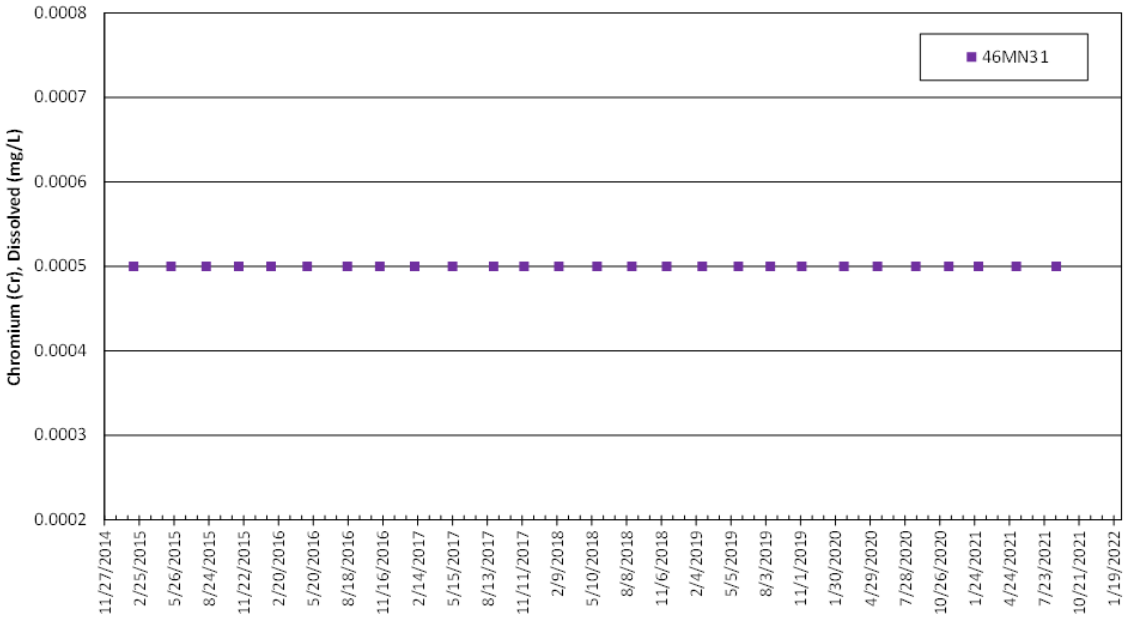

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Field Water Temperature (°C)
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

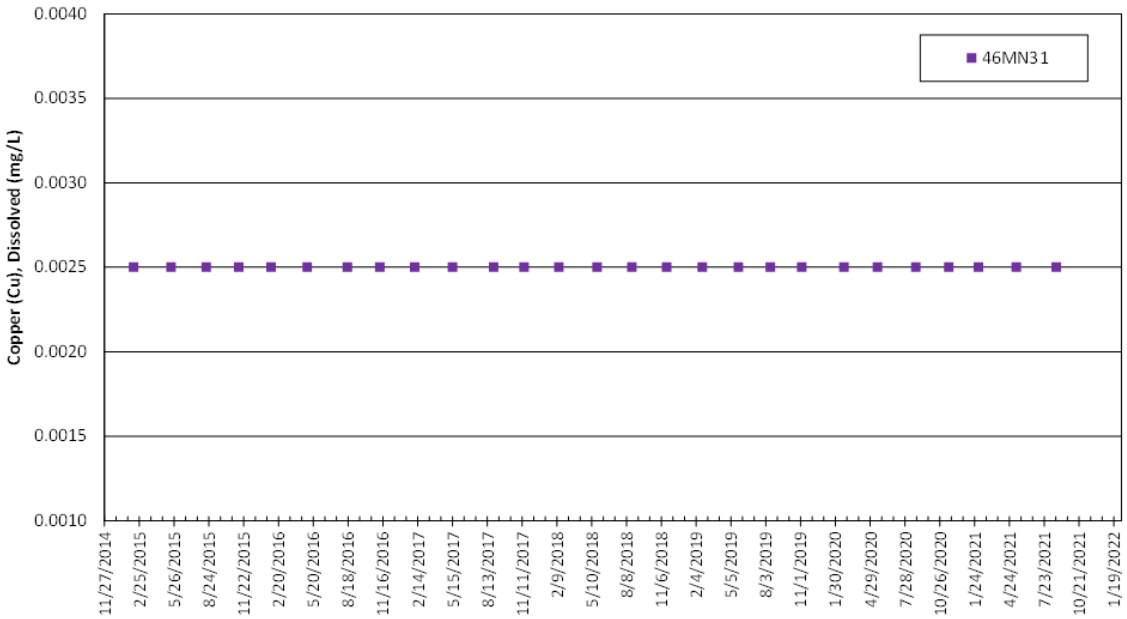

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
Field Flow Rate (gal/min)
100,000.0
10,000.0
1,000.0
100.0
10.0
1.0
0.1
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

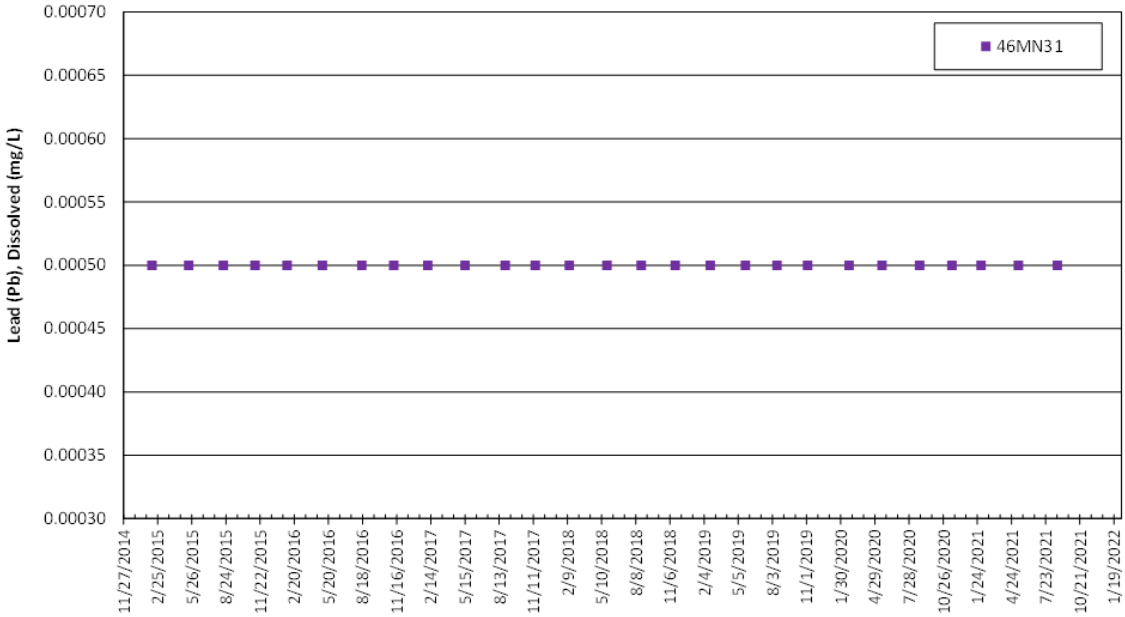

46MN31
Arsenic (As), Dissolved (ug/L)
25.0
20.0
15.0
10.0
5.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

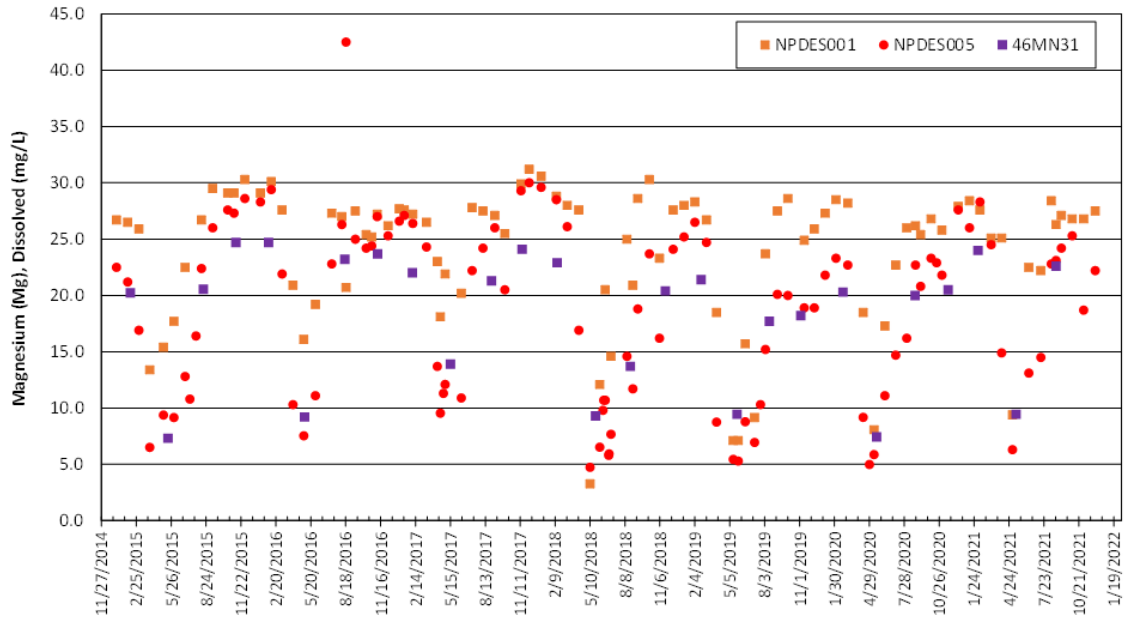

Cadmium (Cd), Dissolved (mg/L)
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

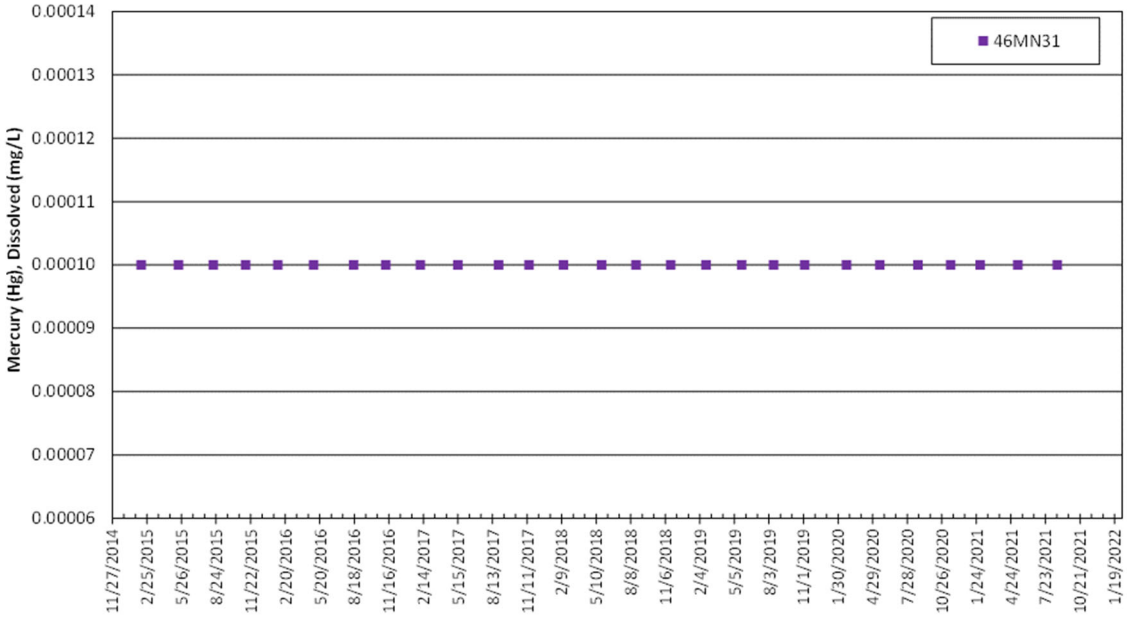

Calcium (Ca), Dissolved (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
NPDES001
NPDES005
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

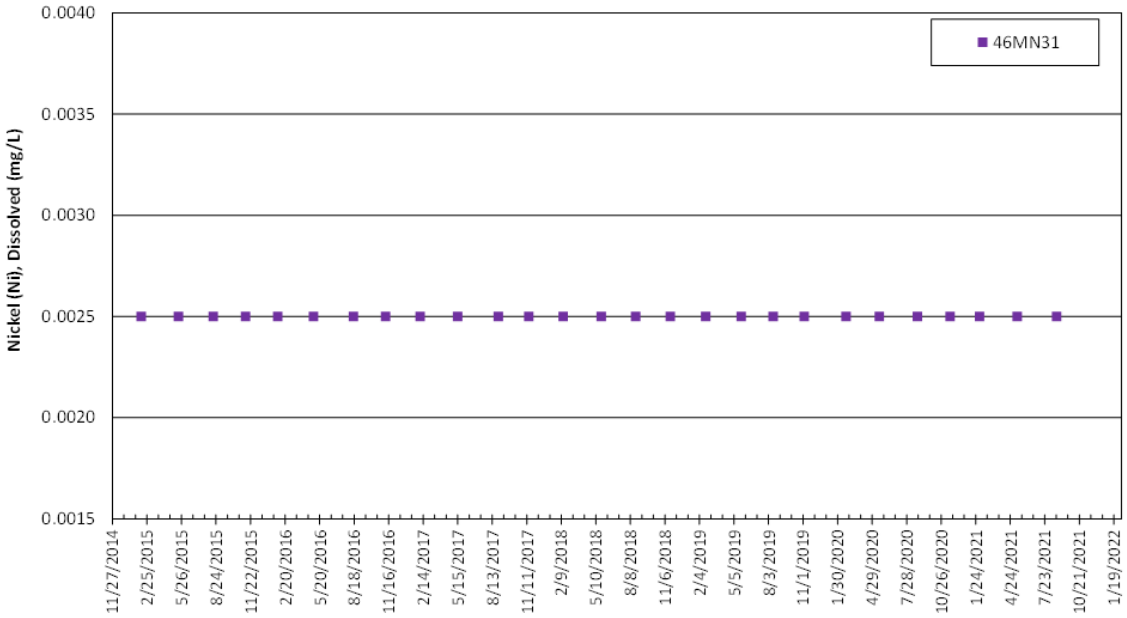

Chromium (Cr), Dissolved (mg/L)
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

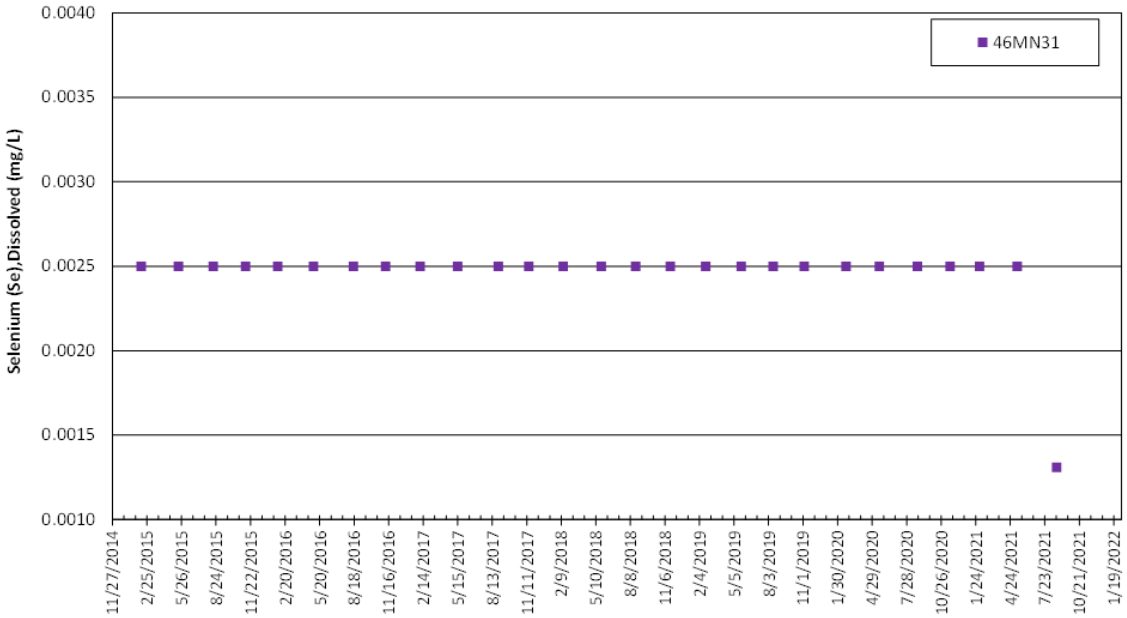

Copper (Cu), Dissolved (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

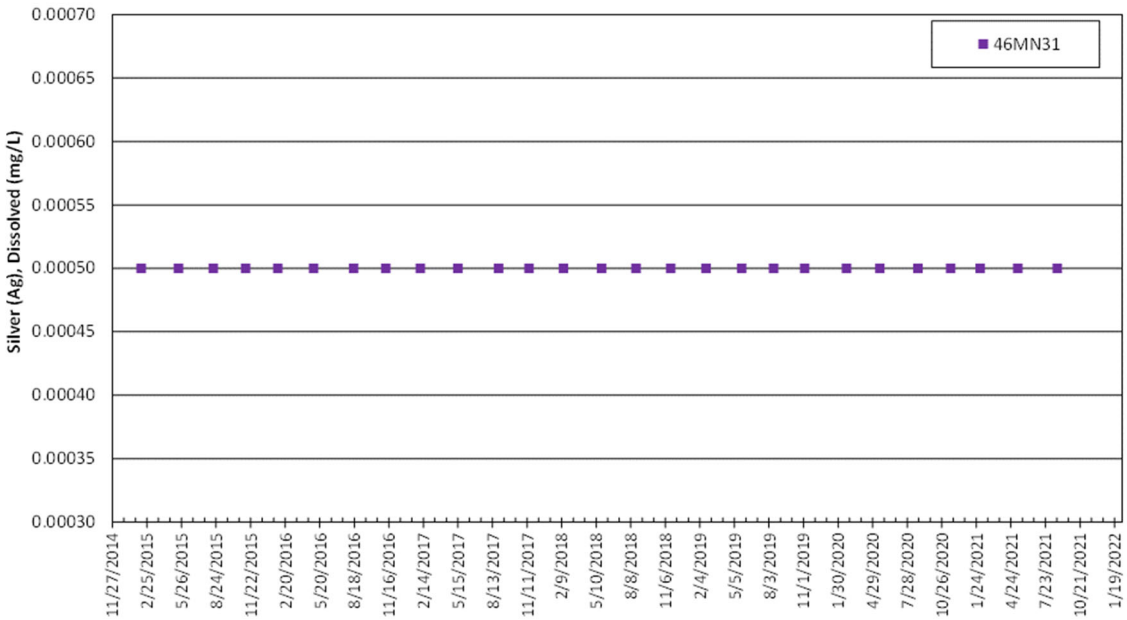

Lead (Pb), Dissolved (mg/L)
0.00070
0.00065
0.00060
0.00055
0.00050
0.00045
0.00040
0.00035
0.00030
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

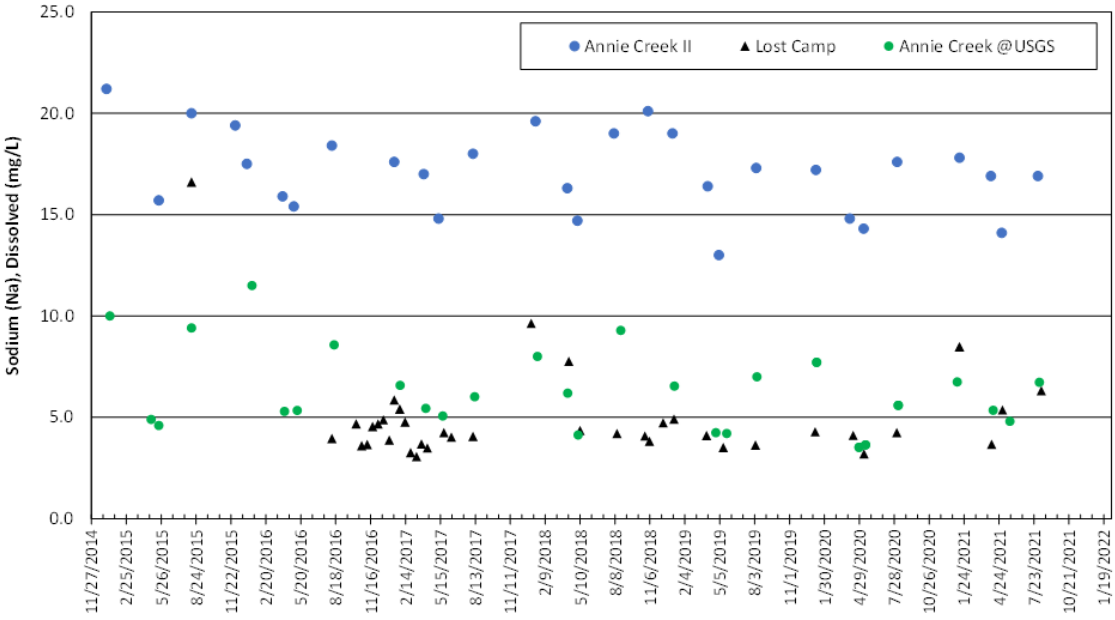

Magnesium (Mg), Dissolved (mg/L)
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
NPDES001
NPDES005
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

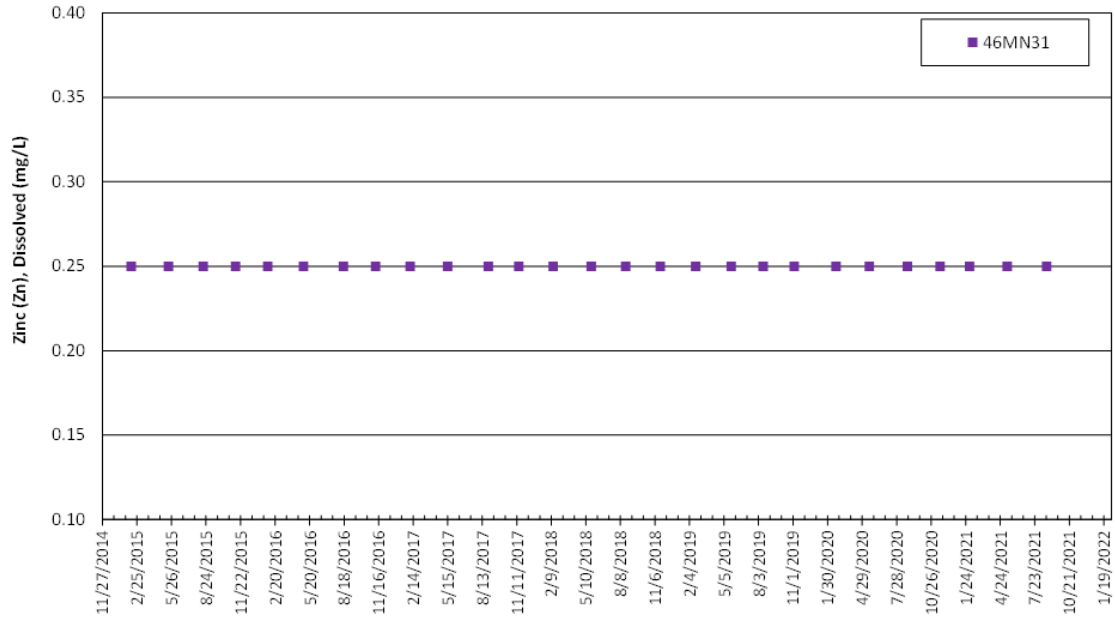

Mercury (Hg), Dissolved (mg/L)
0.00014
0.00013
0.00012
0.00011
0.00010
0.00009
0.00008
0.00007
0.00006
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

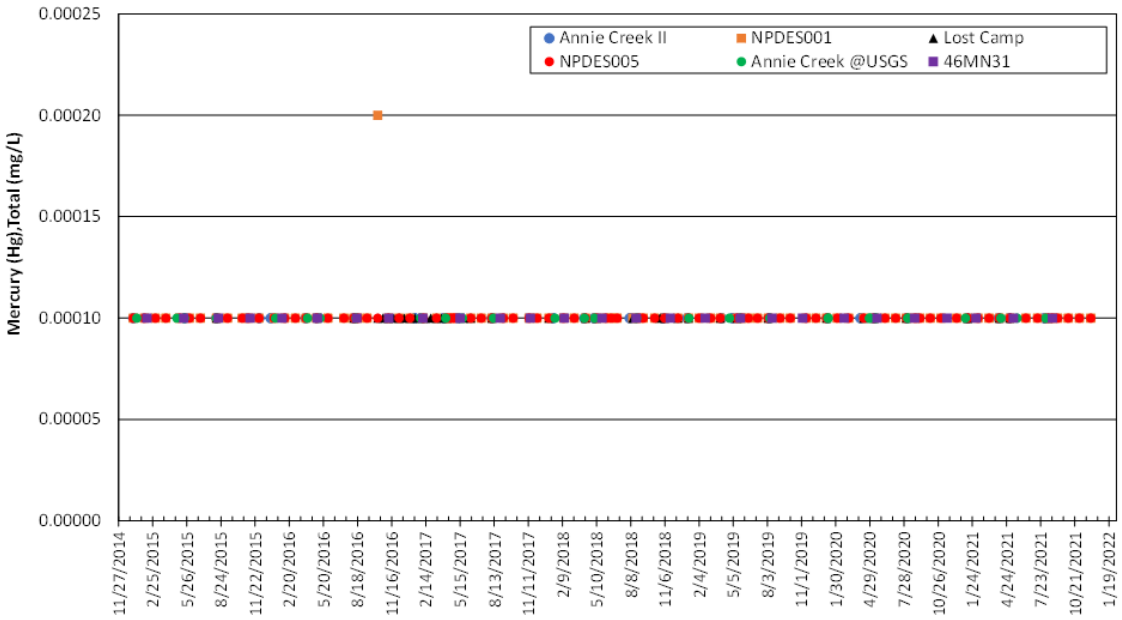

Nickel (Ni), Dissolved (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

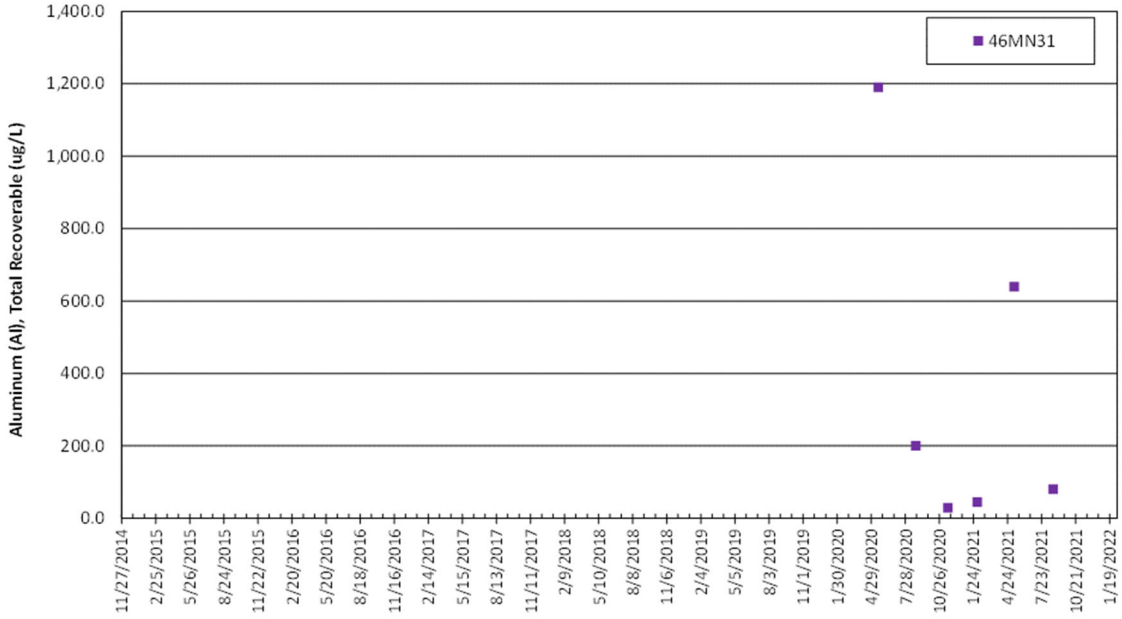

Selenium (Se),Dissolved (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

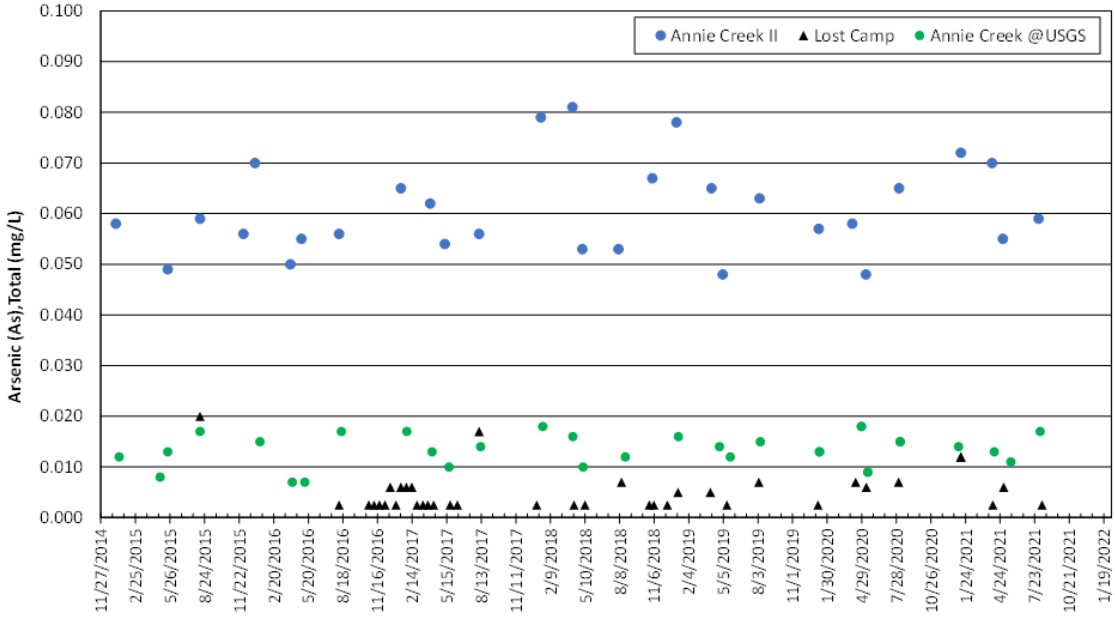

Silver (Ag), Dissolved (mg/L)
0.00070
0.00065
0.00060
0.00055
0.00050
0.00045
0.00040
0.00035
0.00030
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

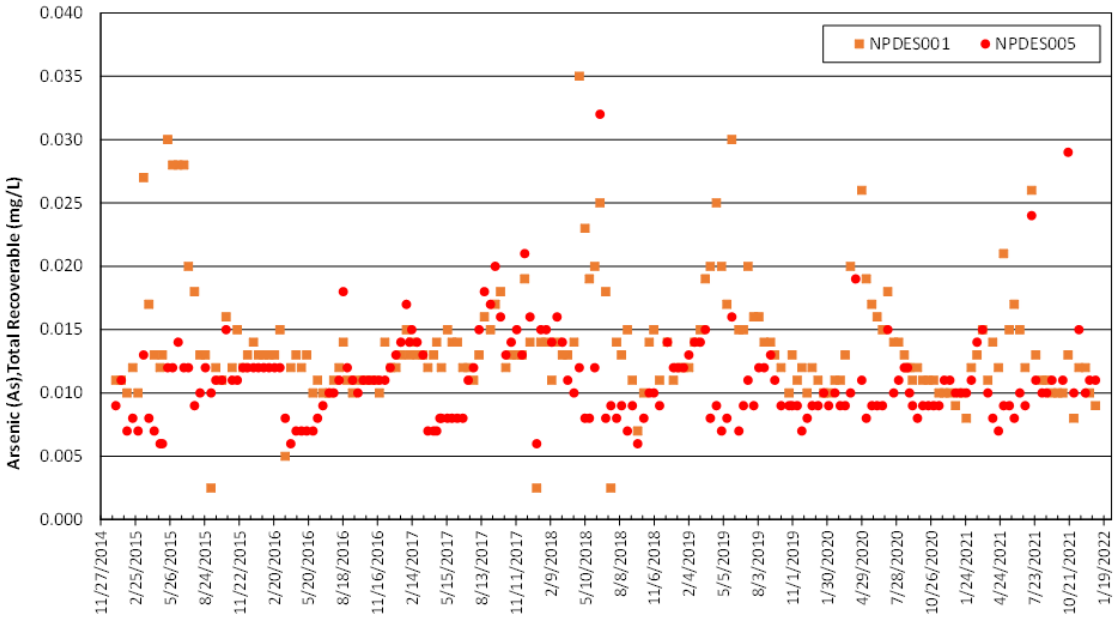

Annie Creek II
Lost Camp
Annie Creek @USGS
Sodium (Na), Dissolved (mg/L)
25.0
20.0
15.0
10.0
5.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

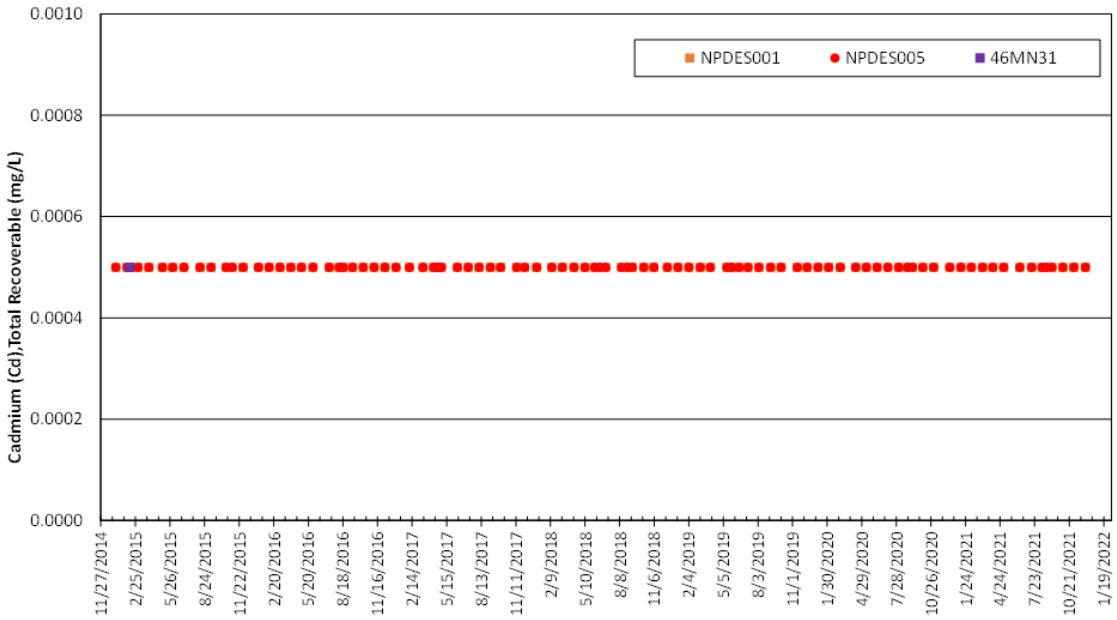

46MN31
Zinc (Zn), Dissolved (mg/L)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

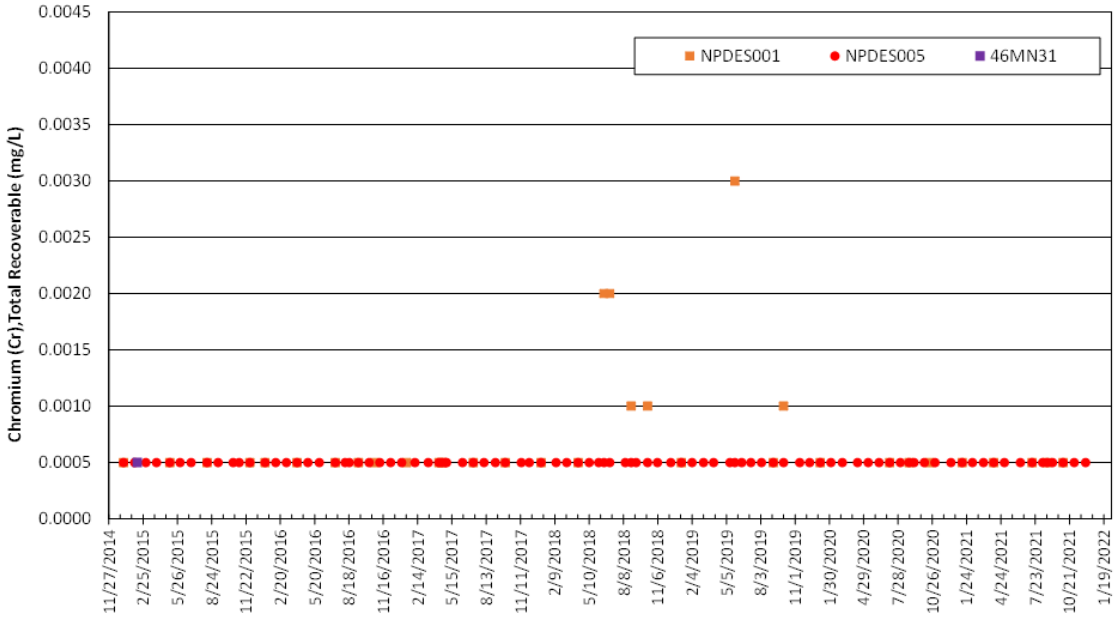

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Mercury (Hg),Total (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

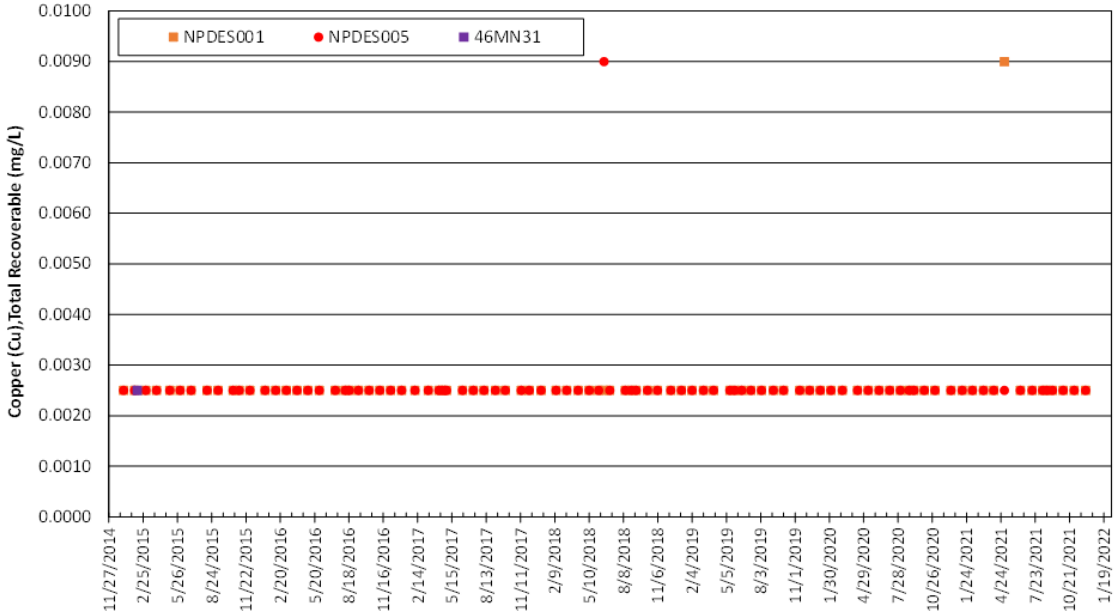

46MN31
Aluminum (Al), Total Recoverable (ug/L)
1,400.0
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

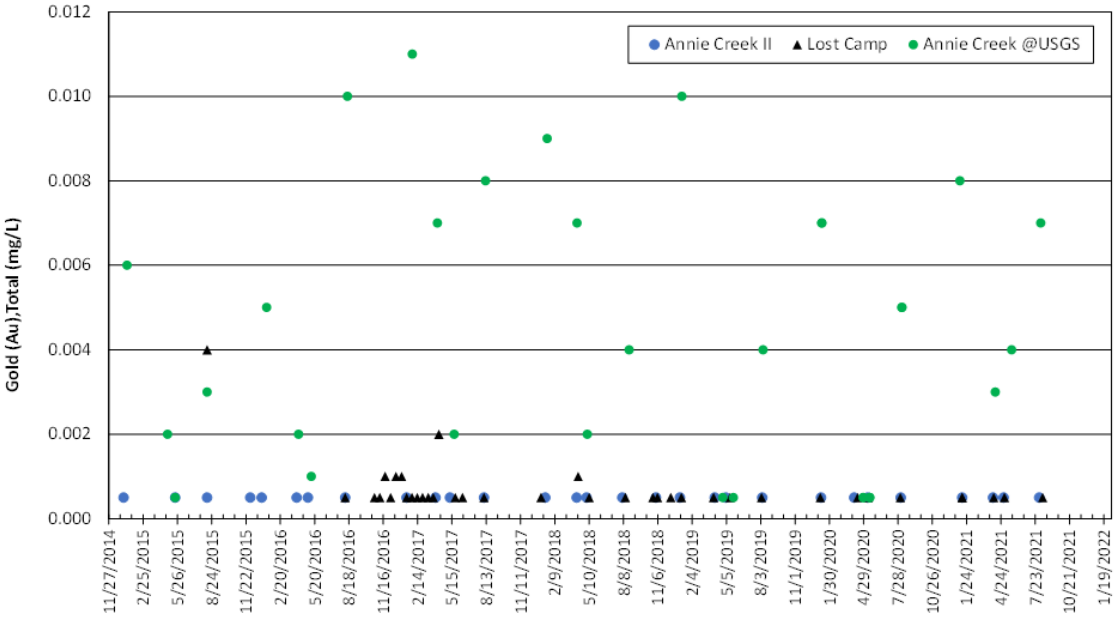

Annie Creek II
Lost Camp
Annie Creek @USGS
Arsenic (As),Total (mg/L)
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

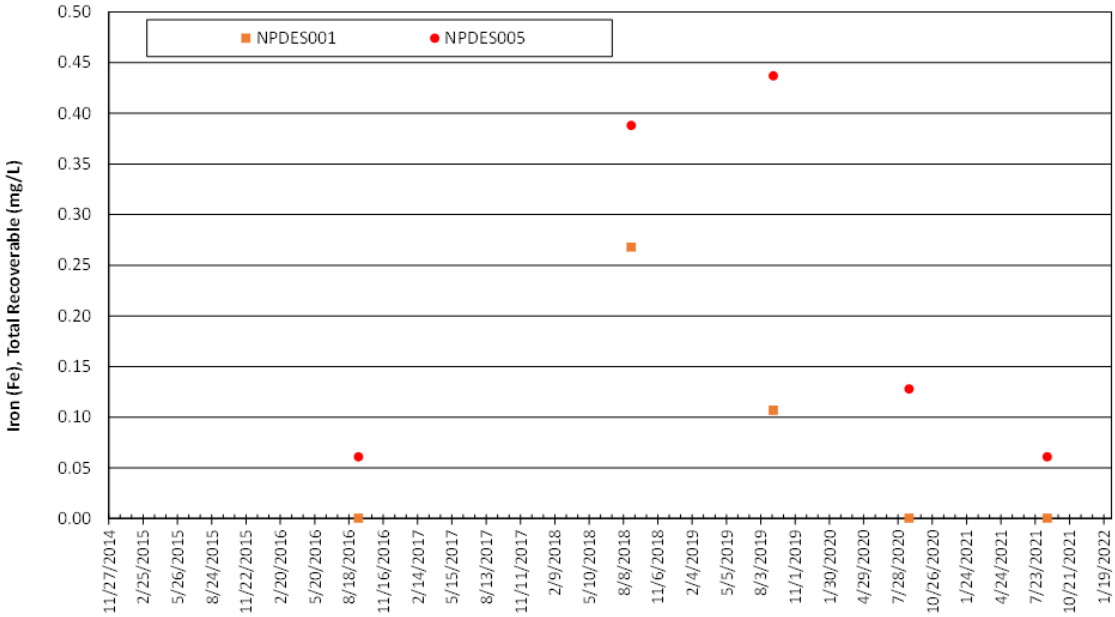

NPDES001
NPDES005
Arsenic (As),Total Recoverable (mg/L)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

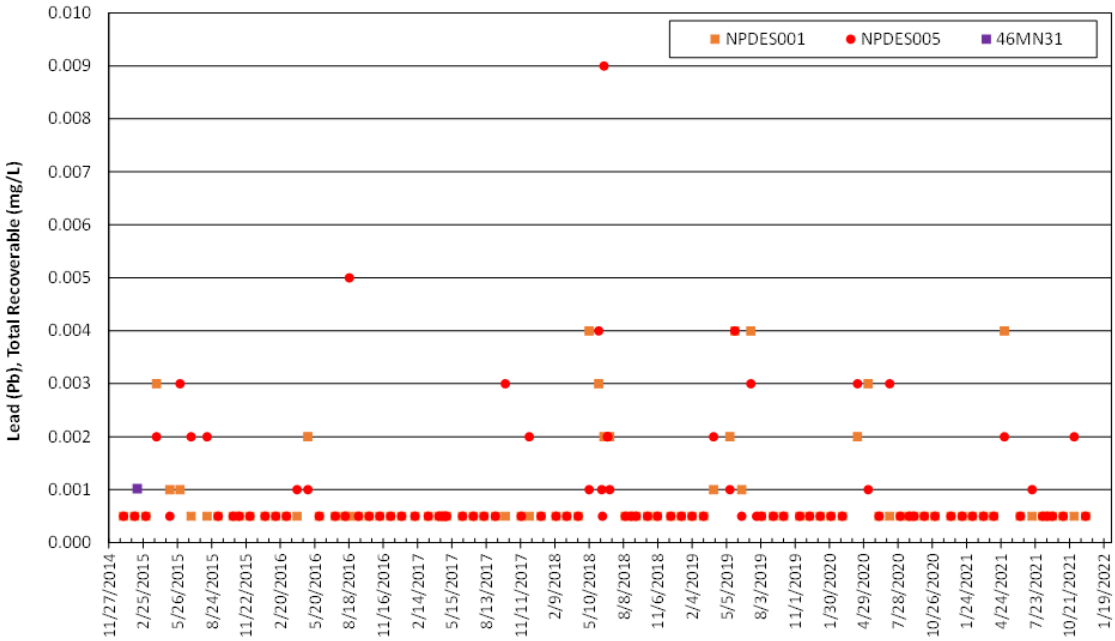

NPDES001
NPDES005
46MN31
Cadmium (Cd),Total Recoverable (mg/L)
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

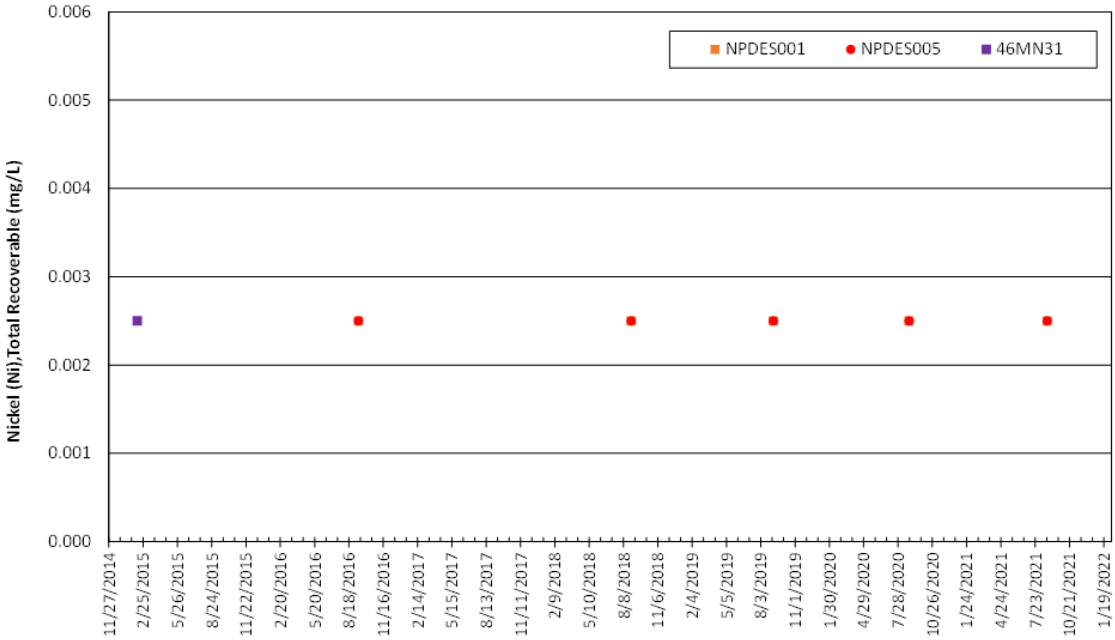

NPDES001
NPDES005
46MN31
Chromium (Cr),Total Recoverable (mg/L)
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

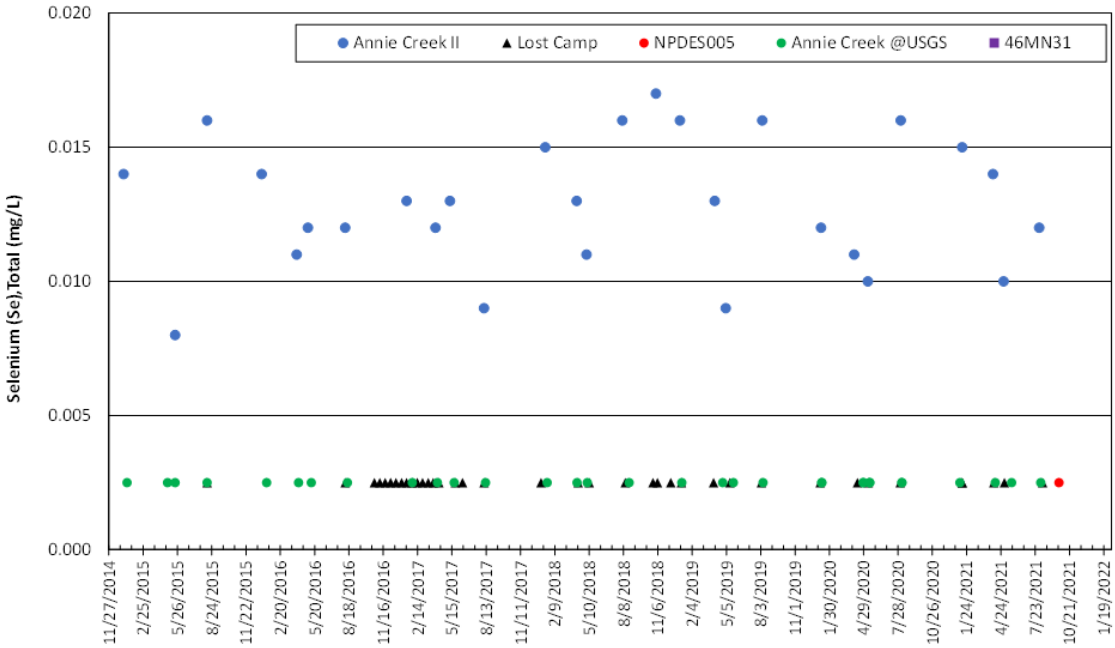

NPDES001
NPDES005
46MN31
Copper (Cu),Total Recoverable (mg/L)
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

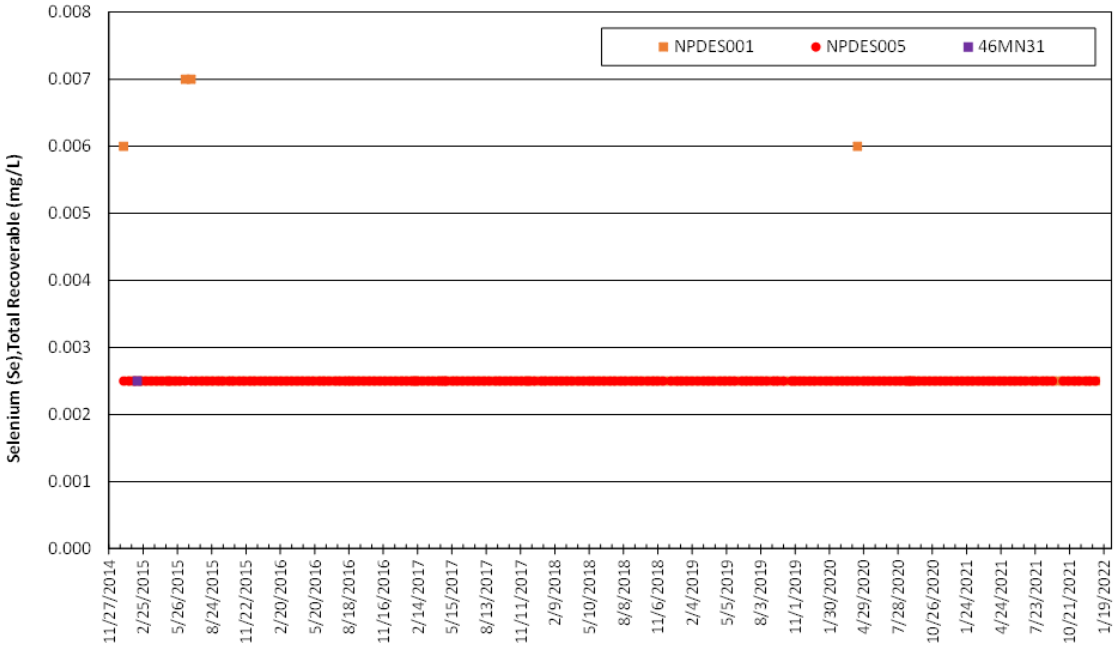

Annie Creek II
Lost Camp
Annie Creek @USGS
Gold (Au),Total (mg/L)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

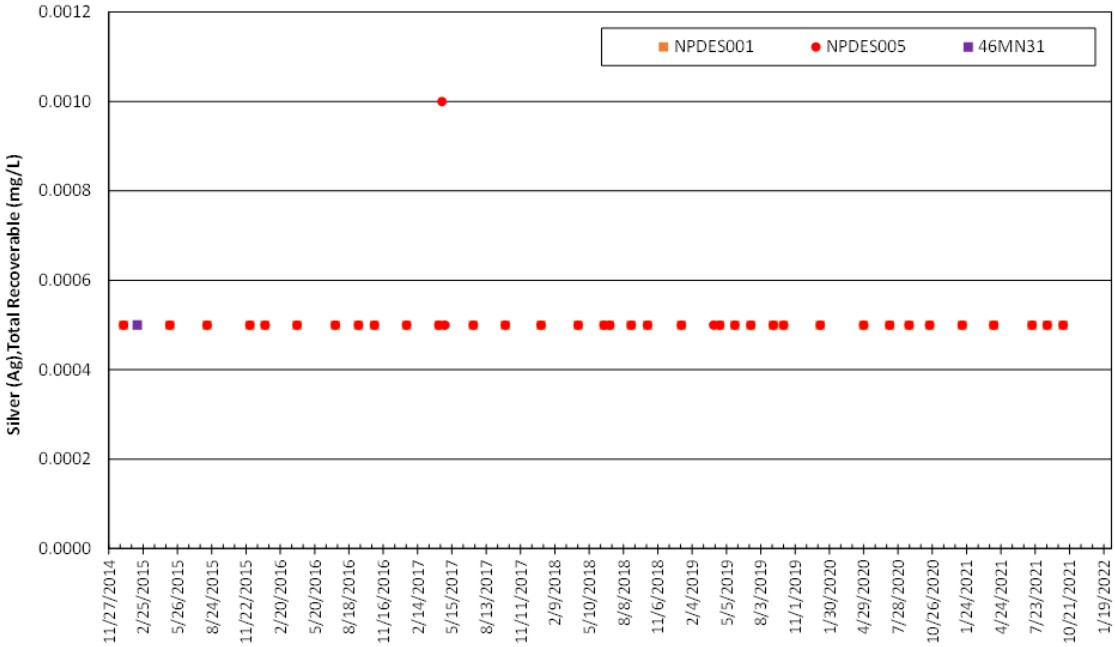

NPDES001
NPDES005
Iron (Fe), Total Recoverable (mg/L)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

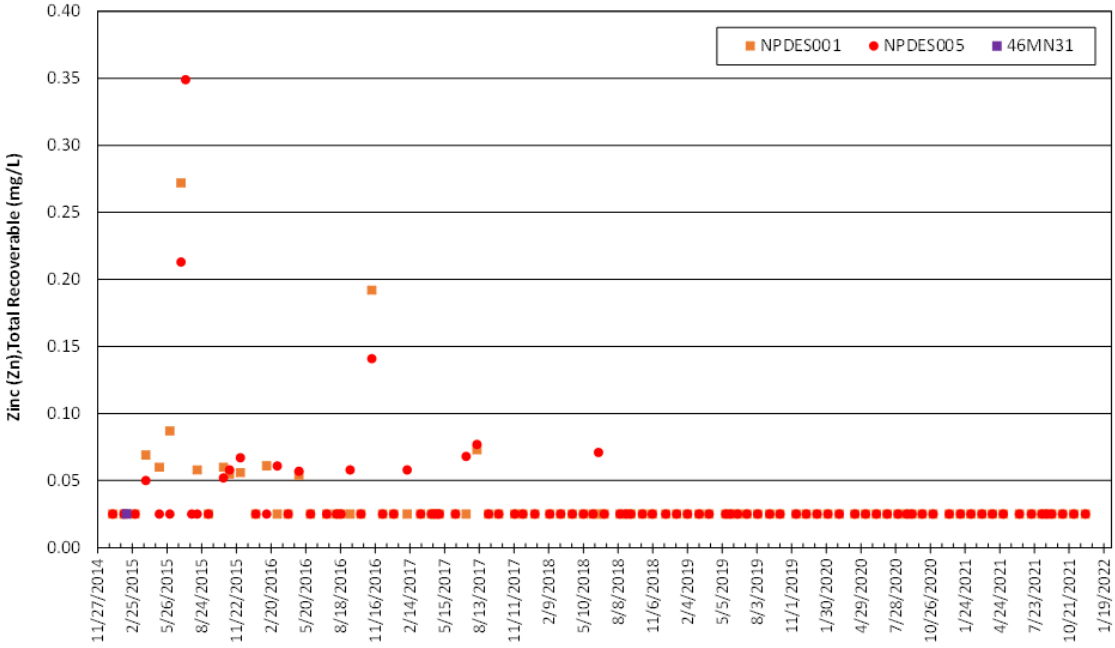

NPDES001
NPDES005
46MN31
Lead (Pb), Total Recoverable (mg/L)
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

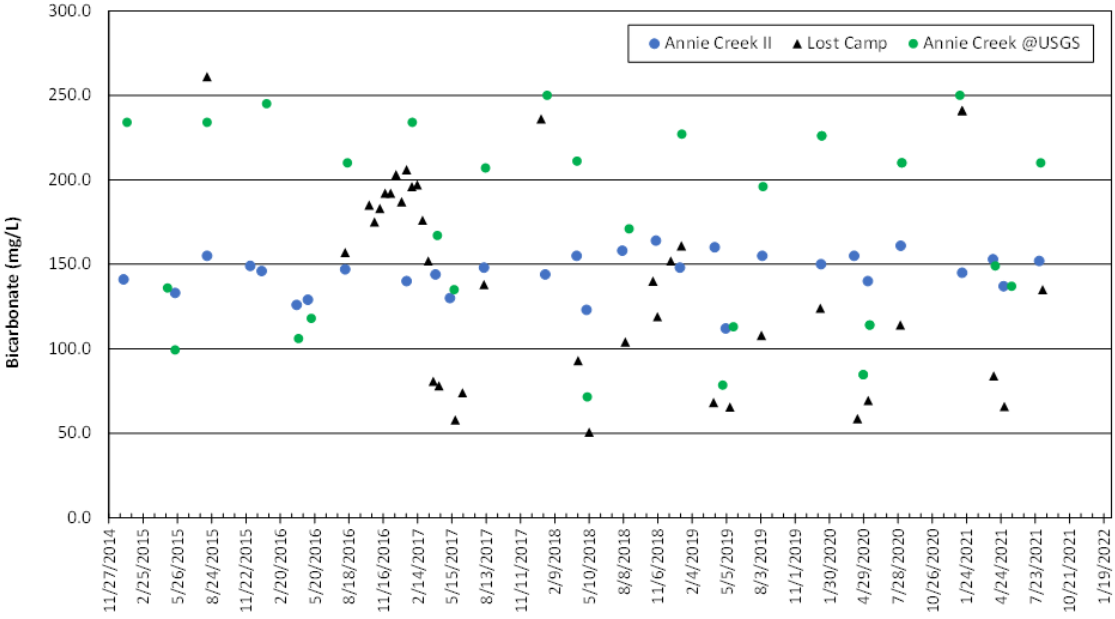

Nickel (Ni),Total Recoverable (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
NPDES001
NPDES005
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

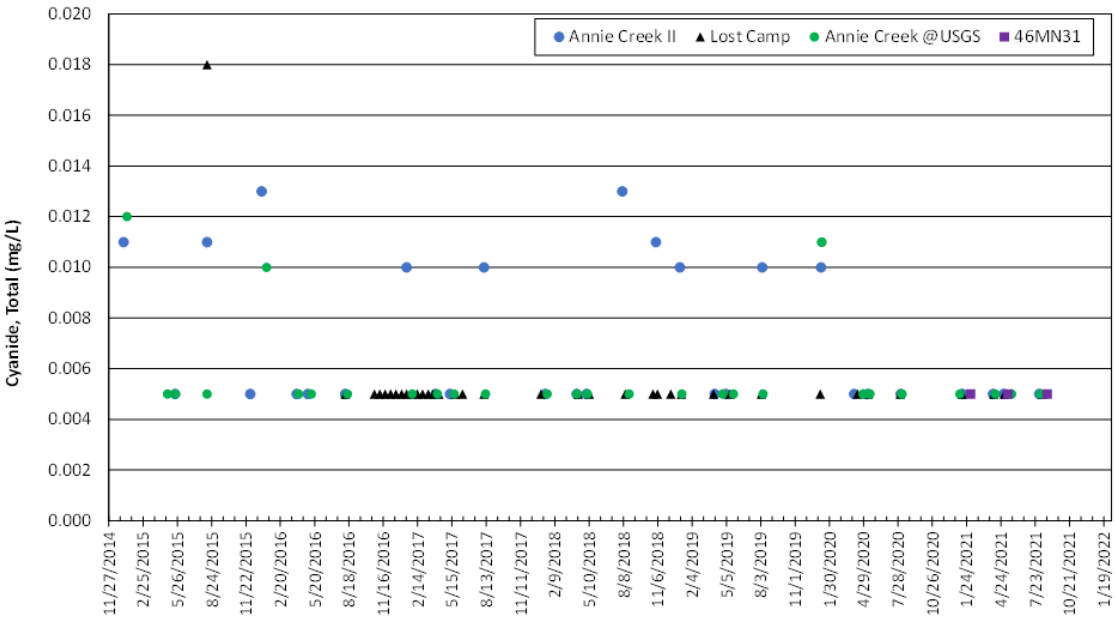

Selenium (Se),Total (mg/L)
0.020
0.015
0.010
0.005
0.000
Annie Creek II
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

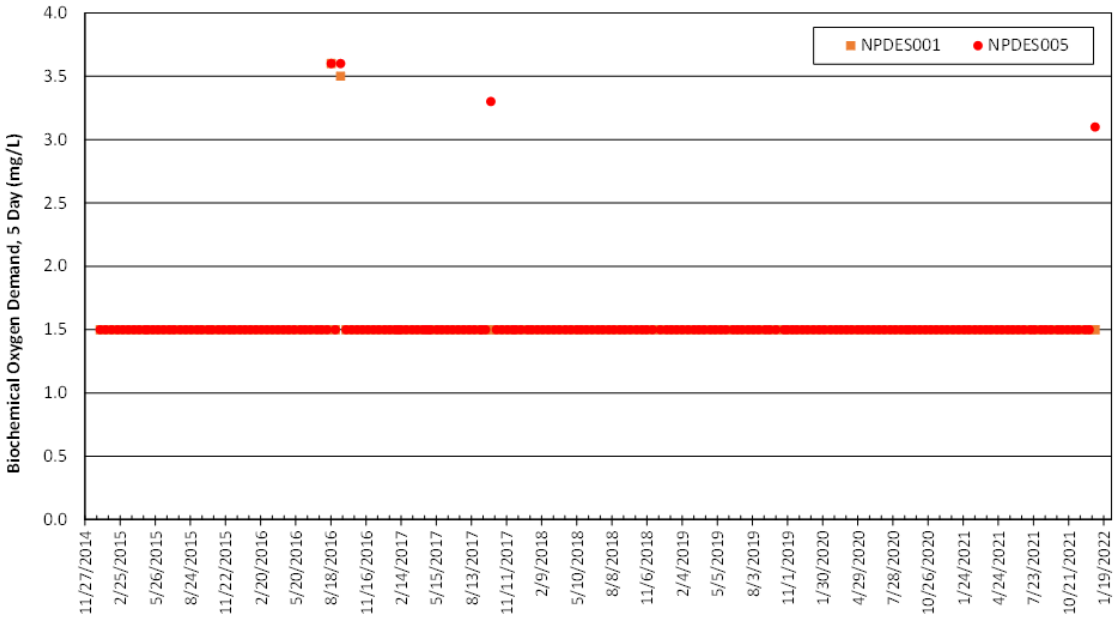

NPDES001
NPDES005
46MN31
Selenium (Se),Total Recoverable (mg/L)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

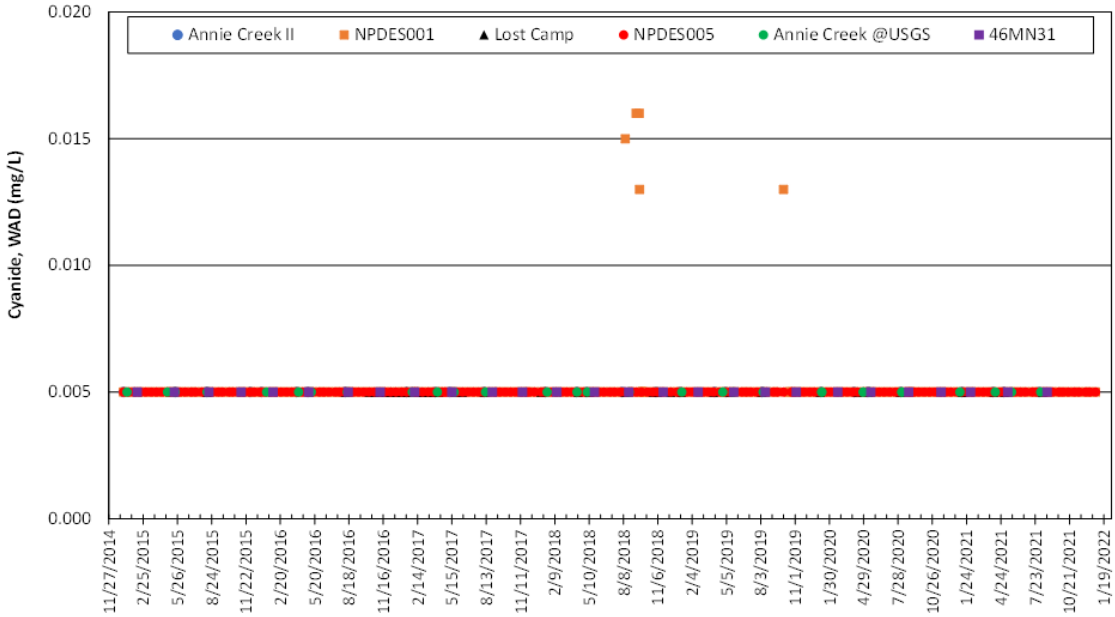

NPDES001
NPDES005
46MN31
Silver (Ag),Total Recoverable (mg/L)
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

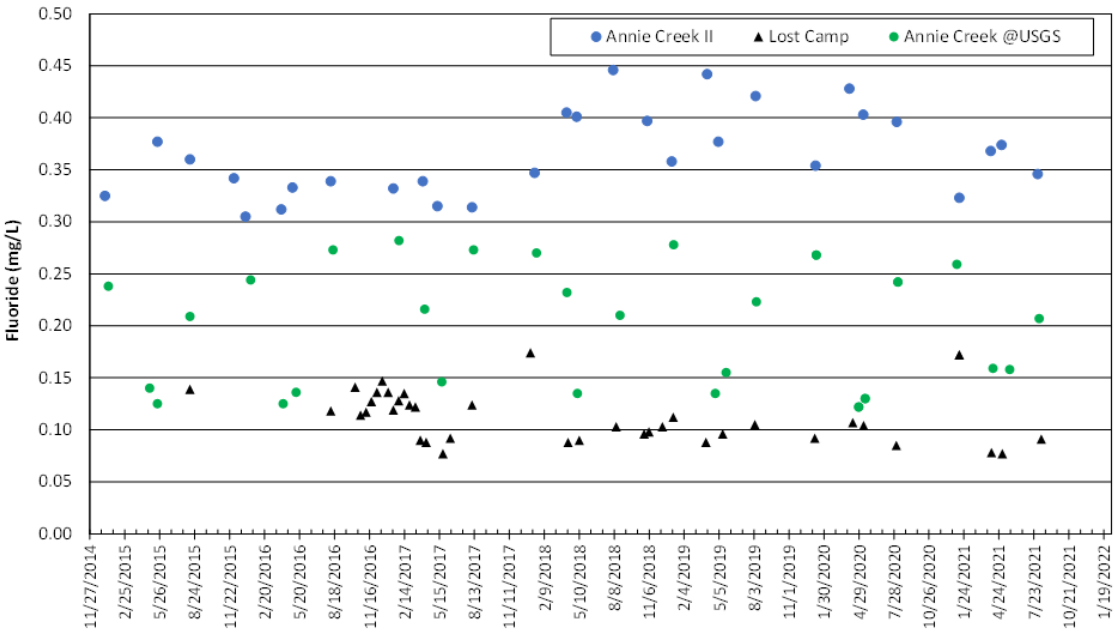

NPDES001
NPDES005
46MN31
Zinc (Zn),Total Recoverable (mg/L)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

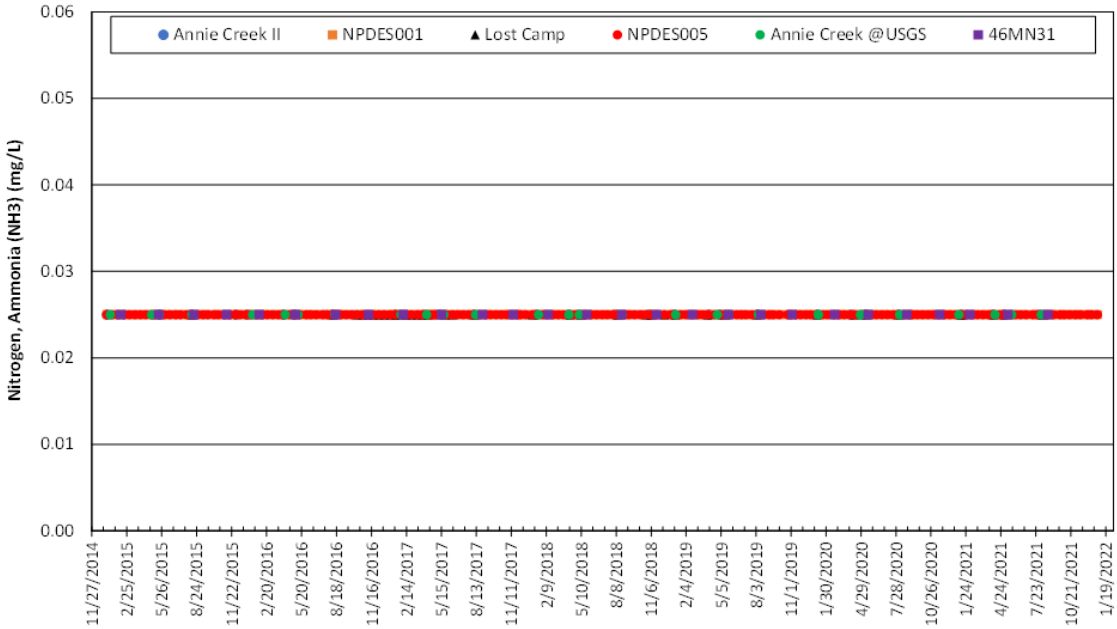

Annie Creek II
Lost Camp
Annie Creek @USGS
Bicarbonate (mg/L)
300.0
250.0
200.0
150.0
100.0
50.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

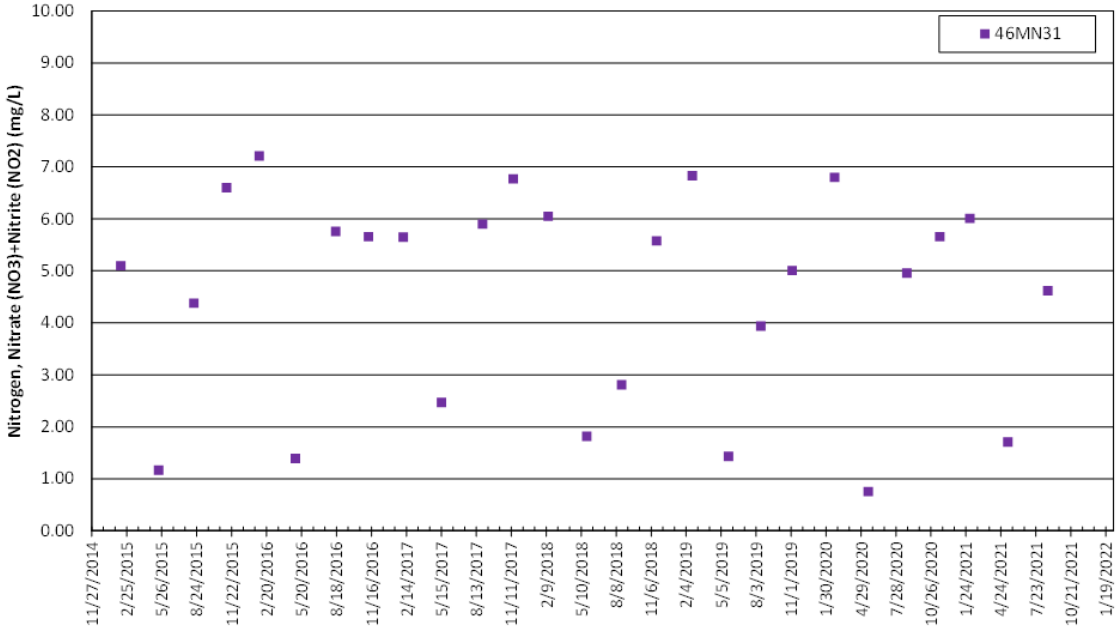

Annie Creek II
Lost Camp
Annie Creek @USGS
46MN31
Cyanide, Total (mg/L)
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

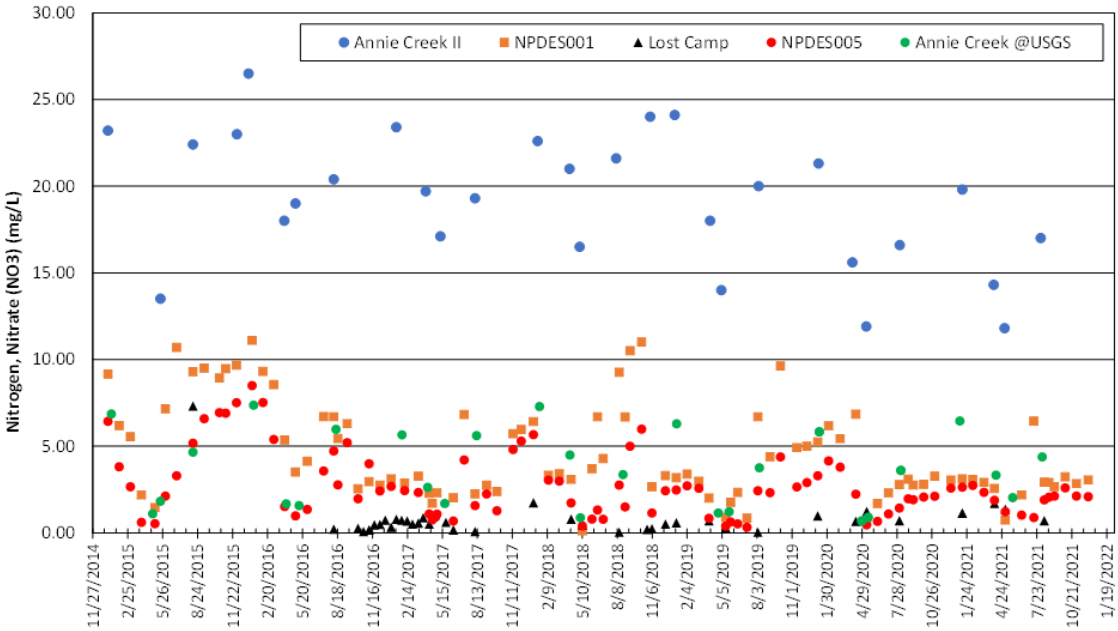

NPDES001
NPDES005
Biochemical Oxygen Demand, 5 Day (mg/L)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

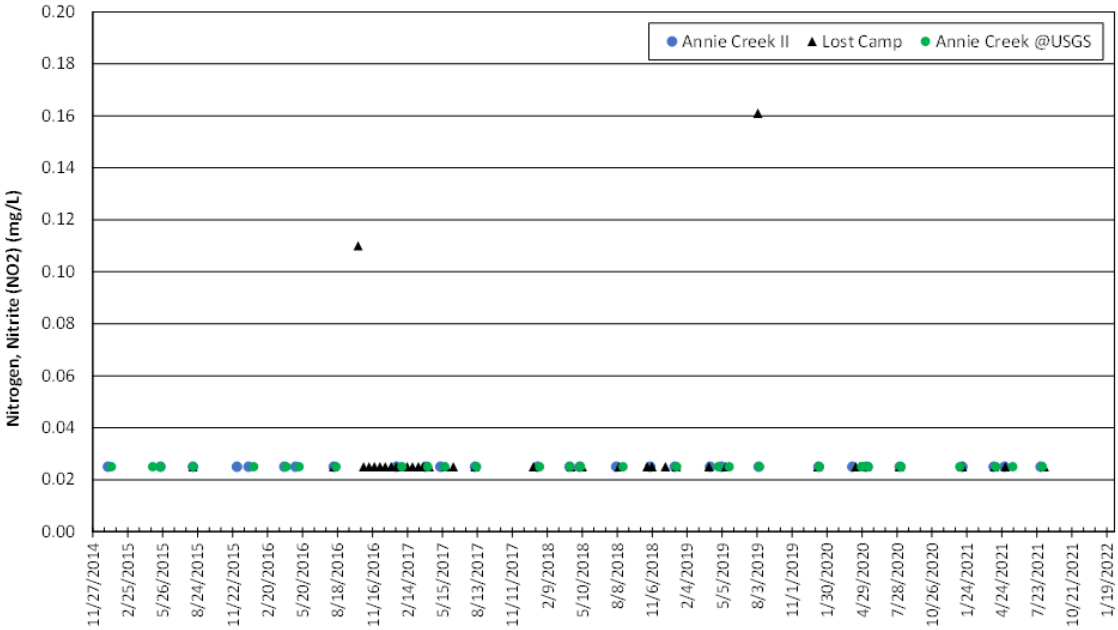

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Cyanide, WAD (mg/L)
0.020
0.015
0.010
0.005
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

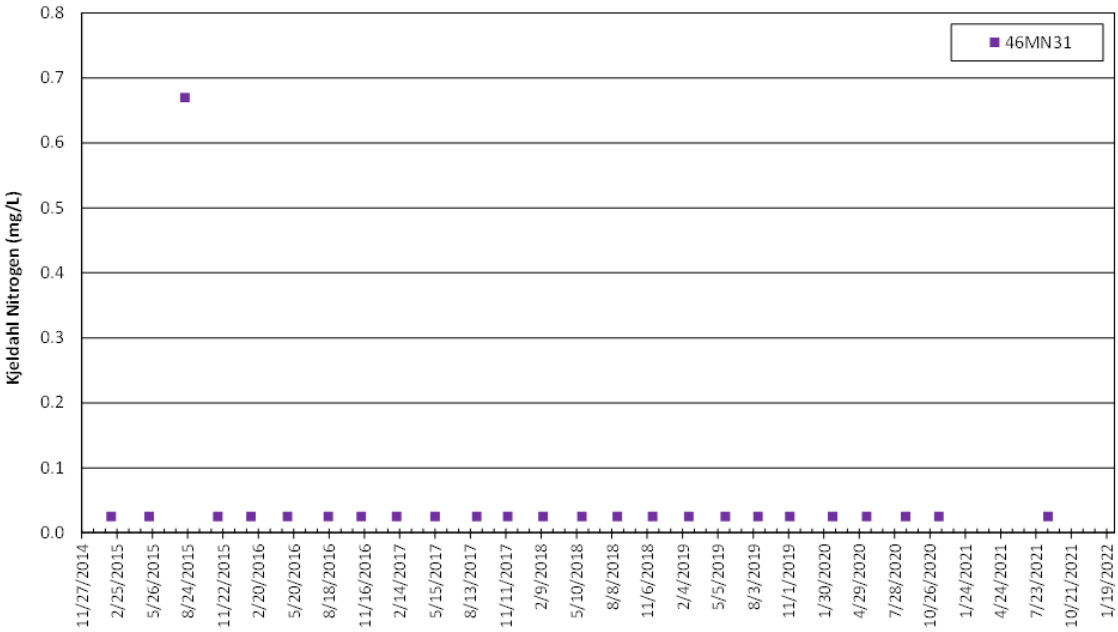

Annie Creek II
Lost Camp
Annie Creek @USGS
Fluoride (mg/L)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

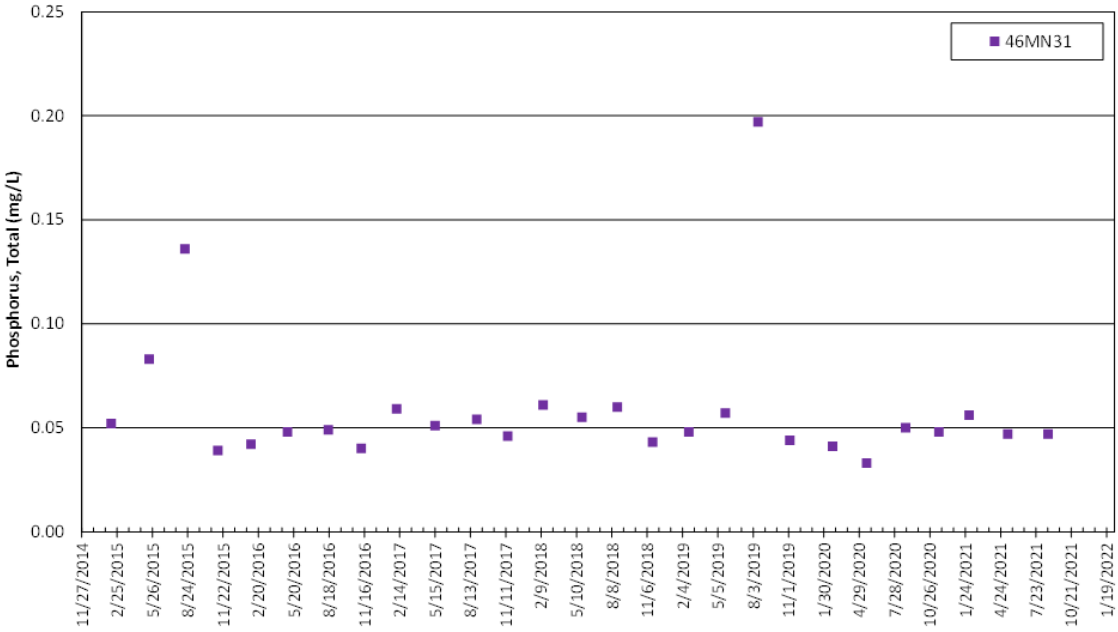

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Nitrogen, Ammonia (NH3) (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

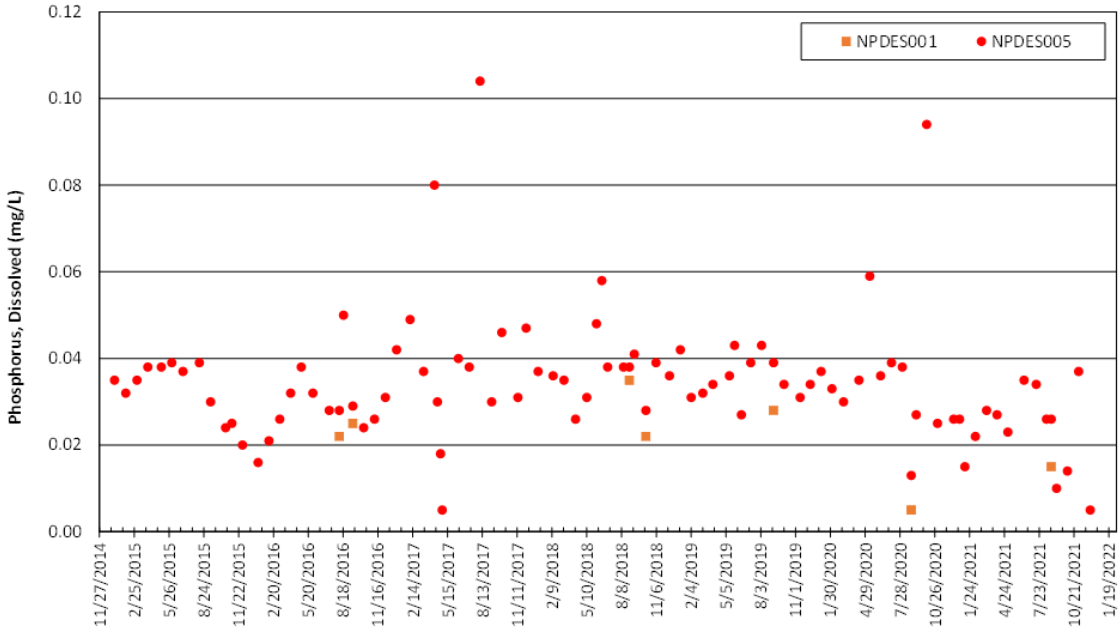

46MN31
Nitrogen, Nitrate (NO3)+Nitrite (NO2) (mg/L)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

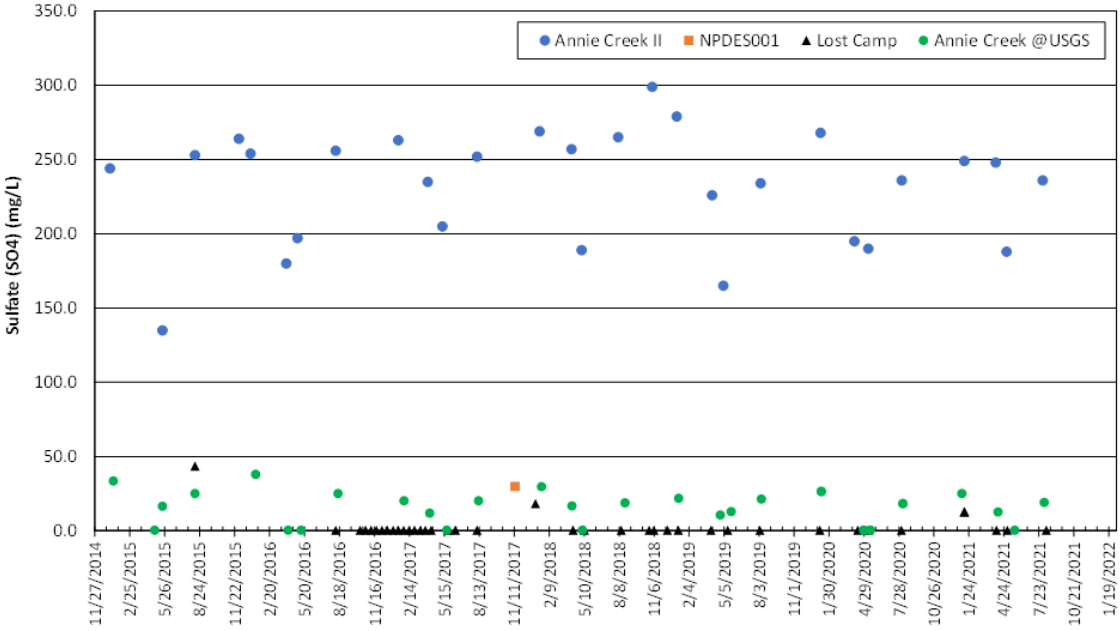

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
Nitrogen, Nitrate (NO3) (mg/L)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

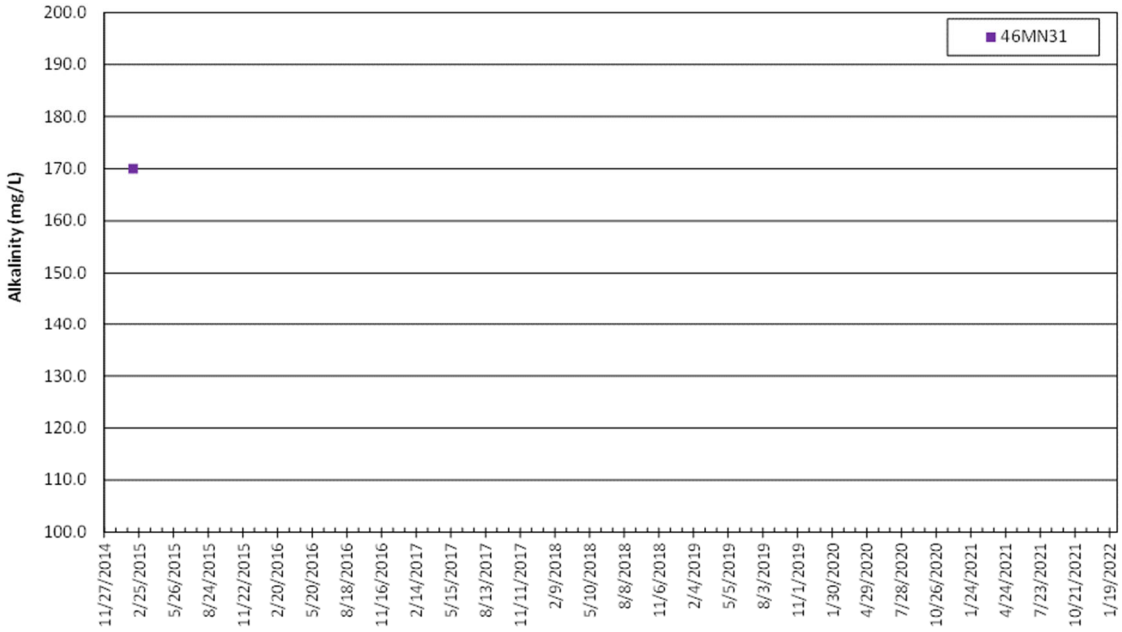

Annie Creek II
Lost Camp
Annie Creek @USGS
Nitrogen, Nitrite (NO2) (mg/L)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

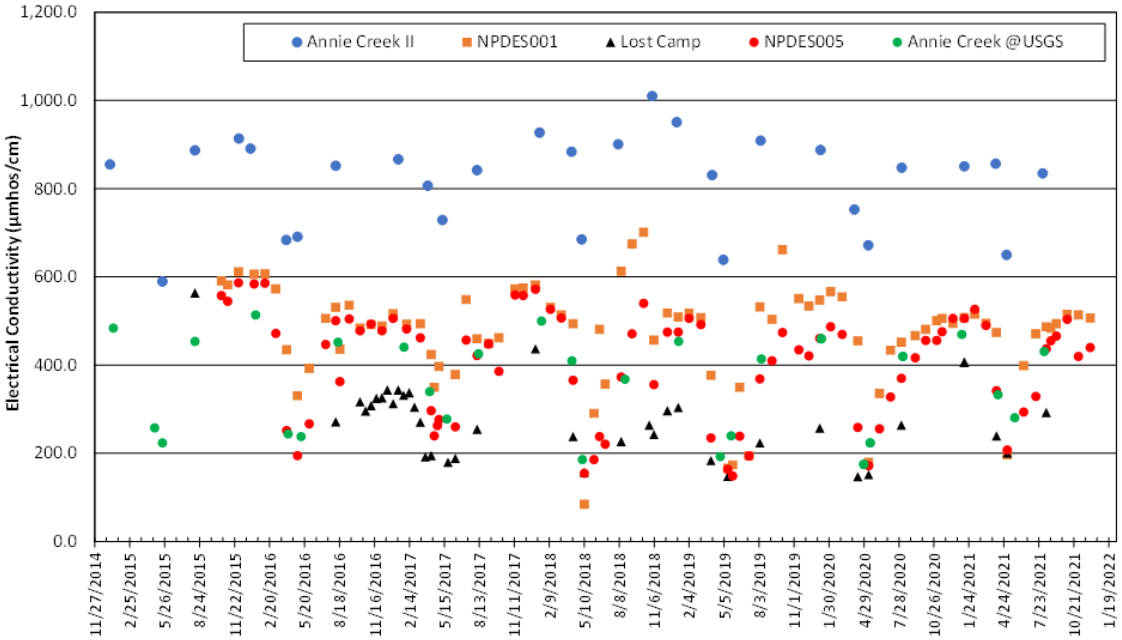

Kjeldahl Nitrogen (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

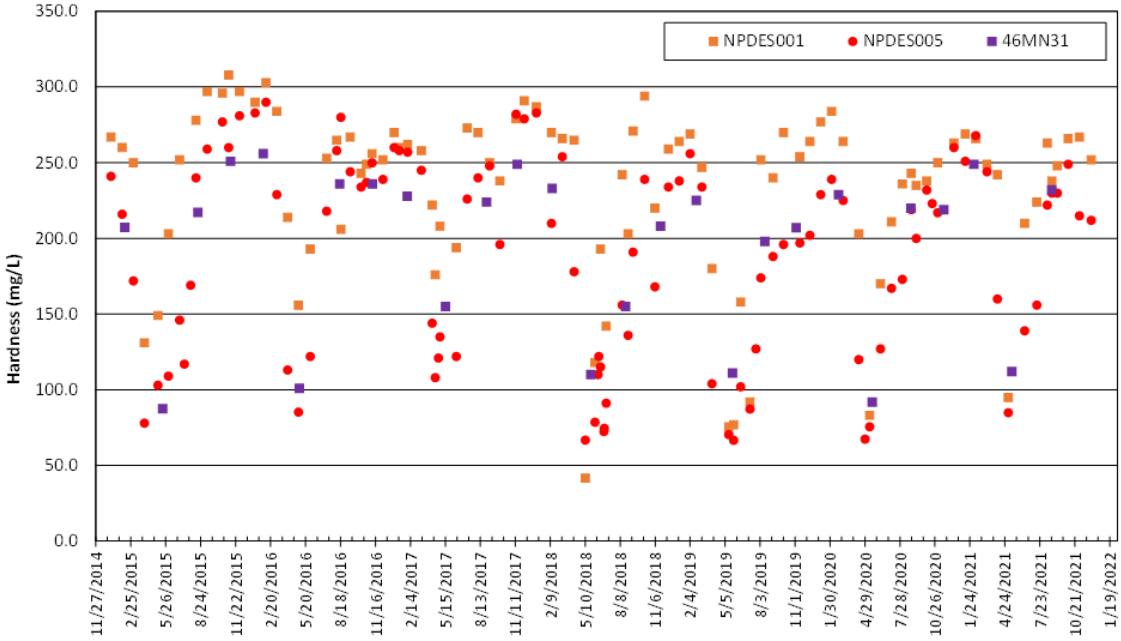

Phosphorus, Total (mg/L)
0.25
0.20
0.15
0.10
0.05
0.00
46MN31
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

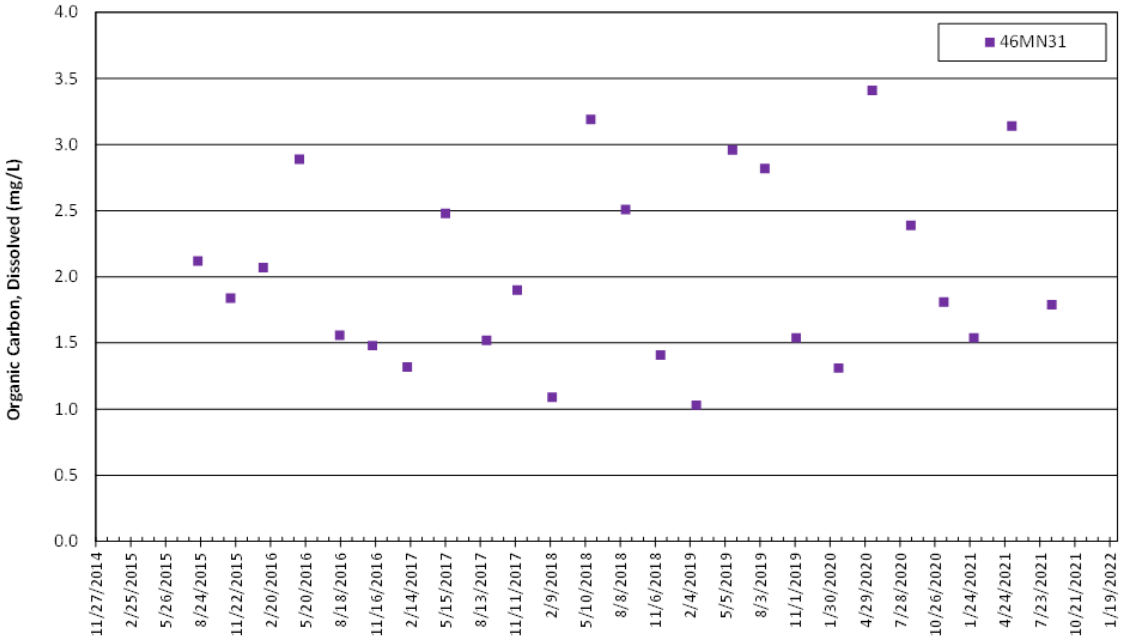

NPDES001
NPDES005
Phosphorus, Dissolved (mg/L)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

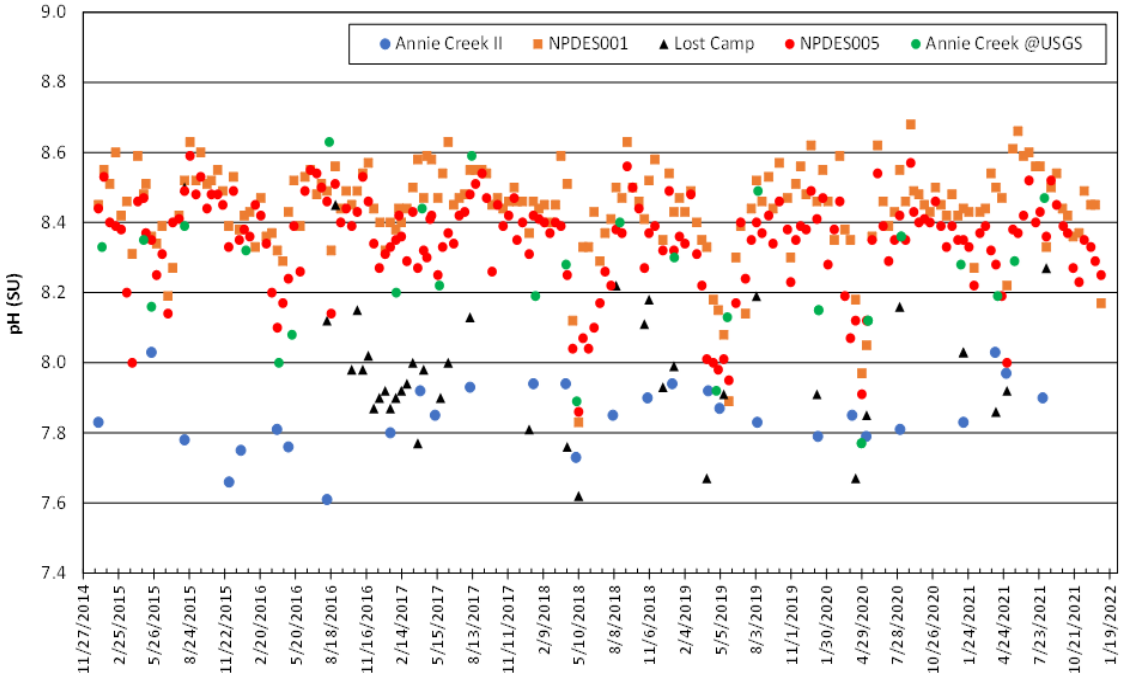

Annie Creek II
NPDES001
Lost Camp
Annie Creek @USGS
Sulfate (SO4) (mg/L)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

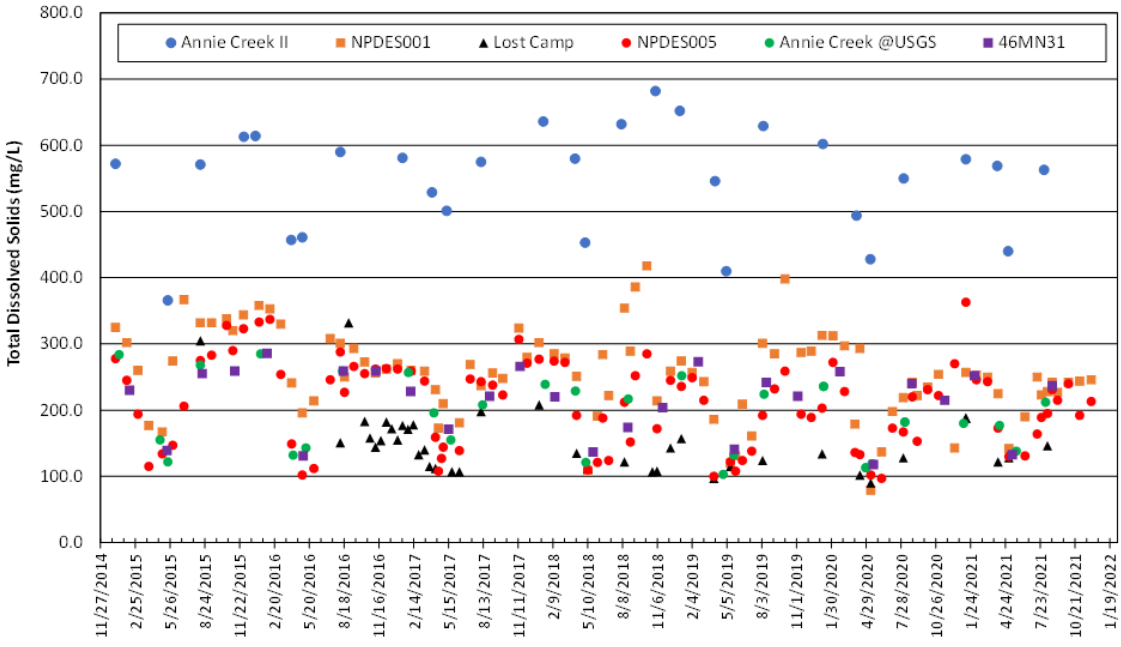

46MN31
Alkalinity (mg/L)
200.0
190.0
180.0
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

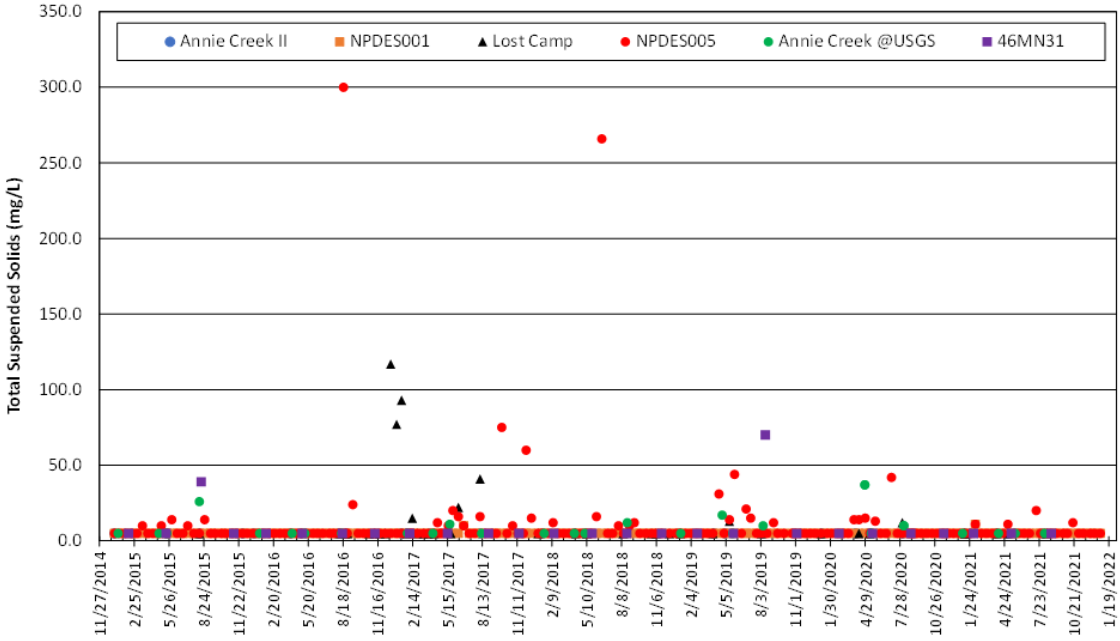

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
Electrical Conductivity (µmhos/cm)
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

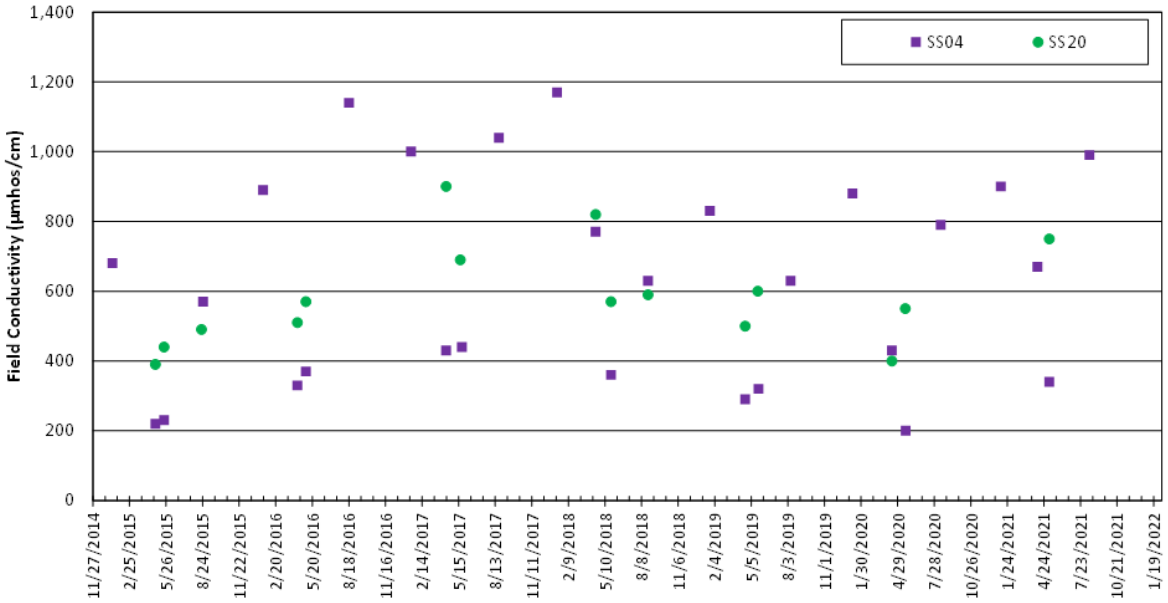

NPDES001
NPDES005
46MN31
Hardness (mg/L)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

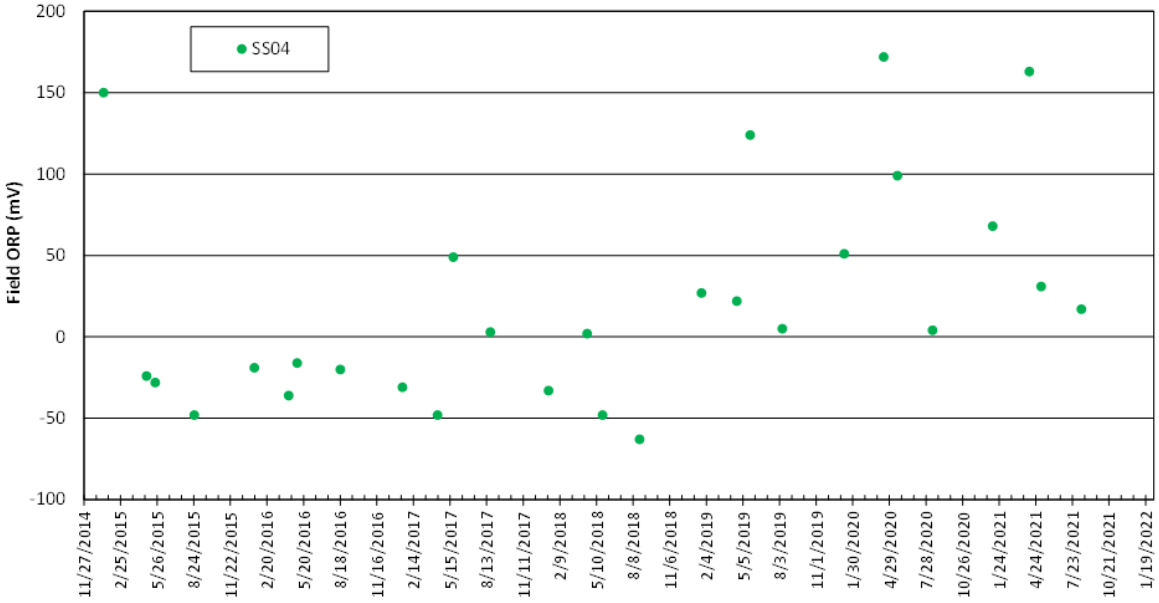

46MN31
Organic Carbon, Dissolved (mg/L)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

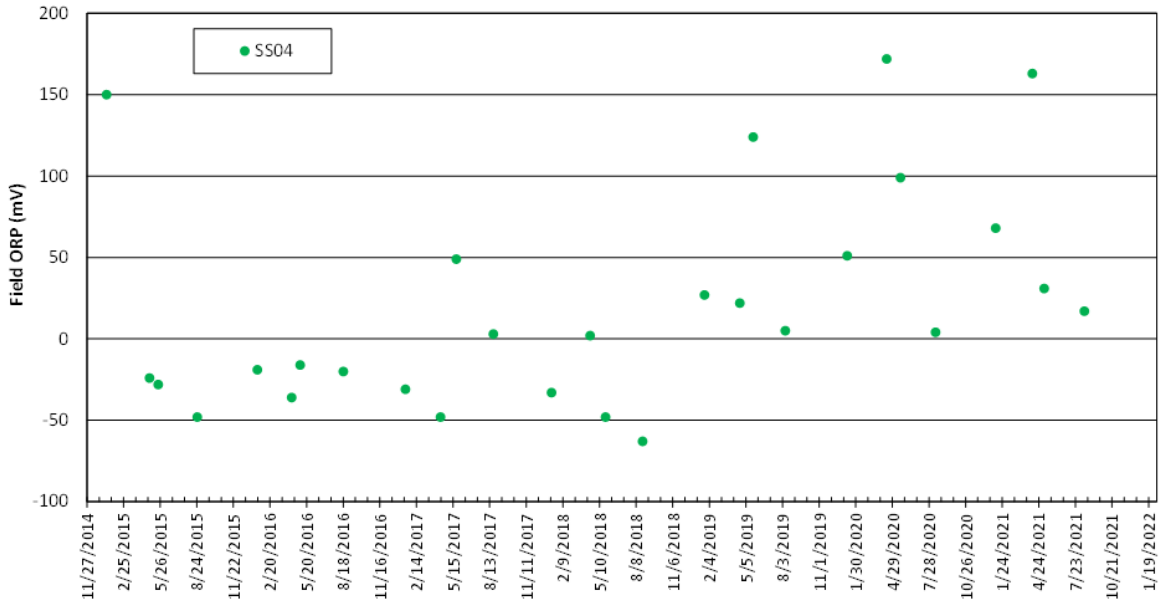

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
pH (SU)
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

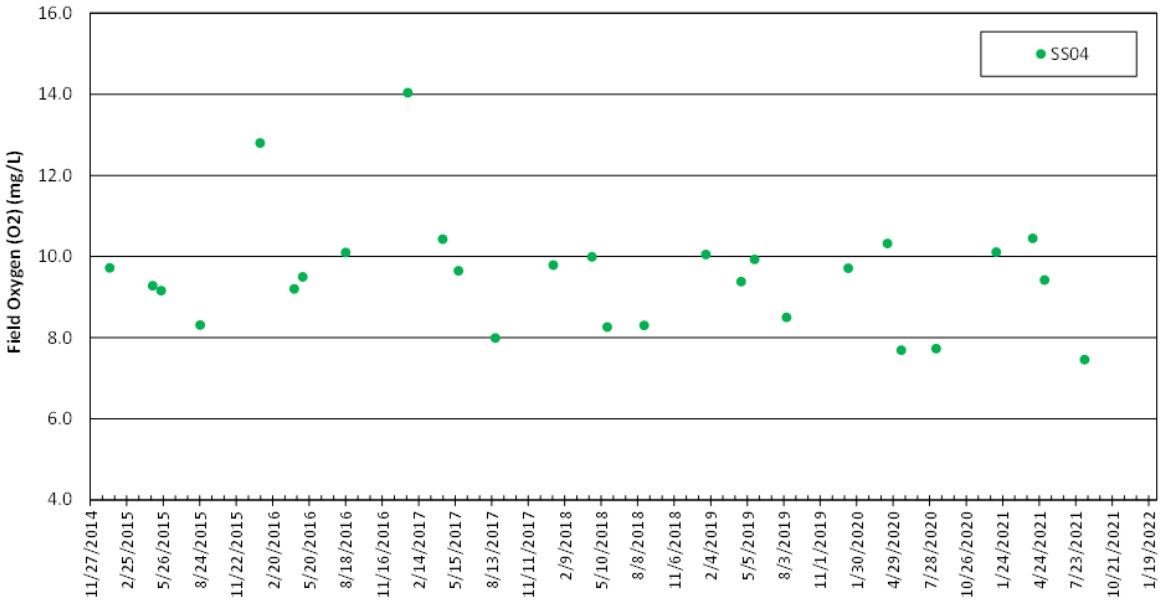

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Total Dissolved Solids (mg/L)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

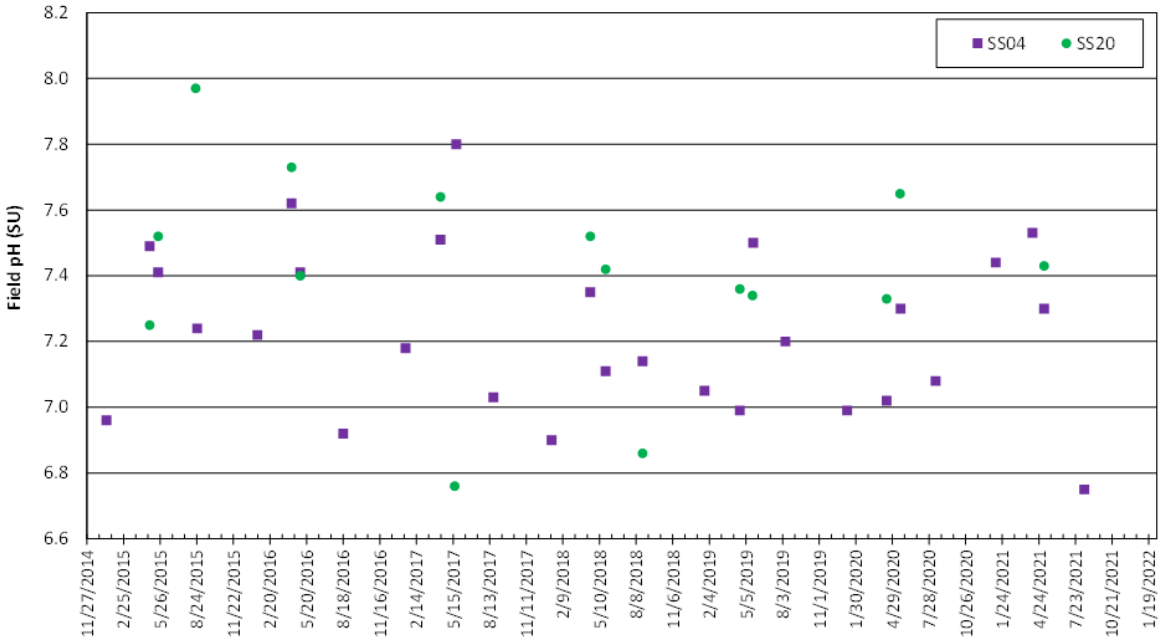

Annie Creek II
NPDES001
Lost Camp
NPDES005
Annie Creek @USGS
46MN31
Total Suspended Solids (mg/L)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

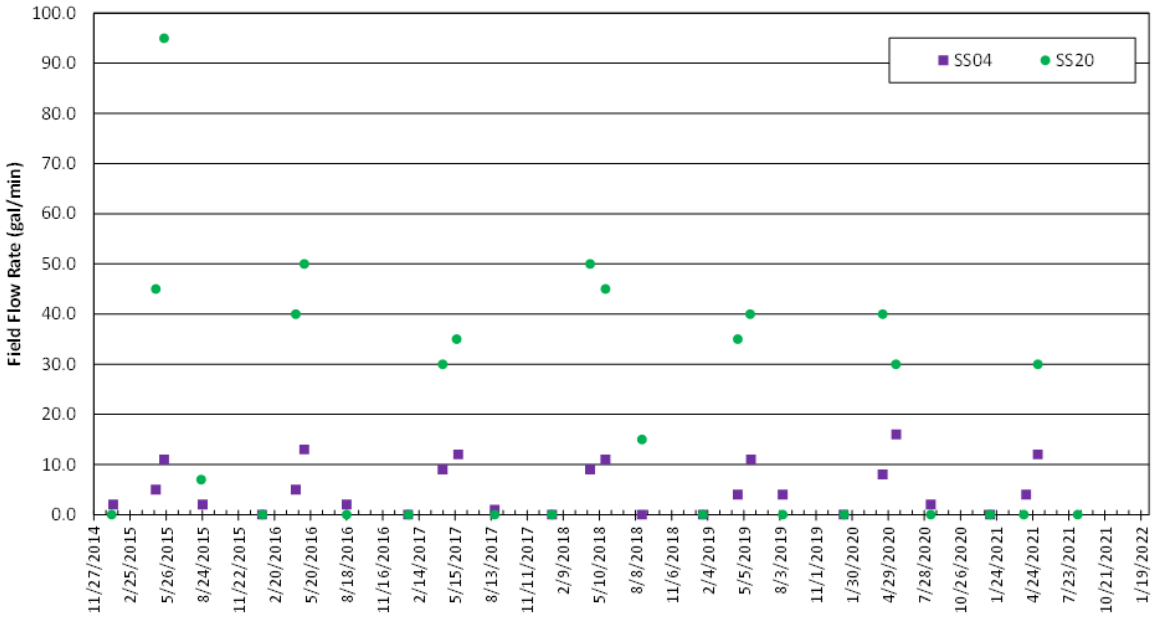

SS04
SS20
Field Conductivity (µmhos/cm)
1,400
1,200
1,000
800
600
400
200
0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

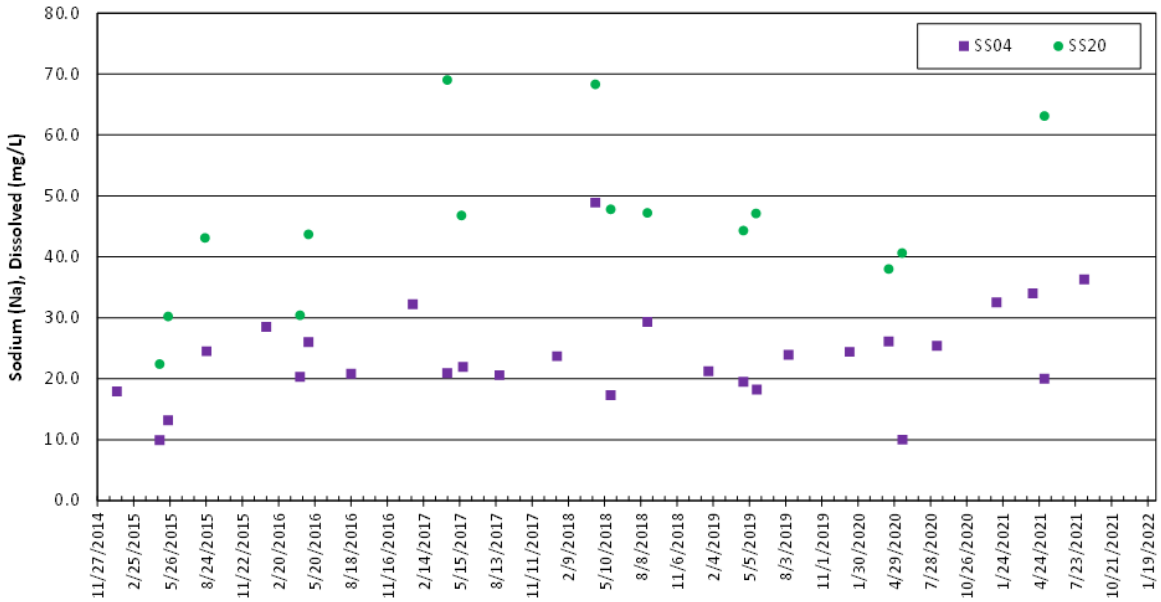

SS04
Field ORP (mV)
200
150
100
50
0
-50
-100
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

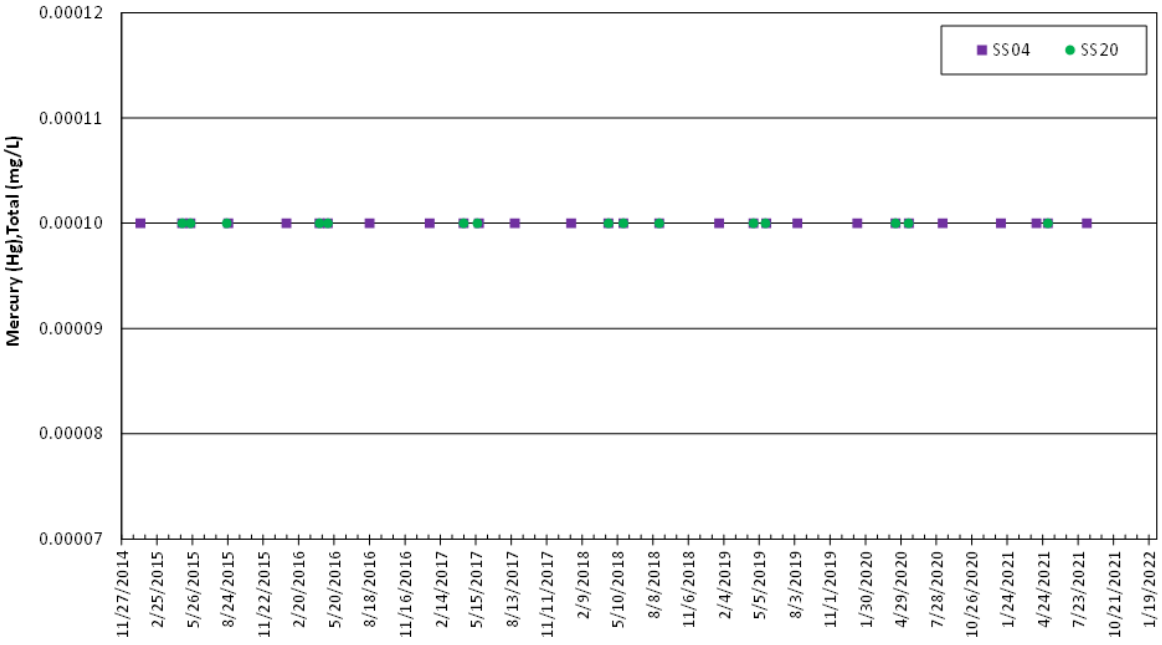

SS04
Field ORP (mV)
200
150
100
50
0
-50
-100
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

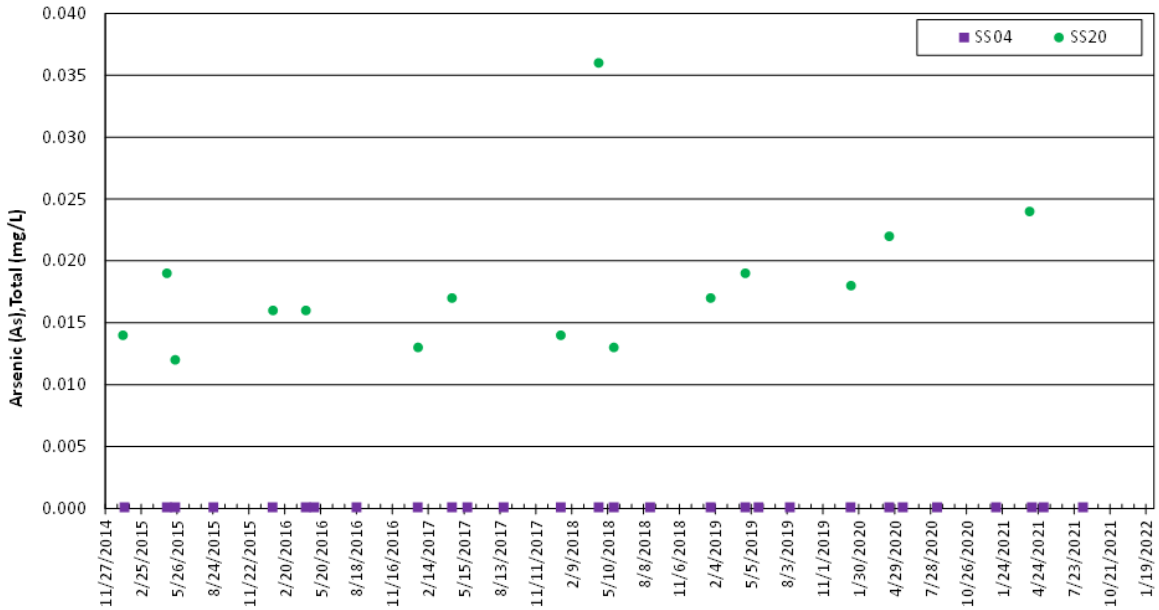

SS04
Field Oxygen (O2) (mg/L)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

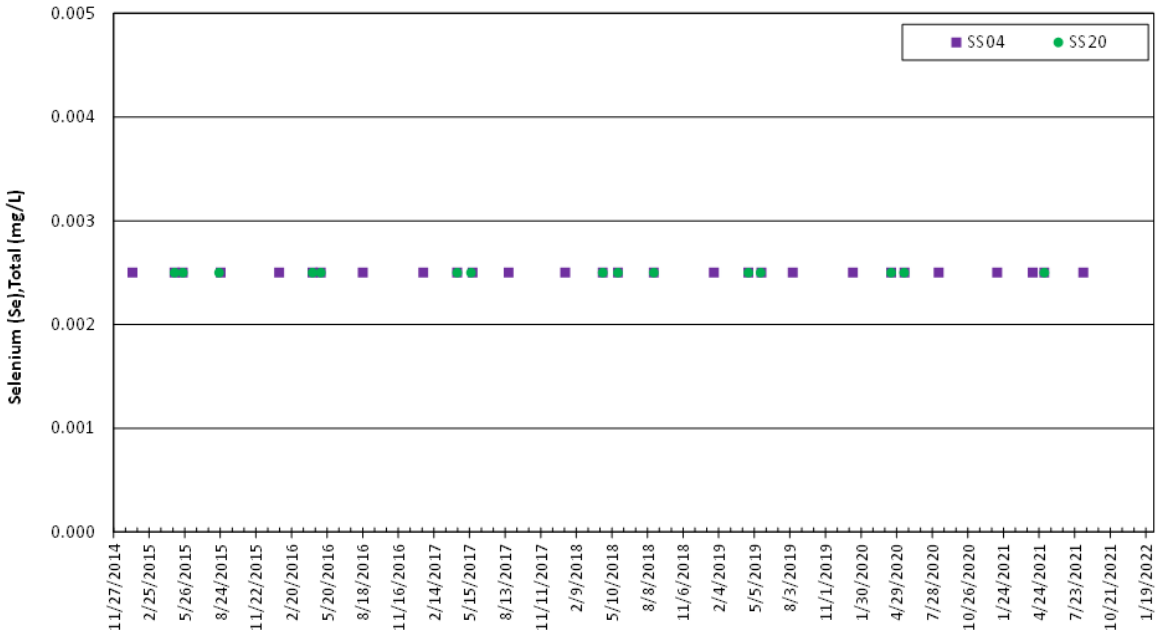

SS04
SS20
Field pH (SU)
8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

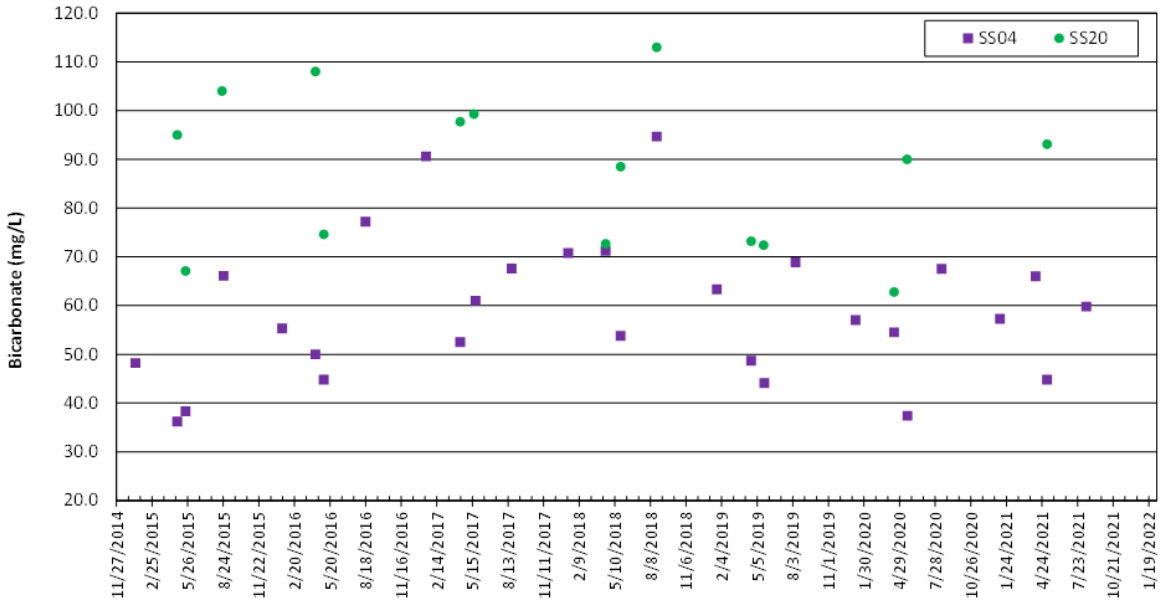

SS04
SS20
Field Flow Rate (gal/min)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

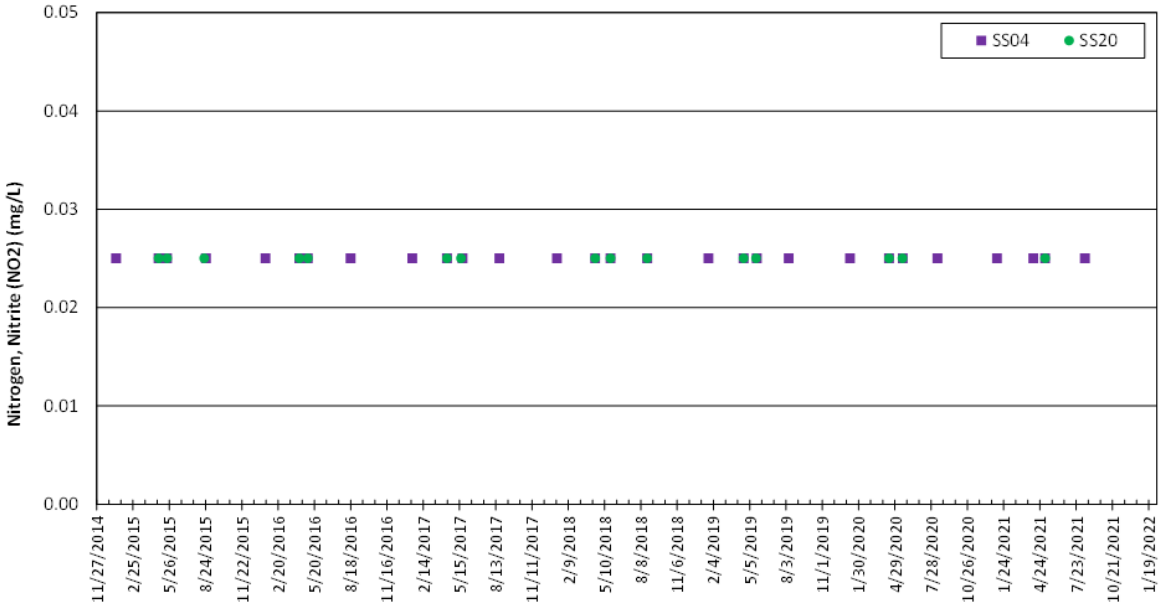

Sodium (Na), Dissolved (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
SS04
SS20
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

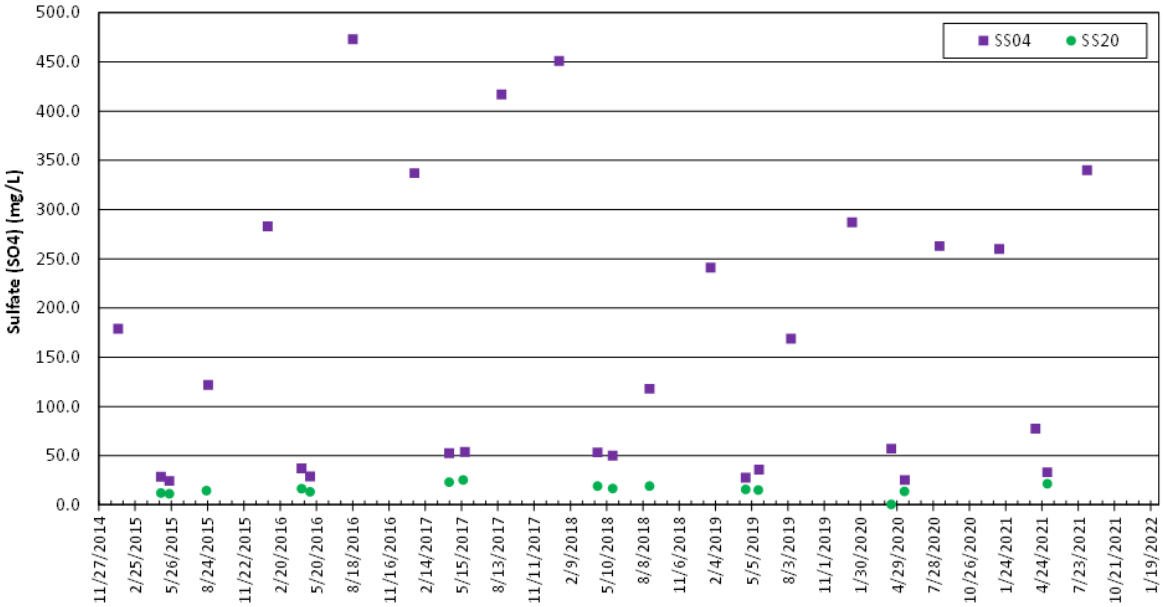

Mercury (Hg),Total (mg/L)
0.00012
0.00011
0.00010
0.00009
0.00008
0.00007
SS04
SS20
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

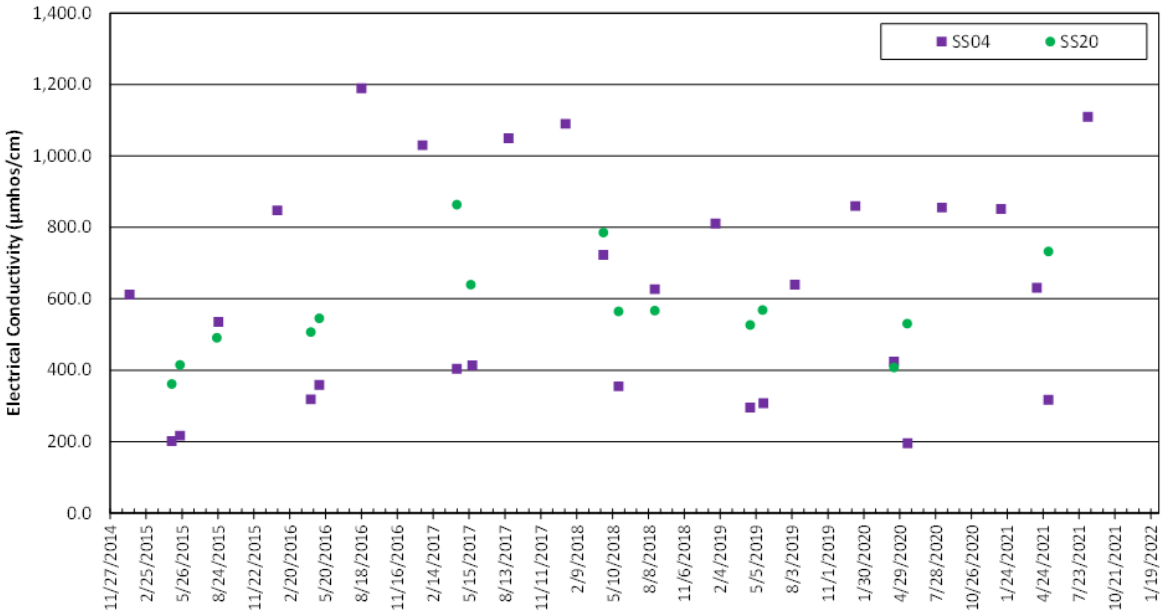

SS04
SS20
Arsenic (As),Total (mg/L)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

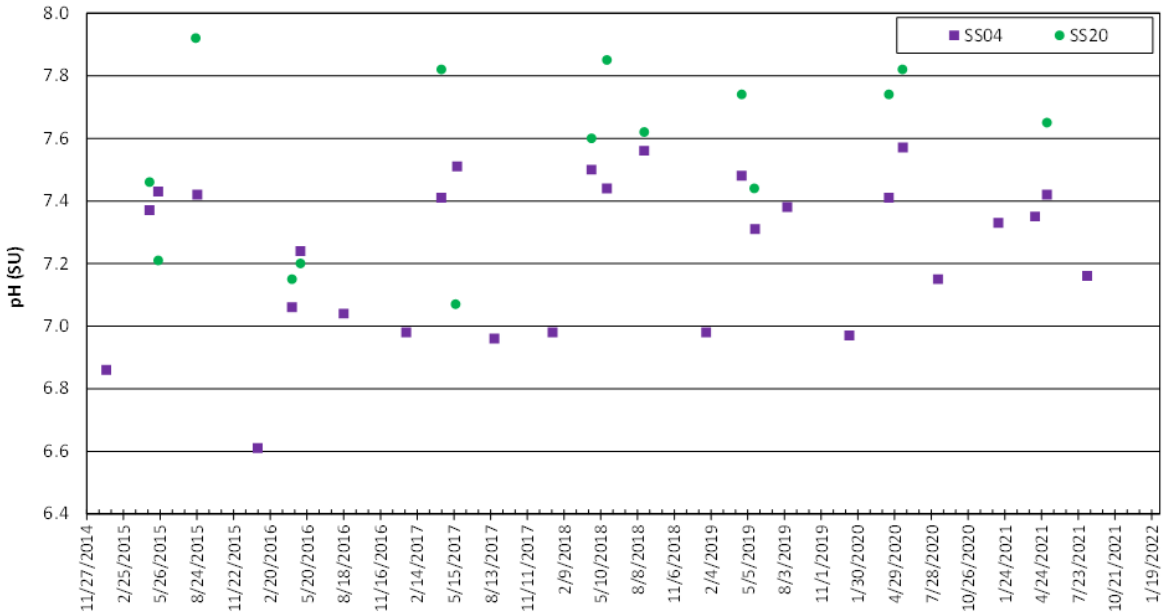

SS04
SS20
Selenium (Se),Total (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

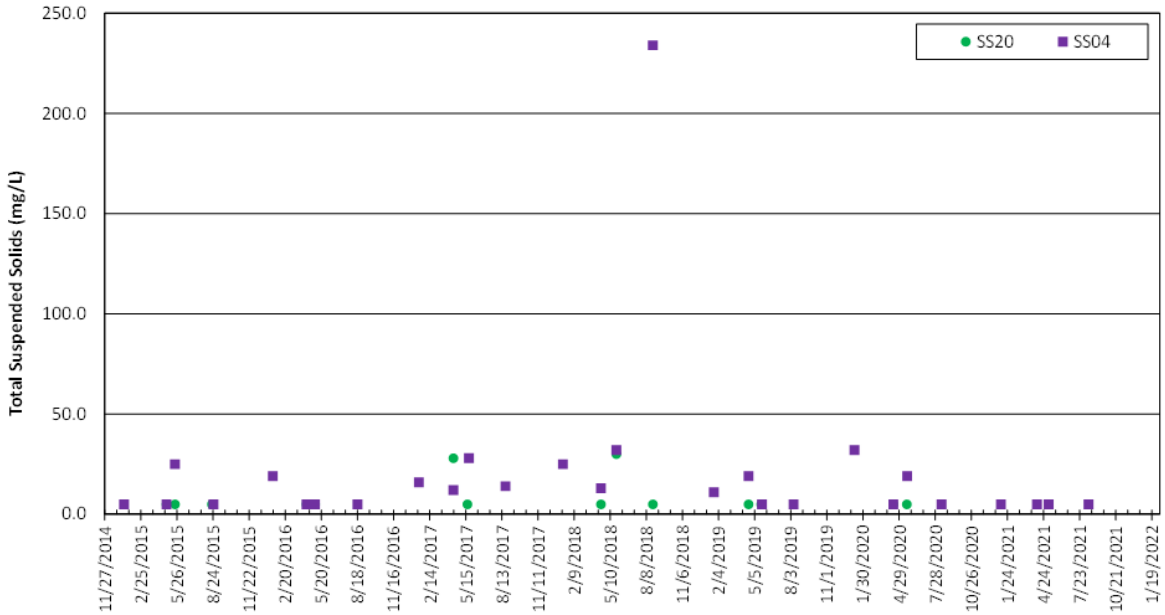

Bicarbonate (mg/L)
SS04
SS20
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022


Nitrogen, Nitrite (NO2) (mg/L)
SS04
SS20
0.05
0.04
0.03
0.02
0.01
0.00
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022


Sulfate (SO4) (mg/L)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
SS04
SS20
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

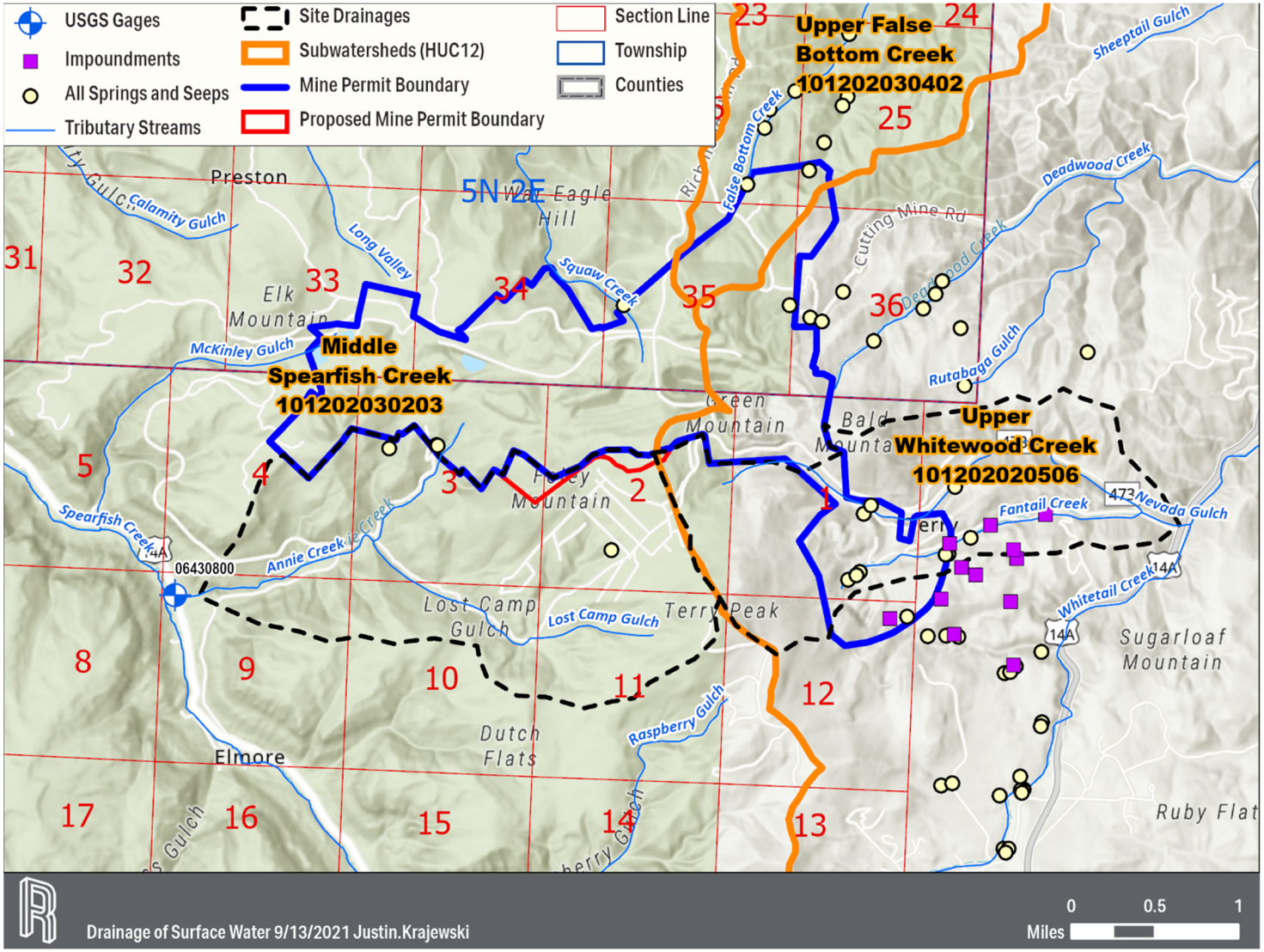

Electrical Conductivity (µmhos/cm)
1,400.0
1,200.0
1,000.0
800.0
600.0
400.0
200.0
0.0
SS04
SS20
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022


SS04
SS20
pH (SU)
8.0
7.8
7.6
7.4
7.2
7.0
6.8
6.6
6.4
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022


SS20
SS04
Total Suspended Solids (mg/L)
250.0
200.0
150.0
100.0
50.0
0.0
11/27/2014
2/25/2015
5/26/2015
8/24/2015
11/22/2015
2/20/2016
5/20/2016
8/18/2016
11/16/2016
2/14/2017
5/15/2017
8/13/2017
11/11/2017
2/9/2018
5/10/2018
8/8/2018
11/6/2018
2/4/2019
5/5/2019
8/3/2019
11/1/2019
1/30/2020
4/29/2020
7/28/2020
10/26/2020
1/24/2021
4/24/2021
7/23/2021
10/21/2021
1/19/2022

APPENDIX G

SURFACE WATER INVENTORY MAP


USGS Gages
Impoundments
All Springs and Seeps
Tributary Streams
Site Drainages
Subwatersheds (HUC12)
Mine Permit Boundary
Proposed Mine Permit Boundary
Section Line
Township
Counties
Upper False Bottom Creek 101202030402
Middle Spearfish Creek 101202030203
Upper Whitewood Creek 101202020506
5N 2E
Preston
Galamity Gulch
Long Valley
War Eagle Hill
Elk Mountain
McKinley Gulch
Squaw Creek
False Bottom Creek
Cutting Mine Rd
Deadwood Creek
Rutabaga Gulch
Sheeptail Gulch
Green Mountain
Bald Mountain
Terry Mountain
Fantail Creek
Nevada Gulch
Spearfish Creek
Annie Creek
06430800
Lost Camp Gulch
Lost Camp Gulch
Terry Peak
Whitetail Creek
Sugarloaf Mountain
Raspberry Gulch
Dutch Flats
Elmore
Ruby Flat
14A
473
31
32
33
34
35
36
5
4
3
2
1
8
9
10
11
12
13
17
16
15
14
23
24
25
Drainage of Surface Water 9/13/2021 Justin.Krajewski
0
0.5
1
Miles

APPENDIX H

LOST CAMP SPRING SURVEY MEMORANDUM

EXTERNAL MEMORANDUM

To: Amy Allen
Sr. Environmental Compliance Coordinator
Coeur Wharf
10928 Wharf Rd.
Lead, SD 57754

cc: Crystal Hocking, PE, PG, RESPEC
Project Central File M0025.21001

From: Nicholas Marnach, PE
Staff Engineer
RESPEC
P.O. Box 725
Rapid City, SD 57709

Date: June 8, 2022

Subject: Lost Camp Creek Spring Survey

A spring survey was completed on Lost Camp Creek on May 24 and 25, 2022, to identify and inventory springs and seeps upstream of the Lost Camp Creek surface-water sampling site. This project was completed by RESPEC Company, LLC (RESPEC) hydrologists for Coeur Wharf (Wharf) in support of permitting efforts for the proposed Boston Expansion and ongoing hydrologic site investigations. No springs or seeps are located within the proposed Boston Expansion Area.

As part of the Boston Expansion project, Wharf conducted a field inventory for springs along Lost Camp Creek in May 2021. The inventory involved searching for a source of water by walking up the Lost Camp Creek drainage from its confluence with Annie Creek to the Lost Camp Creek headwaters. In May 2021, the Lost Camp Creek headwaters spring was sampled while flowing, but the site has been dry since the initial sampling. The field inventory also identified a stormwater outfall from the Lost Camp Creek subdivision, which was contributing flow to the drainage but was not sampled because of uncertainty in its source. In May 2022, RESPEC conducted a spring survey to identify additional sources of flow within the drainage.

At the time of the survey, local streams and creeks had higher flow than observed in 2021, which was likely a result of spring melt and runoff from recent precipitation events. RESPEC observed localized saturated portions of the road surface leading to the Wharf Mine, which confirmed precipitation during the night of May 23. Weather during the spring survey was partly cloudy to sunny with a temperature ranging from 40 to 65 degrees Fahrenheit (°F). Light rain fell for approximately 30 minutes during the afternoon hours of May 24, and May 25 was partly cloudy to sunny.

3824 JET DRIVE
RAPID CITY, SD 57703
P.O. BOX 725 // RAPID CITY, SD 57709
605.394.6400

METHODOLOGY

To identify springs and seeps in the Lost Camp Creek drainage, RESPEC traversed the entire creek length and conducted a visual investigation that involved recording streamflow measurements and collecting data with a multiparameter sonde. Recorded sonde data included temperature, dissolved oxygen, conductivity, and pH. RESPEC also recorded visual seeps or springs and incoming side flow channels into the channel being studied.

RESPEC attempted to maintain consistent stationing of cross-section locations through pacing, but physical streambed characteristics and channel morphology generally dictated the cross-section and measurement station location. RESPEC accessed the entire length of each contributing creek except for one area, approximately 500 feet (ft) along Lost Camp Creek, where the channel became inaccessible because of steep terrain and dense vegetation.

The headwater springs identified by Wharf in 2021 and observed during this study were the only springs where traditional streamflow measurements could be collected outside the main channel. All other springs and seeps observed were either too shallow, too narrow, or too disparate to collect flow measurements with a top-setting wading rod; therefore, flow measurements were collected directly within the Lost Camp Creek channel where the shallowest portion of the cross section possessed a depth greater than 0.2 ft.

Side seeps and springs along each reach were not sampled using the multiparameter sonde because they had shallow depths less than 0.5 inch. Greater depths from a spring or seep were caused by confinement and ponding, not a concentration of flow from the spring or seep; therefore, data collected with the sonde were restricted to within the main Lost Camp Creek channel.

RESPEC used a thermal imaging camera in the study. Results showed observable temperature differences when measuring the relative temperature of side seeps and springs compared to the main channel. RESPEC attempted to identify springs and seeps within the channel using the thermal camera, but the turbulent nature of the flow within the channel was not conducive to observing a gradual mixing of different temperatures. Spring and seep temperatures were cooler than the main channel, but RESPEC assumed that the temperature difference was not great enough to measure with the capabilities of the thermal camera. The colorimetric scale of the thermal camera is relative and temperature readings were found not to be precise in this application compared to sonde temperature measurements. On thermal images, red and yellow colors are relatively warmer temperatures and blue and purple colors represent relatively cooler temperatures.

RESULTS

Twenty total potential spring or seep locations were identified along Lost Camp Creek during the May 2022 spring survey. Sites typically consisted of a single seep or spring, although a few locations consisted of two or more visibly separate springs or seeps. The springs and seeps identified along Lost Camp Creek are listed in Table 1 and shown in Figure 1. Flow measurements and physical data measurements within Lost Camp Creek are listed in Table 2. Representative photographs of springs and seeps along Lost Camp Creek are shown in Figures 2 through 11.

Table 1. Lost Camp Creek Springs and Seep Locations and Physical Data Measurements

Spring I.D.	Description	Latitude	Longitude	Elevation (ft)	Temperature (°F)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
S-1	Spring	44.33238719	103.873252	5,480.2	39.9	11.46	155.4	8.09
S-2	Seep/spring	44.33021711	103.8705156	5,532.3	–	–	–	–
S-3	Two seeps	44.32893814	103.8683654	5,593.2	–	–	–	–
S-4	Seep	44.32862722	103.8674344	5,607.9	–	–	–	–
S-5	Seep	44.328562	103.8671931	5,622.2	–	–	–	–
S-6	Seep	44.32814869	103.865536	5,636.2	–	–	–	–
S-7	Spring/seep	44.32828892	103.8647688	5,629.3	–	–	–	–
S-8	Seep	44.32741644	103.862188	5,688.2	–	–	–	–
S-9	Two seeps	44.32672786	103.862188	5,726.7	–	–	–	–
S-10	Spring	44.32654903	103.8603031	5,726.7	–	–	–	–
S-11	Seep	44.32422664	103.8547772	5,851.5	41.8	10.23	57.1	7.41
S-12	Series of seeps and springs	44.32548275	103.8530282	5,892.3	41.4	10.66	74.9	7.50
S-13	Series of seeps and springs	44.32549886	103.8538909	5,913.2	–	–	–	–
C-14	Confluence	44.32533247	103.8561044	5,811.7	–	–	–	–
S-15	Out welling/ old spring	44.32611442	103.8567752	5,829.8	–	–	–	–
S-16	Spring	coordinate not obtained			–	–	–	–
S-17	Spring/ out welling	44.32732883	103.8560688	5,879.2	40.2	8.23	213.0	7.34
S-18	Spring/ out welling	44.32793783	103.8556806	5,882.3	40.2	8.27	214.7	7.00
S-19	Seep	44.32834425	103.8549457	5,917.2	41.7	9.77	227.7	7.29
S-20	Spring	44.33018117	103.8515424	6,024.5	40.8	9.06	226.8	6.84
S-21	Stream headwater/ spring	44.33220436	103.8473905	6,231.5	39.7	10.70	231.8	8.15

µS/cm = microsiemens per centimeter

mg/L = milligrams per liter

RESPEC walked from the Lost Camp Creek downstream confluence with Annie Creek upstream to its confluence with the eastern tributary of Lost Camp Creek at C-14 shown in Figure 1 on May 24, 2022. On May 25, the upper branch of Lost Camp Creek was inspected from its headwater at S-21 (Figure 1) downstream to C-14. An approximate 500-ft length of stream between spring S-7 and cross-section

measurement station M-6 was inaccessible because of heavy vegetation and steep terrain during the time of the survey.

Figures 2 through 8 show seeps/springs S-2, S-3, S-5, S-6, and S-7. Thermal imaging of side seep/spring S-2 is shown in Figure 3 and was taken from the same frame of seep/spring S-2 shown in Figure 2. Inspection of the thermal gradient shown in Figure 2 yields a discrete temperature difference between the seep/spring and the adjacent Lost Camp Creek.

Table 2. Lost Camp Creek Cross-Section Streamflow and Physical Data Measurements

Stream Cross-Section ID	Latitude	Longitude	Elevation (ft)	Streamflow (cfs)	Temperature (°F)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
M-1	44.33245917	103.8733672	5,503.3	4.06	39.0	11.6	271.3	8.57
M-2	44.33156325	103.8722928	5,515.3	1.51	41.4	11.3	154.5	8.06
M-3	44.33036347	103.8708574	5,556.0	1.35	42.4	11.1	153.0	8.08
M-4	44.32922417	103.8689321	5,566.0	1.83	42.1	10.6	149.4	8.08
M-5	44.32822747	103.8664294	5,634.6	1.83	42.7	10.4	146.5	8.07
M-6	44.32741644	103.862188	5,688.2	2.24	42.0	10.6	144.8	7.95
M-7	44.3251015	103.8580149	5,812.0	1.91	40.9	10.7	140.7	7.66
M-8	44.33220436	103.8473905	6,231.5	0.38	39.7	10.7	231.8	8.15

cfs = cubic feet per second

Between cross-section measurement stations M-6 and M-7, spring S-10 was located on a small terrace approximately 20 ft above the Lost Camp Creek water surface. This spring produced a large marshy area on the terrace with several springs presented in an approximate 150-ft radius. Flow from spring S-10 concentrated on the unimproved road surface adjacent to Lost Camp Creek where it picked up sediment from the road and flowed into the creek at the road crossing. No active traffic was observed at the time of the survey, but the road appears to be used and the clearing above spring S-10 has been disturbed by all-terrain vehicles (ATVs); runoff from such ATV disturbance is finding its way down the ruts created by vehicles.

Several tributaries and springs are present in the clearing at the end of False Bottom Road as identified by S-12 and S-13, which concentrate at the confluence at C-14. As shown in Figure 1, east of the confluence at C-14, an additional tributary at the south side of the clearing located at the end of False Bottom Road flows into Lost Camp Creek from S-11 approximately 300 ft downstream of the confluence at C-14. An effort was made to trace the tributary running upstream of S-11 but was abandoned because of lack of flow.

Streamflow became subterranean several hundred feet downstream of the headwater spring at S-21 and did not return to the surface until S-20 (see Figure 11). From S-20 downstream to C-14, flow measurements were unreliable because of channel conditions (e.g. cobles, braided flow channels with depths less than 0.2 ft, and ponded locations). Traditional runs were minimal; therefore, only sonde data were collected.

Table 2 presents the cross-section streamflow and physical data measurements collected along the length of Lost Camp Creek. The cross-section measurement stations M-1 through M-8 numerically increase from downstream to upstream. Cross-section measurement station M-1 was recorded downstream of the confluence to Annie Creek and includes streamflow from Annie Creek and Lost Camp Creek. Streamflow rates generally increase when traveling upstream from cross-section measurement stations M-2 to M-8, except for M-6. Flow from spring S-10 is likely being realized in the streamflow measurement at cross-section measurement station M-6; however, a greater degree of inaccuracy is likely to result when comparing small stream flow values.

DISCUSSION

Twenty potential spring or seep locations were identified along Lost Camp Creek during the May 2022 spring survey. Sites consisted of single or multiple seeps that often formed shallow marshy areas, which made measuring individual spring flow challenging during this initial survey. Based on RESPEC's understanding of the local surface-water hydrology, most of these springs and seeps are likely to be intermittent; springs are more likely to be dry during late summer and fall and more significant following precipitation events.

CMH:akm



Figure 1. Lost Camp Creek – Springs, Seeps, and Measurement Cross Sections.



Figure 2. Side Seep/Spring S-2 Along Lost Camp Creek.

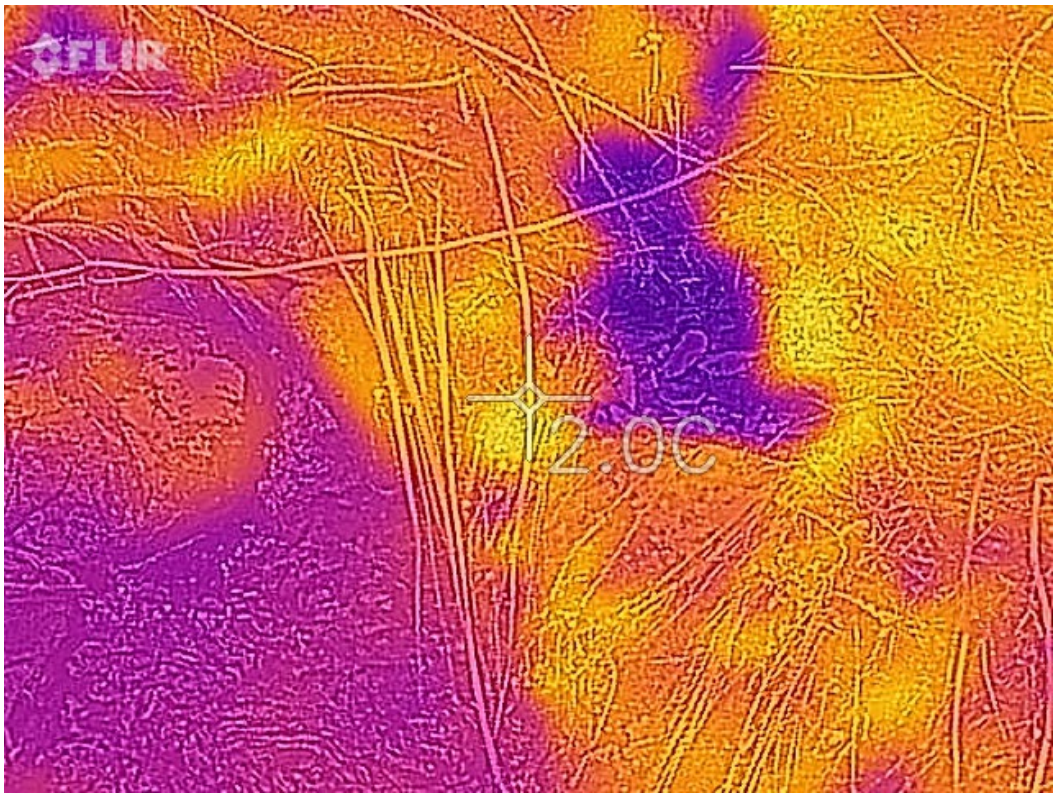


Figure 3. Thermal Imagery of Side Seep/Spring S-2 Along Lost Camp Creek.



Figure 4. Two Side Seeps at S-3 Along Lost Camp Creek.



Figure 5. Side Seep S-5 Along Lost Camp Creek.



Figure 6. Side Seep/Spring S-6 Looking Downstream Toward Lost Camp Creek.

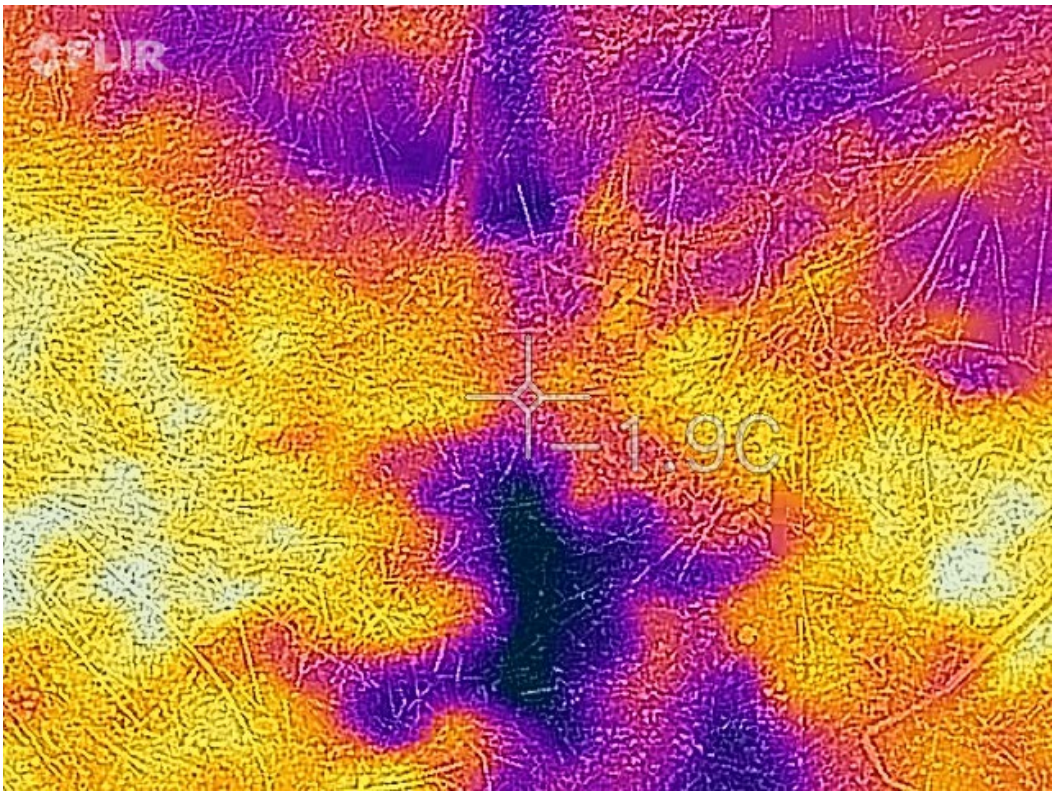


Figure 7. Thermal Imagery of Side Seep/Spring S-6 Along Lost Camp Creek.



Figure 8. Side Seep/Spring S-7 50 Feet to the North of Lost Camp Creek.



Figure 9. Spring S-15.



Figure 10. Spring S-18.



Figure 11. Spring S-20.