SURFACE WATER CHARACTERIZATION STUDY OF THE WHARF EXPANSION PROJECT AREA

Topical Report RSI-2163

prepared for

Wharf Resource (USA), Inc.
10928 Wharf Road
Lead, South Dakota 57754

November 2010

RESPEC
CONSULTING & SERVICES

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by

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1.0 INTRODUCTION

Wharf Resources (USA) Inc. (Wharf) has proposed to expand existing heap-leach gold operations on the proposed permit areas known as the Wharf and Golden Reward Expansions. This area is located approximately 2 to 3 miles west of Lead, South Dakota, in Lawrence County. The proposed permit area consists of approximately 339 acres of private land along the southern edge of the existing Wharf Mine permit boundary and along the eastern base of Terry Peak. Figure 1-1 shows the study area.

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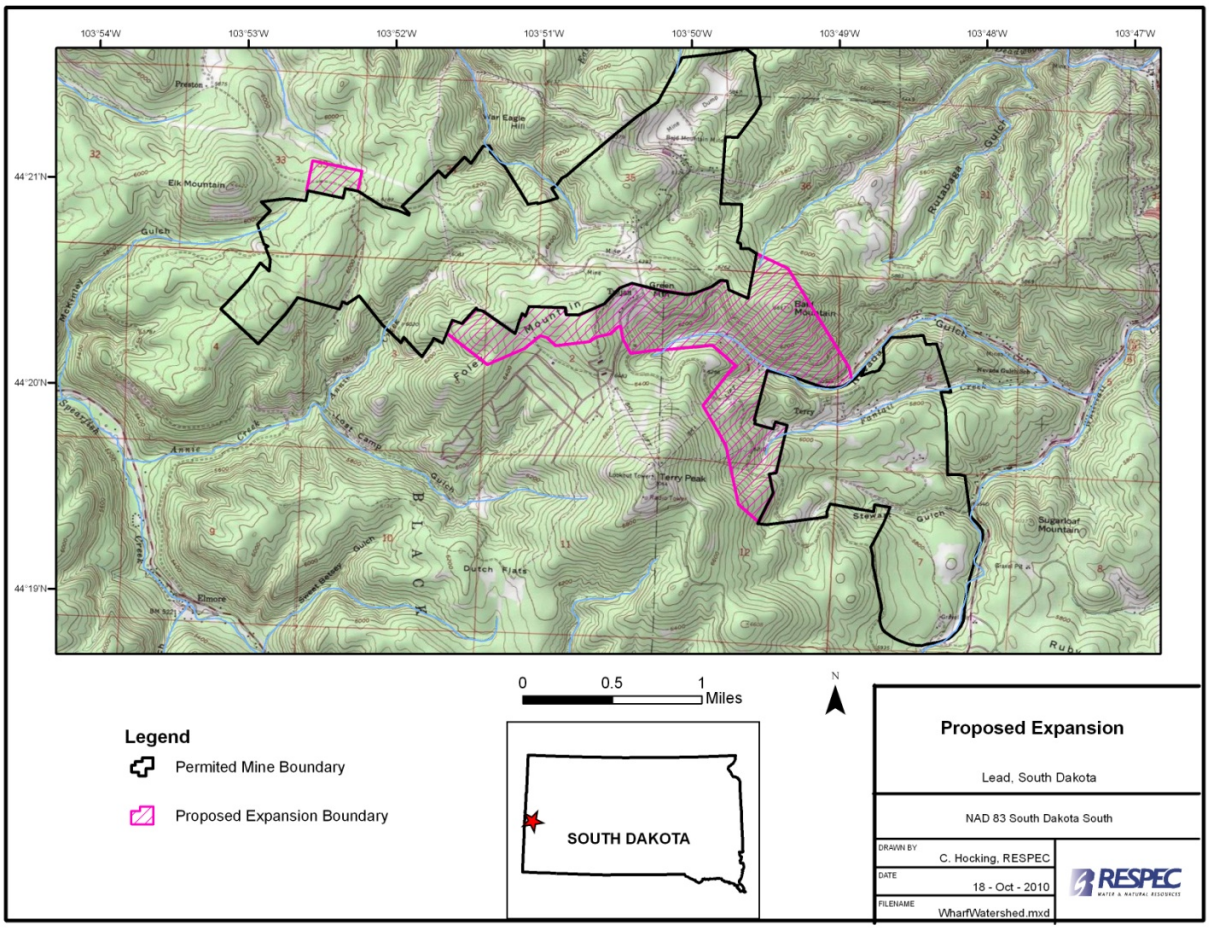

Figure 1-1. Expansion Baseline Study Area Map.

A baseline environmental study in the expansion area has been completed per the requirements of the South Dakota Department of Environment and Natural Resources (SD DENR). The SD DENR mining rules Administrative Rules of South Dakota ARSD 74:29 and South Dakota statutes South Dakota Codified Law (SDCL) 45-6B-7 require a baseline sampling plan to include the baseline water quality of all areas potentially affected by the

proposed mining operation. In compliance with ARSD 74:29:02:07, surface waterbodies, including streams (perennial or ephemeral), must be sampled monthly for at least 1 year unless otherwise justified. Permit requirements also include the measurement of water-level data for a period of at least 1 year.

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. Also included is the statistical analysis of the water quality for 1 year of baseline data (October 1, 2009–September 30, 2010) and a 5-year data summary (October 1, 2005–September 30, 2010).

This report is organized to optimize available information and understanding of the sites' surface water quality. Chapter 2.0 provides information about the sites' physical characteristics, and water-quality information, and Chapter 3.0 summarizes any potential impacts to surface water as a result of the Wharf Expansion Project. Appendix A includes site specific lists of sampled constituents, Appendix B includes maps and flow data from the aquatic sampling effort, Appendix C describes the sampling methodology used for the project, Appendix D lists all raw data from the previous five years at baseline sites, Appendix E shows water quality statistics by site, Appendix F contains boxplots of water-quality parameters at all baseline sites, and Appendix G includes statistics on USGS data.

The condition of the surface water in the project area was evaluated for a previous baseline sampling plan by J. M. Montgomery Consulting Engineers, Inc., (JMM) of Boise, Idaho [1996]. The Wharf Expansion Project area is within the surface water characterization area studies by JMM as part of the Clinton Expansion.

The following is a list of descriptions, analyses, and sampling required by South Dakota law for mine permit applicants:

1. **SDCL 45-6B-7 (9) (a-mm):** Baseline water quality (Section 2.3, Appendix D)
2. **SDCL 45-6B-41:** Minimize disturbance to prevailing hydrologic balance (Chapter 3.0)
3. **ARSD 74:29:02:07:** Water-quality and water level data (Section 2.3, Appendix D)
4. **ARSD 74:29:02:11(1):** Baseline surface and groundwater reports
5. **ARSD 74:29:02:11(3):** Surface water inventory map on a topographic base map, depicting all identifiable surface water resources potentially affected by the operation, including seeps, springs, rivers, streams, lakes, ponds, wetlands, and dams (Section 2.1, Figure 2-1, and Figure 2-2)
6. **ARSD 74:29:02:11(7):** Surface and groundwater monitoring plan for life of mine (Section 2.2)
7. **ARSD 74:29:07:08:** Hydrologic balance – water quality (Section 2.3, Appendix D).

2.0 SURFACE WATER QUALITY

2.1 BACKGROUND AND LOCATION

The Wharf Expansion falls within the Belle Fourche River Basin (BFRB), which primarily extends through two states—Wyoming and South Dakota. The southeastern tip of Montana and the southwestern tip of North Dakota are also included in the BFRB. The basin drains approximately 7,188 square miles. Land elevation in the BFRB ranges from about 2,030 feet to 7,113 feet above mean sea level. Land elevations of the Wharf Expansion area range from approximately 5,800 feet to 6,600 feet.

2.1.1 Site Drainage Characteristics

Multiple small tributaries (Deadwood Creek, Rutabaga Gulch, Nevada Gulch, Fantail Creek, Lost Camp Gulch, Annie Creek, McKinley Gulch, Calamity Gulch, Long Valley, False Bottom Creek, Whitetail Creek, Ross Valley, Stewart Gulch, and Squaw/Cleopatra Creek) are located within or adjacent to the current Wharf Mine and drain into Spearfish Creek (Hydrologic Unit Code (HUC) 101202030302), the Lower Redwater Creek (HUC 101202030402), and the Middle Belle Fourche River (HUC 101202020207). These tributaries eventually discharge into the Belle Fourche River. All three drainages are located in Lawrence County, South Dakota. The Wharf expansion permit area drains into the multiple subbasins falling within the Spearfish Creek and Middle Belle Fourche River Watersheds, as shown in Figure 2-1. The baseline sampling sites fall within these drainages and appear to represent the Wharf expansion area well. A delineation of the local watershed shows 8 of the 14 tributaries have proposed surface disturbance within their drainage basins (Fantail Creek, Nevada Gulch, Stewart Gulch, Deadwood Creek, Lost Camp Gulch, Annie Creek, Long Valley, and McKinley Gulch). Each major drainage is briefly described in the following paragraphs.

2.1.1.1 Fantail Creek

Fantail Creek lies immediately south of Nevada Gulch. It is an intermittent stream that originates within the Golden Reward Mine. Fantail Creek flows northeasterly to its confluence with Nevada Gulch. Two baseline sampling sites are located on Fantail Creek, SS-06 and SS-14A.

2.1.1.2 Nevada Gulch

Nevada Gulch is an ephemeral stream originating near the base of Terry Peak. It flows toward the east and into Whitetail Creek downstream of the expansion area. There are three current surface water monitoring sites on Nevada Gulch (SS-04, SS-05, and SS-20).

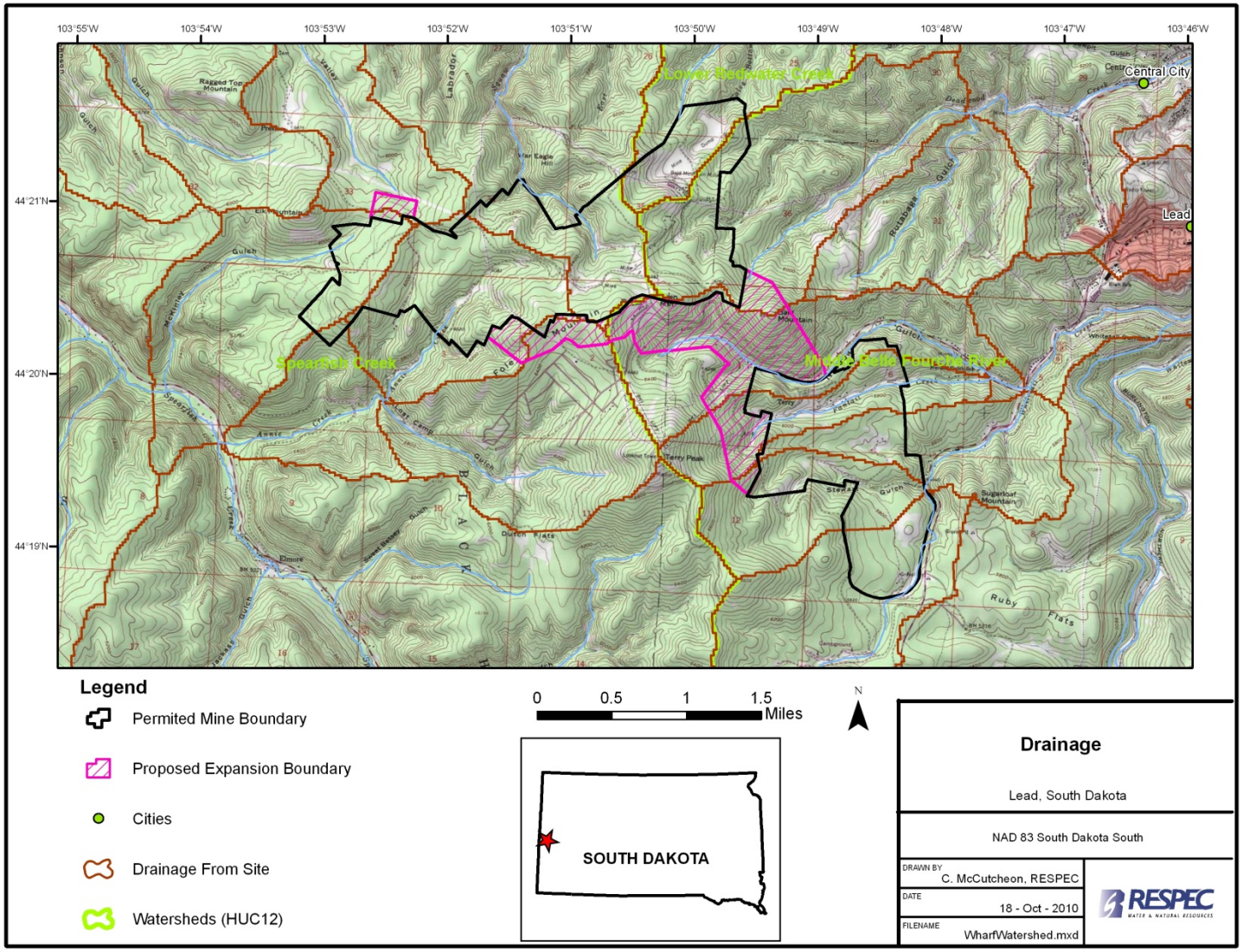

Figure 2-1. Drainage of Surface Water From the Wharf Mine and the Proposed Expansion Area.

2.1.1.3 Stewart Gulch

Stewart Gulch, an ephemeral stream, flows into Whitetail Creek. Stewart Gulch is located on the east side of the study area. Two baseline sampling sites (SS-01 and SS-12) are located on Stewart Gulch.

2.1.1.4 Deadwood Creek

Deadwood Creek is ephemeral within the study area and perennial at its mouth. It receives flow from Rutabaga Gulch and is located on the northeast side of the study area. Two baseline sampling sites (BMT-1 and DWD-1) are located on Deadwood Creek.

2.1.1.5 Lost Camp Gulch

Lost Camp Gulch flows northwest to its confluence with Annie Creek on the west side of the Wharf Mine. Lost Camp Gulch is an ephemeral stream with one surface water monitoring site (Lost Camp).

2.1.1.6 Annie Creek

Annie Creek is a perennial stream which flows southwest into Spearfish Creek. Annie Creek has one baseline sampling site (Annie Creek @ USGS).

2.1.1.7 Long Valley

Long Valley drains the north side of the small rectangular expansion proposed on the north side of the existing Wharf Mine. Long Valley is ephemeral and flows into Spearfish Creek. No baseline monitoring sites currently exist on this stream.

2.1.1.8 McKinley Gulch

McKinley Gulch also drains the south side of the small rectangular expansion proposed on the north side of the existing Wharf Mine. McKinley Gulch is ephemeral and flows into Spearfish Creek. No baseline monitoring sites currently exist on McKinley Gulch.

2.1.2 Site Beneficial Uses

All surface waters in the state of South Dakota are classified into 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.

Table 2-1 gives the state of South Dakota beneficial uses (when assigned) for small tributaries which could potentially be affected by the proposed expansion area. Streams located immediately within drainages affected by the expansion are denoted with a star. Water-quality standards associated with beneficial uses of these tributaries are given in Table 2-2. Streams listed as "n/a" are not included in the 303(d) list. The South Dakota 2010 303(d) list [South Dakota Department of Environment and Natural Resources, 2010] classifies False Bottom Creek as impaired near the expansion area because pH values fall below the criteria for cold-water marginal fish life and fish and wildlife propagation, recreation, and stock watering. The Creek's support status related to these beneficial uses is listed as nonsupporting [South Dakota Department of Environment and Natural Resources, 2010].

2.2 SURFACE WATER MONITORING PROGRAM

2.2.1 Sampling Sites

Currently, 23 surface water monitoring sites are being sampled, including one new site in Nevada Gulch. The monitoring sites are listed in Table 2-3. Of all sites, 6 are sampled monthly, 15 are sampled four times per year, and 4 are sampled once per year. Ten of these sites (Annie Creek @ USGS, Lost Camp, BMT-1, DWD-1, SS-01, SS-04, SS-06, SS-12, SS-14A, and SS-20) are considered baseline monitoring sites for the expansion area, and the last 5 years of data for these sites are presented in this report and shown in Figure 2-2. The new site (SS-20) is being sampled monthly for 1 year beginning in December 2009. Site SS-05 had been sampled historically but had been removed from Golden Reward's required sampling sites. As requested by the SD DENR, this site will be added back into the sampling program. Historical data for this site (2004) will serve as baseline data for SS-05 as new sampling began in October 2010 and results were not available at the time this report was compiled.

Table 2-1. Beneficial Uses of Streams in and Near the Wharf Permit Area [South Dakota Department of Environment and Natural Resources, 2010]

Waterbody	Beneficial Uses
Deadwood Creek[(a)]	3, 7, 8, 9, 10
Rutabaga Gulch	n/a
Nevada Gulch[(a)]	n/a
Fantail Creek[(a)]	2, 7, 8, 9, 10
Lost Camp Gulch[(a)]	n/a
Annie Creek[(a)]	3, 7, 8, 9
McKinley Gulch[(a)]	n/a
Calamity Gulch	n/a
Long Valley[(a)]	n/a
False Bottom Creek	3, 8, 9, 10
Squaw/Cleopatra Creek	n/a
Stewart Gulch[(a)]	2, 8, 9, 10
Ross Valley	n/a
Whitetail Creek	2, 7, 8, 9, 10

(a) Located within drainages affected by proposed expansion.

The chemical parameters analyzed in the sampling program were derived from those currently required by the SD DENR for the water-quality program at the existing Wharf Mine and from SDCL 45-6B-7(9). The relevant parameter list for each site is listed in Table 2-3 with the actual parameter lists available in Appendix A.

In addition to water-quality sampling, flow was measured during an aquatic sampling effort. Sites where flow was measured during aquatic sampling are not necessarily coincident with water-quality sites. Maps of these aquatic sites, as well as flow data from this project, are provided in Appendix B. Additional aquatic habitat information is described in the aquatic biological monitoring plans for streams near Wharf and Golden Reward [Chadwick Ecological Consultants, Inc., 2006a; 2006b].

United States Geological Survey (USGS) has operated three surface water data collection sites since 2006 in the vicinity of the proposed permit area. USGS 06436165 (Deadwood Creek at Central City, South Dakota) is located less than 2 miles downstream of the confluence of Deadwood Creek and Rutabaga Gulch, USGS 06436156 (Whitetail Creek at Lead, South Dakota) is located approximately 1.5 miles downstream of the confluence of Nevada Gulch and

Fantail Creek, and USGS 06430800 (Annie Creek near Lead, South Dakota) is located approximately 1 mile downstream of the confluence of Annie Creek and Lost Camp Gulch. Flow data are available at the Deadwood Creek site and the Annie Creek site, while temperature and conductivity data are available at all three sites (Appendix G). Data from the three USGS sites can be downloaded from the USGS website.

Table 2-2. Beneficial Use Numeric Criteria [South Dakota Department of Environment and Natural Resources, 2010]

Parameters (mg/L) Except Where Noted	(2) Cold-Water Permanent Fish Life Propagation	(3) Cold-Water Marginal Fish Life Propagation	(7) Immersion Recreation	(8) Limited Contact Recreation	(9) Fish, Wildlife Propagation, Recreation, Stock Watering	(10) Irrigation
Alkalinity (CaCO3)					750[a] 1,313[b]	
Chloride	175 (acute); 100 (chronic)					
Coliform, fecal (cfu/100 mL) (c)			200 (mean); 400 (single sample)	1,000 (mean); 2,000 (single sample)		
Conductivity (µS/cm @ 25°C)					4,000[a] 7,000[b]	2,500[a] 4,375[b]
Hydrogen sulfide, undisassociated	0.002	0.002				
Nitrogen, unionized ammonia as N	Calculation[d]	Calculation[d]				
Nitrogen, nitrates as N					50[a] 88[b]	
Oxygen, dissolved	6.0; 7.0 (during spawning season)	5.0	5.0	5.0		
pH (standard units)	6.5–9.0	6.5–9.0			6.0–9.5	
Sodium Adsorption Ratio						10
Solids, suspended	30[a] 53[b]	90[a] 158[b]				
Solids, total dissolved					2,500[a] 4,375[b]	
Temperature (°F)	65	75				
Total Petroleum Hydrocarbons					10.0	
Oil and Grease					10.0	

(a) Thirty-day average.

(b) Daily maximum.

(c) cfu/100 mL = colony-forming units per 100 milliliters.

(d) Calculation based on temperature and pH.

Table 2-3. Surface Water Monitoring Sites at Wharf Mine

Site	Drainage	Frequency	Parameter List[a]
Ross Springs[b]	Ross Valley	Monthly	1, 2
RV French Drain[b]	Ross Valley	Monthly	1, 2
RVLC Pond[b]	Ross Valley	Monthly	1, 2
RVSO Discharge[b]	Ross Valley	Monthly	1, 2
Annie Creek @ USGS[b,d]	Annie Creek	4 times/year	1
Annie Creek II[b]	Annie Creek	4 times/year	1
Beaver Springs[b]	Reliance	4 times/year	1
McKinley Gulch[b]	McKinley Gulch	4 times/year	1
FB Spring[b]	False Bottom	4 times/year	1
FB-1[b]	False Bottom	4 times/year	1
FB-2[b]	False Bottom	4 times/year	1
BMT-1[b,d]	Deadwood	4 times/year	1
DWD-1[b,d]	Deadwood	4 times/year	1
Lost Camp[b,d]	Lost Camp	1 time/year	1
Spearfish Falls[b]	Little Spearfish	1 time/year	1
Squaw War Eagle[b]	Cleopatra	1 time/year	1
SS-01[c,d]	Stewart Gulch	4 time/year	4
SS-04[c,d]	Nevada Gulch	4 times/year	3
SS-05[c,d,e]	Nevada Gulch	Monthly	3
SS-06[c,d]	Fantail Gulch	4 times/year	4
SS-12[c,d]	Stewart Gulch	4 times/year	3
SS-14A[c,d]	Fantail Gulch	4 times/year	4
SS-17[c]	No Name Gulch	4 times/year	5
SS-20[d,f]	Nevada Gulch	Monthly	6

(a) Parameter lists are provided in Appendix B.
(b) Site is part of the existing Wharf monitoring program.
(c) Site is part of the existing Golden Reward monitoring program.
(d) Site for inclusion in permit application analysis.
(e) Site dropped 2005, re-added October 2010.
(f) Newly added site (December 2009).

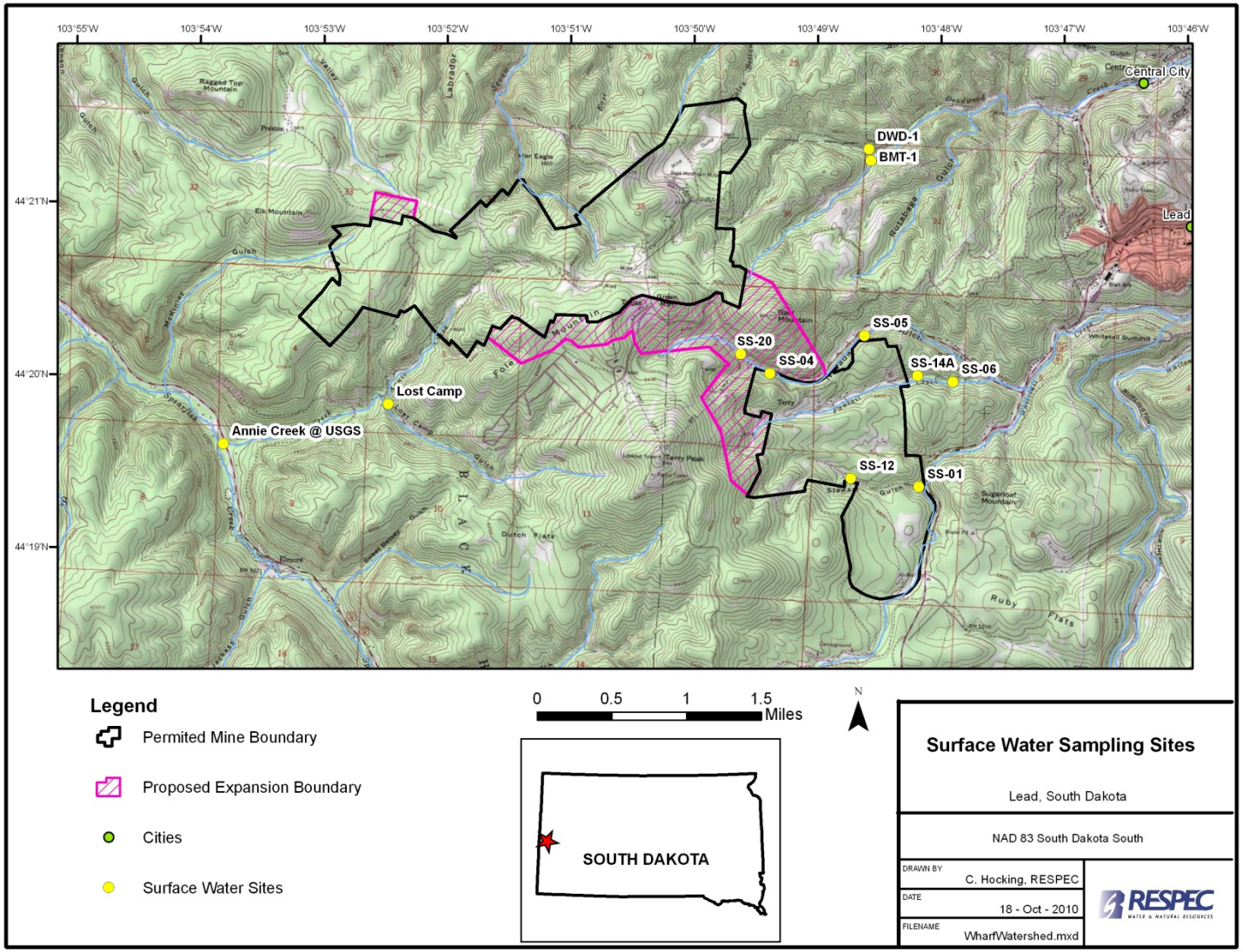

Figure 2-2. Location of Surface Water Sampling Sites at the Wharf Mine Applicable to the Baseline Expansion Area.

Wharf will review the analytical results with the SD DENR upon request and determine any changes to the sampling program that may be necessary. Following monthly baseline sampling, the new surface water site (SS-20) will be sampled four times per year for the life of the mine unless otherwise directed by the SD DENR.

2.2.1 Sampling Methods

Wharf collected samples from the new sites in addition to existing monitoring at Wharf and Golden Reward following their established sampling protocols (Appendix C). Field measurements were taken for conductivity, flow, oxidation reduction potential (ORP), dissolved oxygen, pH, and temperature.

2.3 RESULTS

Raw data for each surface water sampling site relevant to Wharf's expansion plans are included in Appendix D. These sites include: Annie Creek @ USGS, Lost Camp, BMT-1, DWD-1, SS-01, SS-04, SS-06, SS-12, SS-14A, and SS-20. Appendix D also contains SS-05 sample data, which was collected on one date in 2004. Appendix E contains statistical summaries of parameters by site.

Table 2-4 gives a comprehensive list of statistics for all sites combined by constituent, including the practical quantitation limit (PQL); the number of samples analyzed; the number and percent of samples with concentrations of constituents detected above the PQL; and statistics for all surface water constituents, including mean, standard deviation, Q1, median, Q3, minimum, and maximum. If a water-quality result was reported as less than the PQL value in the raw data, that result was included in the statistical analyses as half of the PQL value. If two separate PQL values were reported for a single constituent, the PQL occurring more frequently was used as the PQL when reporting results of the statistical analyses. Similarly, 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. If results of statistical analysis were calculated to be less than the PQL, those results were then reported as less than the PQL instead of the calculated value. Also, if a result was reported as zero in the raw data for a constituent having a specified PQL, half of the specified PQL was used in the statistical analyses instead of the zero value.

2.4 ANALYSIS AND SUMMARY OF SURFACE WATER CHEMISTRY

The objective of the sampling program was to build a baseline database from evaluation of the surface water quality at various locations before the expansion. Surface water quality samples were analyzed for ten monitoring sites (Annie Creek @ USGS, Lost Camp, BMT-1,

Table 2-4. Statistics for Surface Water Constituents (Page 1 of 6)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	104	N/A	N/A	387	285	150	320	580	41.3	1460
Field ORP (mV)	N/A	32	N/A	N/A	90	87	31	88	122	-95	273
Field Oxygen (O2) (mg/L)	N/A	32	N/A	N/A	8.93	1.57	8.02	8.91	10.04	3.82	11.8
Field pH (SU)	N/A	104	N/A	N/A	8	0.48	7.68	8.04	8.37	6.87	8.83
Field Temperature (° C)	N/A	104	N/A	N/A	6.9	4.6	3.7	6.7	9.2	-1.2	21.5
Field Flow Rate (gal/min)	N/A	86	N/A	N/A	654	1298	27	134	756	0.14	7930
Metals, Dissolved											
Arsenic (As),Dissolved (mg/L)	0.005	72	70	97.2	0.021	0.0156	0.009	0.014	0.033	< 0.005	0.059
Barium (Ba),Dissolved (mg/L)	0.005	1	1	100	0.0707	< 0.005	0.0707	0.0707	0.0707	0.0707	0.0707
Cadmium (Cd),Dissolved (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calcium (Ca),Dissolved (mg/L)	1	82	82	100	41.4	28.6	20.6	29.5	63.9	6.08	111
Chromium (Cr),Dissolved (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Dissolved (mg/L)	0.005	57	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Dissolved (mg/L)	0.001	17	2	11.8	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002

Table 2-4. Statistics for Surface Water Constituents (Page 2 of 6)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Magnesium (Mg),Dissolved (mg/L)	0.5	83	83	100	12.7	9.63	5.06	8.5	22	1.85	37.6
Potassium (K),Dissolved (mg/L)	0.5	59	59	100	1.98	1.03	1.1	1.87	2.72	0.534	4.98
Silver (Ag),Dissolved (mg/L)	0.001	17	1	5.88	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00148
Sodium (Na),Dissolved (mg/L)	0.5	115	115	100	10.1	11.5	2.53	4.53	14.2	1.1	57.1
Zinc (Zn),Dissolved (mg/L)	0.05	41	4	9.76	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.1
Metals, Total											
Aluminum (Al),Total (mg/L)	0.01	8	8	100	0.962	1.18	0.172	0.571	1.27	0.0598	3.6
Antimony (Sb),Total (mg/L)	0.005	8	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Arsenic (As),Total (mg/L)	0.005	98	53	54.1	0.016	0.0171	< 0.005	0.008	0.026	< 0.005	0.06
Barium (Ba),Total (mg/L)	0.005	8	8	100	0.417	0.21	0.231	0.4	0.561	0.178	0.774
Beryllium (Be),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd),Total (mg/L)	0.001	59	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 2-4. Statistics for Surface Water Constituents (Page 3 of 6)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Chromium (Cr),Total (mg/L)	0.001	8	4	50	0.0016	0.00205	< 0.001	< 0.001	0.0015	< 0.001	0.00653
Cobalt (Co),Total (mg/L)	0.001	8	1	12.5	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00211
Copper (Cu),Total (mg/L)	0.005	60	9	15	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00952
Gold (Au),Total (mg/L)	0.001	60	33	55	0.002	0.003	< 0.001	0.001	0.003	< 0.001	0.016
Iron (Fe),Total (mg/L)	0.05	8	7	87.5	0.796	1.283	0.134	0.339	0.753	< 0.05	3.89
Lead (Pb),Total (mg/L)	0.001	8	1	12.5	0.0013	0.0022	< 0.001	< 0.001	< 0.001	< 0.001	0.00676
Lithium (Li),Total (mg/L)	0.02	6	5	83.3	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.044
Manganese (Mn),Total (mg/L)	0.01	8	2	25	0.026	0.056	< 0.01	< 0.01	< 0.01	< 0.01	0.164
Mercury (Hg),Total (mg/L)	0.0002	84	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum (Mo),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel (Ni),Total (mg/L)	0.005	8	1	12.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00817
Silver (Ag),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Strontium (Sr),Total (mg/L)	0.001	8	8	100	0.133	0.0366	0.0996	0.128	0.16	0.0938	0.193
Vanadium (V),Total (mg/L)	0.005	8	1	12.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00944
Zinc (Zn),Total (mg/L)	0.05	60	17	28.3	< 0.05	< 0.05	< 0.05	< 0.05	0.0523	< 0.05	0.242
Metals, Total Recoverable											
Arsenic (As),Total Recoverable (mg/L)	0.005	22	18	81.8	0.0109	0.0099	0.005	0.008	0.013	< 0.005	0.0458

Table 2-4. Statistics for Surface Water Constituents (Page 4 of 6)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Cadmium (Cd),Total Recoverable (mg/L)	0.001	21	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr),Total Recoverable (mg/L)	0.001	21	1	4.76	0.0011	0.001	< 0.001	< 0.001	0.0025	< 0.001	0.0025
Copper (Cu),Total Recoverable (mg/L)	0.005	22	2	9.09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.01
Lead (Pb),Total Recoverable (mg/L)	0.001	23	4	17.4	0.0012	0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.00714
Nickel (Ni),Total Recoverable (mg/L)	0.005	21	2	9.52	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Silver (Ag),Total Recoverable (mg/L)	0.001	23	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc (Zn),Total Recoverable (mg/L)	0.05	21	2	9.52	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.057
Nonmetallics											
Bicarbonate (mg/L)	10	78	78	100	86.6	75.1	33.3	62.3	111	13.2	286
Boron (B),Total (mg/L)	0.02	8	4	50	0.0221	< 0.02	< 0.02	< 0.02	0.035	< 0.02	0.0467
Carbonate (mg/L)	5	60	1	1.67	< 5	< 5	< 5	< 5	< 5	< 5	10.4
Chloride (Cl-) (mg/L)	0.5	61	46	75.4	13.2	30	< 0.5	2.75	7.31	< 0.5	140
Cyanide, Free (mg/L)	0.02	8	0	0	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, Total (mg/L)	0.01	120	13	10.8	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.059
Cyanide, WAD (mg/L)	0.01	120	1	0.83	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.011
Fluoride (mg/L)	0.05	65	64	98.5	0.35	0.28	0.158	0.262	0.379	< 0.05	1.27
Nitrogen, Ammonia (NH3) (mg/L)	0.05	58	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Table 2-4. Statistics for Surface Water Constituents (Page 5 of 6)

Constituent	PQL	n Analyzed	n Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nitrogen, Nitrate (NO3) (mg/L)	0.05	160	134	83.8	3.26	4	0.201	1.48	5.19	< 0.05	16.4
Nitrogen, Nitrite (NO2) (mg/L)	0.05	158	2	1.27	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.123
Selenium (Se),Dissolved (mg/L)	0.005	41	1	2.44	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Selenium (Se),Total (mg/L)	0.005	77	1	1.3	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Selenium (Se),Total Recoverable (mg/L)	0.005	21	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silicon (Si),Total (mg/L)	1	8	8	100	7.6	2.47	6.23	7.78	8.9	3.42	11.6
Sulfate (SO4) (mg/L)	10	139	116	83.5	96.1	138	14.4	49.6	127	< 10	1100
Physical Properties											
Alkalinity (mg/L)	10	8	8	100	62	13.9	50.4	61.3	73	45.1	82.9
Anion - Cation Balance (%)	N/A	59	N/A	N/A	-0.0965	2.7	-2.51	0.0837	1.54	-5.32	5.58
Anions (meq/L)	N/A	59	N/A	N/A	2.54	1.77	1.2	2.09	2.98	0.519	8.16
Cations (meq/L)	N/A	59	N/A	N/A	2.55	1.79	1.2	2.02	2.99	0.566	8.32
Electrical Conductivity (µmhos/cm)	5	116	116	100	374	312	170	252	514	65	1950
Hardness (mg/L)	N/A	31	N/A	N/A	233	92	155	266	301	62.9	352
pH (SU)	N/A	138	N/A	N/A	7.69	0.39	7.43	7.69	7.97	6.46	8.49

Table 2-4. Statistics for Surface Water Constituents (Page 6 of 6)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Total Dissolved Solids (mg/L)	50	142	142	100	271	225	124	183	377	< 50	1720
Total Suspended Solids (mg/L)	10	140	27	19.3	15	47	< 10	< 10	< 10	< 10	500
Turbidity (NTU)	0.2	8	8	100	11	16	2.3	5.3	11	0.6	50
Radionuclides											
Gross Alpha (pCi/L)	N/A	2	N/A	N/A	7.5	3.4	5.1	7.5	9.9	5.1	9.9
Radium-226 (pCi/L)	N/A	2	N/A	N/A	0.4	0.1	0.3	0.4	0.5	0.3	0.5
Radium-228 (pCi/L)	N/A	2	N/A	N/A	0.6	0	0.6	0.6	0.6	0.6	0.6

DWD-1, SS-01, SS-04, SS-06, SS-12, SS-14A, and SS-20). Sampling will begin at one monitoring site in October 2010. This report provides the data and analyses of the surface water quality to support the development of a permit application for the expansion of the Wharf Mine. Statistical analysis results for each site are included in Appendix E, and box plots from the chemical analyses are included in Appendix F.

2.4.1 Flow Data Analysis

Flow data from the baseline sampling is included with the Appendix D baseline sampling data. Flow values from the Wharf baseline sampling were not continuous, as sampling only occurred as often as once per month. Baseline sampling flows were variable, ranging from nearly dry to greater than 15 cubic feet per second (cfs) at the baseline sampling sites. Highest flows at the baseline sampling sites generally occurred during spring. Flow data for the two USGS sites, USGS 06430800 (Annie Creek near Lead, South Dakota) and USGS 06436165 (Deadwood Creek at Central City, South Dakota), was available on a daily basis, and the maximum daily average flows in Annie Creek and Deadwood Creek were 128 cfs and 125 cfs, respectively. The maximum flow at both USGS sites occurred in June. Low flows for Annie Creek and Deadwood Creek occurred during winter months. Flow at the aquatics sites (Appendix B) was measured only in late August and was generally less than 1 cfs at all sites.

2.4.2 One-Year Baseline Data Analysis

All field measurements having set criteria (conductivity, dissolved oxygen, pH, and temperature) have been in full compliance of their criteria for the ten baseline expansion area monitoring sites over the past year. The single sample total suspended solids (TSS) SD DENR criteria has been set at 53 mg/L for cold-water permanent fish propagation and 158 mg/L for cold-water marginal fish life propagation. Two TSS samples were measured above 50 mg/L in the past year—one in January at SS-20 (99 mg/L) and one in April at SS-12 (89 mg/L). The April sample could have been because of spring runoff. These sites are located on Nevada Gulch, which is not designated with beneficial uses in the 2010 SD DENR Integrated Report.

All criteria set by SD DENR were met within the past year. Arsenic, cyanide, and selenium are primary constituents to evaluate in gold mining operations. Arsenic levels have been in compliance with the U.S. Environmental Protection Agency (EPA) freshwater recommendations of 0.340 mg/L over the past year (October 1, 2009, through September 30, 2010). The EPA recommends Weak Acid Dissociable (WAD) cyanide be below 0.022 mg/L in fresh water. This recommended WAD cyanide criteria was not exceeded at any baseline sampling sites during the past year. All selenium concentrations at all baseline sites were measured to be less than 0.005 mg/L within the past year, which is in compliance of the recommended criteria.

2.4.3 Five-Year Historical Data Analysis

Analysis of field parameters in comparison to the South Dakota state criteria showed one of seventeen dissolved oxygen samples (6 percent) falling below the set criteria for the cold-water marginal fish life propagation use (≤ 5 mg/L) and the limited recreation use (≤ 5 mg/L) for Annie Creek over the past 5 years. The sample was measured in October, 2007. One sample in Stewart Gulch, measured to be 67.82°F, exceeded the SD DENR temperature criteria of 65°F for cold-water permanent fish life beneficial use in August 2009. All other in-field measurements having set criteria (conductivity, dissolved oxygen, pH, and temperature) have been in full compliance with the criteria for the ten baseline expansion area monitoring sites over the past 5 years (October 1, 2005, through September 30, 2010). Boxplots of the field constituents are located in Appendix F, and samples not meeting set criteria are generally clear.

Four TSS samples were measured above 50 mg/L—one at each of the following locations: SS-04 (233 mg/L), SS-20 (99 mg/L), SS-12 (233 mg/L), and BMT-1 (53 mg/L). The single-sample TSS criterion is 53 mg/L for cold-water permanent fish propagation and 158 mg/L for cold-water marginal fish life propagation. The maximum TSS value of 233 mg/L at SS-04 of Nevada Gulch was measured on January 30, 2008. Site SS-12 is located on Stewart Gulch, which is designated with a cold-water permanent fish life propagation beneficial use and has TSS criteria of 53 mg/L. Site BMT-1 is located on Deadwood Creek, which is designated with cold-water marginal fish life propagation, and thus, does not exceed the criteria of 158 mg/L. The Nevada Gulch sites are not designated with a beneficial use. The SD DENR daily maximum nitrate criteria of 88 mg/L as *N* was met within the past 5 years, and arsenic was in compliance with the EPA freshwater recommendations of 0.340 mg/L over the past 5 years. WAD cyanide was consistently below the EPA-recommended criteria (0.022 mg/L) at all baseline sampling sites during the past 5 years. Selenium concentrations at all baseline sites were also in compliance with recommended criteria throughout the past 5 years. The EPA-recommended criteria for zinc is 0.12 mg/L. Three quarterly samples had concentrations higher than this criteria—two of which were at DWD-1 (2006, 0.242 mg/L and 2008, 0.142 mg/L) and one of which was at BMT-1 (2008, 0.163 mg/L).

3.0 PROJECTED IMPACTS

According to the J. M. Montgomery Consulting Engineers, Inc. [1996], potential impacts from current Wharf mining operations to Cleopatra (Squaw) Creek were controlled by the Cleopatra Creek rock facility and to Deadwood Creek by the Trojan Pit. J. M. Montgomery Consulting Engineers, Inc. [1996] mentioned that these streams would not experience sediment loading changes from the (at that time proposed) Clinton Expansion, and that there would be slightly lower surface runoff flows to the Deadwood Creek drainage. The policies for sedimentation, erosion, and drainage structures for the current Wharf Expansion will be similar to those of previous mine expansions:

- These structures will be in place before any disturbance occurs for prevention of downstream sedimentation, and they will remain in place until suitable vegetation is established.
- Quarterly inspections of the structures will occur and upgrades and cleaning will be completed as considered necessary during the postclosure period.
- Once vegetation is established and self-sustaining, it will prevent sedimentation during rain and run-off events. When this occurs, structures will be removed [Wharf Resources, 1997].

Other than structures constructed for new disturbance, Wharf will use the same general practices on the new expansion as are used for the current mining area.

Surface disturbances within the expansion area will not directly overlie any streams and are not expected to greatly impact surface water flow or water quality in drainages. This is because precipitation will be captured by the pit area, making flow available from recharge fairly minimal. A detailed hydrologic modeling effort was not requested by the SD DENR for the current proposed expansion as impacts are anticipated to be minor and similar to that already occurring at the mine site. Based on impacts from current practices, possible impacts from expansion of the mine area could include increased nitrate levels from blasting and decreased surface water quality from pits, waste rock disposal, and tailings.

4.0 REFERENCES

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APPENDIX A

PARAMETER LISTS

Table A-1. Water-Quality Parameter List 1 (Page 1 of 2)

Site	pH, Lab	EC, Lab	WAD CN	Total CN	NO_2, Nitrite	NO_3, Nitrate	NH_3, Ammonia	TDS[a]	TSS[b]	F, Flouride	Bicarbonate	Na, Sodium	SO_4, Sulfate	As, Arsenic	Se, Selenium	Cd, Cadmium	Cu, Copper	Au, Gold	Ag, Silver	Hg, Mercury	pH, Field	EC, Field	ORP[c], Field	DO[d], Field	Temp, Field	Flow Rate	Water-Level
French Drain	X	X	X	X	X	X	X	X		X	X	X	X	TR,D	TR,D		D	D	D	T	X	X	X	X	X	X	
HDH-8A	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-1	X	X	X	X	X	X	X	X		X	X	X	X	TR,D	TR,D		D	D	D	T	X	X	X	X	X		X
MW-13	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-13A	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-14	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-1A	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-2	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-2A	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-31	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-45	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
Ross Springs	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X	X	
RVLC Pond	X	X	X	X	X	X	X	X		X	X	X	X	TR,D	TR,D		D	D	D	T	X	X	X	X	X		
RVSO Discharge		X	X	X	X	X	X			X	X	X	X	TR,D	TR,D		D	D	D	T	X	X	X	X	X	X	
Annie Creek @ USGS	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
Annie Creek II	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
Beaver Springs	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X	X	
GWAC6	X	X	X	X	X	X	X	X	X	X	X	X	X	T,D	T,D		D	D	D	T	X	X	X	X	X		X
MW-17	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-18	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-19	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-33	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-52	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
HDH-10A	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
HDH-11	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
HDH-12	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
McKinley Gulch	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T	D	D	D	D	T	X	X	X	X	X	X	
MW-9	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-9A	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-10	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-10A	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X

Table A-1. Water-Quality Parameter List 1 (Page 2 of 2)

Site	pH, Lab	EC, Lab	WAD CN	Total CN	NO_2, Nitrite	NO_3, Nitrate	NH_3, Ammonia	TDS[a]	TSS[b]	F, Flouride	Bicarbonate	Na, Sodium	SO_4, Sulfate	As, Arsenic	Se, Selenium	Cd, Cadmium	Cu, Copper	Au, Gold	Ag, Silver	Hg, Mercury	pH, Field	EC, Field	ORP[c], Field	DO[d], Field	Temp, Field	Flow Rate	Water-Level
MW-15	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-44	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-47	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-48	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-49	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-50	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-51	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-53	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-54	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-55	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-56	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-57	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
MW-58	X	X	X	X	X	X	X	X		X	X	X	X	D	D	D	D	D	D	T	X	X	X	X	X		X
FB Spring	X	X	X	X	X	X	X	X	X	X	X	X	X	D	D		D	D	D	T	X	X	X	X	X	X	
FB-1	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
FB-2	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
MW-42	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-43	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
BMT-1	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
DWD-1	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
MW-40	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
Joseph Well	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-37	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
MW-41	X	X	X	X	X	X	X	X		X	X	X	X	D	D		D	D	D	T	X	X	X	X	X		X
Lost Camp	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
Spearfish Falls	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	
Squaw War Eagle	X	X	X	X	X	X	X	X	X	X	X	X	X	T	T		D	D	D	T	X	X	X	X	X	X	

(a) TDS = Total Dissolved Solids
(b) TSS = Total Suspended Solids
(c) ORP = Oxidation Reduction Potential
(d) DO = Dissolved Oxygen

Table A-2. Water-Quality Parameter List 2

Site	NO2, Nitrite	NO3, Nitrate	NH3, Ammonia	As, Arsenic	pH, Field	EC, field	ORP, Field	DO, Field	Temp, Field	Flow Rate	Water-Level
Ross Spring	X	X	X	D	X	X	X	X	X	X	
RVSO Discharge	X	X	X	TR,D	X	X	X	X	X	X	
French Drain	X	X	X	TR,D	X	X	X	X	X	X	
RVLCP	X	X	X	TR,D	X	X	X	X	X		
MW-1	X	X	X	TR,D	X	X	X	X	X		X
MW-1A	X	X	X	D	X	X	X	X	X		X
MW-31	X	X	X	D	X	X	X	X	X		X
MW-13	X	X	X	D	X	X	X	X	X		X
MW-13A	X	X	X	D	X	X	X	X	X		X
MW-2	X	X	X	D	X	X	X	X	X		X
MW-2A	X	X	X	D	X	X	X	X	X		X
MW-45	X	X	X	D	X	X	X	X	X		X
HDH-10A	X	X	X	D	X	X	X	X	X		X
MW-53	X	X	X	D	X	X	X	X	X		X
MW-54	X	X	X	D	X	X	X	X	X		X
MW-55	X	X	X	D	X	X	X	X	X		X
MW-56	X	X	X	D	X	X	X	X	X		X
MW-57	X	X	X	D	X	X	X	X	X		X
MW-58	X	X	X	D	X	X	X	X	X		X
MW-37	X	X	X	D	X	X	X	X	X		X

Table A-3. Water-Quality Parameter List 3[(a)]

pH	SO_4 (Sulfate)
Conductivity	As (Arsenic – Dissolved)
TDS (Total Dissolved Solids)	Se (Selenium – Dissolved)
CN – cyanide, total and WAD	Hg (Mercury – Total)
Na (Sodium)	NO_3 (Nitrate)
F (Fluoride)	NO_3 (Nitrite)
Cu (Copper)	Zn (Zinc)

(a) This list is also known as the "Indicator List" for Golden Reward Sampling.

Table A-4. Water-Quality Parameter List 4[(a)]

pH	SO_4 (Sulfate)
Conductivity	As (Arsenic – Dissolved)
TDS (Total Dissolved Solids)	Se (Selenium – Dissolved)
Hardness	Hg (Mercury – Total)
Na (Sodium)	NO_3 (Nitrate)
F (Fluoride)	NO_3 (Nitrite)
Cu (Copper)	Zn (Zinc)
Pb (Lead)	Ag (Silver)
Cd (Cadmium)	Cr (Chromium)

(a) This list is also known as the "Surface Water Discharge Permit List" for Golden Reward Sampling.

Table A-5. Water-Quality Parameter List 5[a]

pH	SO_4 (Sulfate)
Conductivity	As (Arsenic – Dissolved)
TDS (Total Dissolved Solids)	Se (Selenium – Dissolved)
TSS (Total Suspended Solids)	Hg (Mercury – Total)
Cl (Chloride)	HCO_3 (Bicarbonate)
Na (Sodium)	Ca (Calcium)
F (Fluoride)	NO_3 (Nitrate)
Cu (Copper)	NO_3 (Nitrite)
Mn (Manganese)	Zn (Zinc)
CN – cyanide, total and WAD	Mg (magnesium)

(a) This list is also known as the "Special List" for Golden Reward Sampling.

Table A-6. Water-Quality Parameter List 6[a] (Constituents to Be Analyzed in New Surface Water Monitoring Sites' Samples)

Aluminum	Silver
Arsenic	Sodium
Barium	Sulfate
Cadmium	Zinc
Calcium	Gross Alpha[a]
Chloride	Gross Beta[a]
Chromium	Gross Gamma[a]
Copper	Radon 222[a]
Fluoride	Radium 226[a]
Iron	Radium 228[a]
Lead	Cyanide[(total and WAD)]
Magnesium	Anion-Cation Balance
Manganese	Bicarbonate
Mercury	Carbonate
Nitrate	Hardness
Nitrite	Conductivity
Potassium	Total Dissolved Solids (TDS)
Selenium	pH

(a) One-time sample at new monitoring site.

APPENDIX B

AQUATIC SAMPLING MAPS AND FLOW DATA

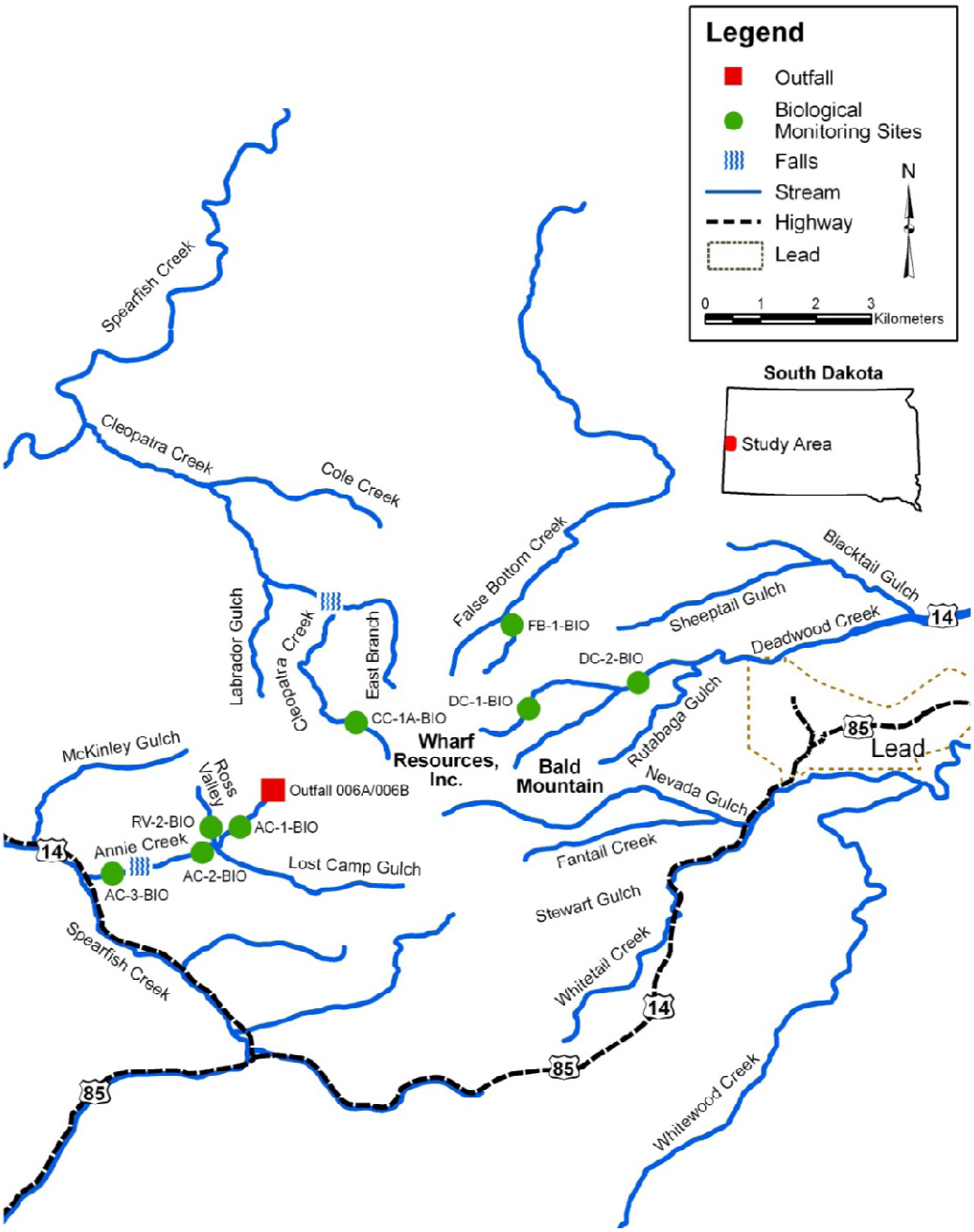

Figure B-1. Aquatic Biological Monitoring Sites on Annie Creek, Ross Valley, Deadwood Creek, False Bottom Creek, McKinley Gulch, and Cleopatra Creek Near Lead, South Dakota [Chadwick Ecological Consultants, 2006a].

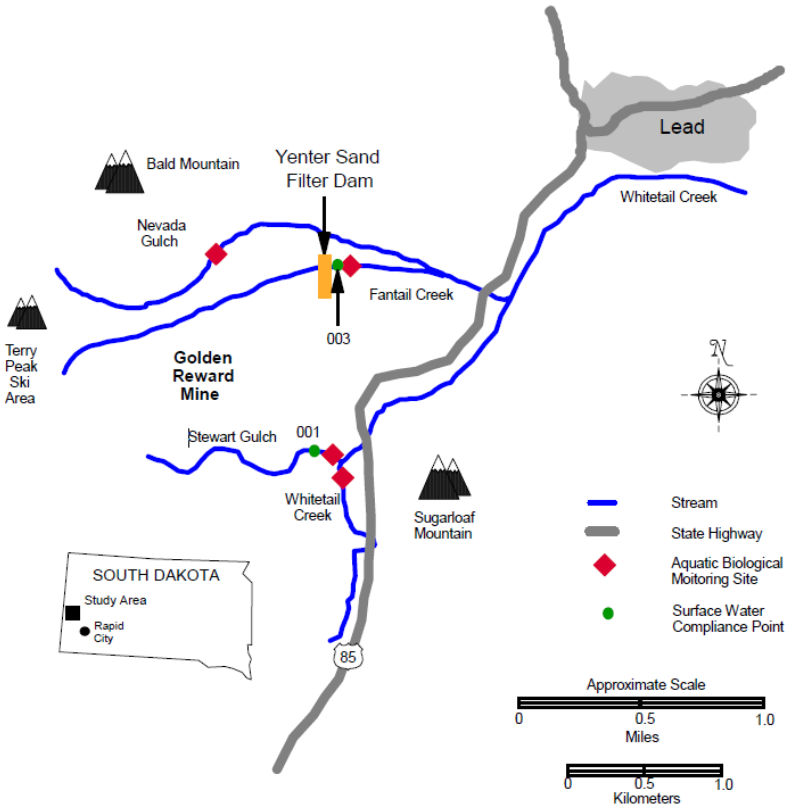

Figure B-2. Aquatic Biological Monitoring Sites on Fantail Creek and Stewart Gulch Near Lead, South Dakota [Chadwick Ecological Consultants, 2006b].

Table B-1. Aquatic Sampling Flow Data

Stream	Aquatic Sampling Site	Date	Flow (cfs)[a]	Date	Flow (cfs)[a]	Date	Flow (cfs)[a]	Date	Flow (cfs)[a]	Date	Flow (cfs)[a]
		2006		2007		2008		2009		2010	
Annie Creek	AC-1	8/30/2006	0.006	8/28/2007	0.037	8/25/2008	0.041	8/26/2009	0.999	8/24/2010	0.295
Annie Creek	AC-2	8/30/2006	0.017	8/28/2007	0.036	8/26/2008	0.695	8/26/2009	1.006	8/24/2010	0.375
Annie Creek	AC-3	8/30/2006	0.280	8/29/2007	0.28	8/27/2008	0.510	8/26/2009	0.480	8/24/2010	0.540
Cleopatra Creek	CC-1A	8/31/2006	0.004	8/27/2007	0.0054	8/28/2008	0.021	8/25/2009	0.030	8/25/2010	0.008
Deadwood Creek	DC-1	8/31/2006	Dry	8/30/2007	Dry	8/27/2008	Dry	8/27/2009	0.019	8/26/2010	0.003
Deadwood Creek	DC-2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8/26/2010	0.191
False Bottom	FB-1	8/31/2006	0.015	8/29/2007	0.0063	8/28/2008	0.068	8/25/2009	0.158	8/25/2010	0.062
Fantail Creek	Fantail Creek	8/29/2006	0.015	8/30/2007	0.021	8/27/2008	0.093	8/28/2009	0.000	8/26/2010	0.074
Lost Camp Gulch	LC-1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8/24/2010	0.084
Nevada Gulch	Lower Nevada Gulch	8/30/2006	0.002	8/30/2007	0.0021	8/27/2008	0.008	8/25/2009	0.000	8/26/2010	0.011
Nevada Gulch	Upper Nevada Gulch	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8/26/2010	0.031
Ross Valley	RV-2	8/30/2006	0.002	8/28/2007	0.083	8/26/2008	0.196	8/26/2009	0.079	8/24/2010	0.024
Stewart Gulch	Stewart Gulch	8/26/2006	0.832	8/30/2007	1.05	8/26/2008	0.931	8/25/2009	0.000	8/25/2010	1.188
Whitetail Creek	Whitetail Creek	8/29/2006	0.177	8/30/2007	0.39	8/27/2008	0.661	8/28/2009	0.000	8/25/2010	0.779

(a) cfs = cubic feet per second.

APPENDIX C

SAMPLING METHODS

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 D

WATER-QUALITY RESULTS BY SITE

Table D-1. DWD-1 Water Quality 2006

Parameter	1/6/2006	4/4/2006	5/8/2006	8/8/2006
Calcium (Ca),Dissolved (mg/L)	33.7	21.1	6.08	29.6
Magnesium (Mg),Dissolved (mg/L)	10.1	5.42	1.94	8.5
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	0.004	0.005	0.003	0.003
Zinc (Zn),Total (mg/L)	0.242	0.057	<0.05	0.091
Bicarbonate (mg/L)	29.3	26.4	15.3	34.1
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	1.75	1.25	1.25	0.5
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	<0.05	0.348	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	3.43	2.64	1.04	3.38
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	3.52	2.54	1.76	3.33
Sulfate (SO4) (mg/L)	117	59.1	<10	80.1
Anion - Cation Balance (%)	–3.69	–0.622	4.33	3.61
Anions (meq/L)	2.96	1.7	0.519	2.24
Cations (meq/L)	2.75	1.68	0.566	2.41
Electrical Conductivity (µmhos/cm)	316	205	70.7	269
pH (SU)	6.94	7.17	7.19	7.42
Total Dissolved Solids (mg/L)	204	141	62	196
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-2. DWD-1 Water Quality 2007

Parameter	1/11/2007	4/17/2007	5/1/2007	8/1/2007
Field Conductivity (µmhos/cm)	110	150	100	243
Field pH (SU)	7.58	7.5	7.68	7.23
Field Temperature (° C)	–1.2	3.1	9.3	13.7
Field Flow Rate (gal/min)	40	1050	756	46.7
Calcium (Ca),Dissolved (mg/L)	25.8	15.1	11.6	26.4
Magnesium (Mg),Dissolved (mg/L)	6.07	4.43	2.88	6.35
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	0.006
Gold (Au),Total (mg/L)	<0.001	0.014	0.002	<0.001
Zinc (Zn),Total (mg/L)	0.068	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	29.5	13.2	38.4	65.3
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	2.25	2.75	<0.5	<0.5
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	0.085	7.88	<0.05	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.39	1.38	1.1	2.63
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.98	2.52	1.1	2.55
Sulfate (SO4) (mg/L)	58.6	24	15.3	48.8
Anion - Cation Balance (%)	5.47	–3.56	–3.07	–1.67
Anions (meq/L)	1.77	1.36	0.948	2.09
Cations (meq/L)	1.98	1.26	0.892	2.02
Electrical Conductivity (µmhos/cm)	210	164	103	237
pH (SU)	7.3	7.16	7.65	7.69
Total Dissolved Solids (mg/L)	114	100	78	147
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-3. DWD-1 Water Quality 2008

Parameter	1/17/2008	4/15/2008	5/23/2008	8/21/2008
Field Conductivity (µmhos/cm)	—	210	—	190
Field pH (SU)	—	8	—	7.69
Field Temperature (° C)	—	4	—	13.5
Field Flow Rate (gal/min)	—	1.5	—	—
Calcium (Ca),Dissolved (mg/L)	35.8	23.1	9.93	16.3
Magnesium (Mg),Dissolved (mg/L)	10.2	6.52	2.29	4.9
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	0.007	<0.005	0.00952
Gold (Au),Total (mg/L)	0.001	0.003	<0.001	<0.001
Zinc (Zn),Total (mg/L)	0.142	0.074	0.0701	0.061
Bicarbonate (mg/L)	29.6	21.2	17.5	28.8
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	1.5	0.75	0.5	1.5
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	1.16	1.05	1.03	0.37
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	3.35	2.53	1.3	1.68
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	3.29	2.71	1.79	4.65
Sulfate (SO4) (mg/L)	114	68.1	24.5	39.4
Anion - Cation Balance (%)	–2.19	0.295	–5.32	3.57
Anions (meq/L)	2.98	1.86	0.884	1.36
Cations (meq/L)	2.85	1.87	0.795	1.46
Electrical Conductivity (µmhos/cm)	330	231	88.5	198
pH (SU)	6.77	7.18	7.22	7.33
Total Dissolved Solids (mg/L)	207	163	86	131
Total Suspended Solids (mg/L)	<10	<10	37	42

Table D-4. DWD-1 Water Quality 2009 (Page 1 of 2)

Parameter	1/21/2009	4/9/2009	5/14/2009	8/18/2009
Field Conductivity (µmhos/cm)	—	—	110	198
Field ORP (mV)	—	—	—	128
Field Oxygen (O2) (mg/L)	—	—	—	8.88
Field pH (SU)	—	—	8.04	7.73
Field Temperature (° C)	—	—	4.6	10.8
Field Flow Rate (gal/min)	—	—	2810	149
Calcium (Ca),Dissolved (mg/L)	21.4	6.45	8.45	—
Copper (Cu),Dissolved (mg/L)	—	—	—	<0.005
Gold (Au),Dissolved (mg/L)	—	—	—	<0.001
Magnesium (Mg),Dissolved (mg/L)	5.99	2.45	3.02	—
Silver (Ag),Dissolved (mg/L)	—	—	—	<0.001
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	—
Copper (Cu),Total (mg/L)	0.00632	0.00711	0.00605	—
Gold (Au),Total (mg/L)	<0.001	<0.001	<0.001	—
Mercury (Hg),Total (mg/L)	—	—	—	<0.0002
Zinc (Zn),Total (mg/L)	0.0609	0.0507	0.0521	—
Bicarbonate (mg/L)	28.3	21.4	30.6	65.7
Carbonate (mg/L)	0	0	0	—
Chloride (Cl-) (mg/L)	0.75	<0.5	<0.5	—
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	—	—	—	0.98
Nitrogen, Ammonia (NH3) (mg/L)	—	—	—	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.554	0.328	0.19	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.49	0.97	1.28	—
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.81	3.25	2.09	3.74

Table D-4. DWD-1 Water Quality 2009 (Page 2 of 2)

Parameter	1/21/2009	4/9/2009	5/14/2009	8/18/2009
Sulfate (SO4) (mg/L)	58.1	17.2	14.4	57
Anion - Cation Balance (%)	0.371	–3	–1.33	—
Anions (meq/L)	1.73	0.732	0.815	—
Cations (meq/L)	1.75	0.689	0.794	—
Electrical Conductivity (µmhos/cm)	217	103	107	275
pH (SU)	7.05	7.47	7.61	7.78
Total Dissolved Solids (mg/L)	142	100	51	140
Total Suspended Solids (mg/L)	20	<10	<10	<10

Table D-5. DWD-1 Water Quality 2010

Parameter	1/13/2010	4/21/2010	5/11/2010	8/19/2010
Field Conductivity (µmhos/cm)	139	41.3	44	140
Field ORP (mV)	88	87	69	27
Field Oxygen (O2) (mg/L)	10.1	9.96	10.6	7.75
Field pH (SU)	6.87	7.67	7.61	7.34
Field Temperature (° C)	0.7	5.1	3.6	12.7
Field Flow Rate (gal/min)	50	508	1790	30
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Dissolved (mg/L)	<0.001	<0.001	<0.001	<0.001
Silver (Ag),Dissolved (mg/L)	0.00148	<0.001	<0.001	<0.001
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Bicarbonate (mg/L)	13.7	16.9	18.3	33.9
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.598	0.252	0.231	0.566
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.275	0.572	0.508	0.077
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	3.52	1.86	1.93	3.26
Sulfate (SO4) (mg/L)	88.5	<10	12	56.3
Electrical Conductivity (µmhos/cm)	247	65	73.1	189
pH (SU)	6.46	7.11	7.25	7.33
Total Dissolved Solids (mg/L)	171	75	81	130
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-6. BMT-1 Water Quality 2006

Parameter	1/6/2006	4/4/2006	5/8/2006	8/8/2006
Calcium (Ca),Dissolved (mg/L)	26.4	15.6	9.1	29.3
Magnesium (Mg),Dissolved (mg/L)	7.27	4.46	2.28	7.41
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	0.003	0.003	0.003	0.002
Zinc (Zn),Total (mg/L)	<0.05	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	34.7	26.8	35.1	49.7
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	<0.5	<0.5	<0.5	<0.5
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	<0.05	0.055	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	3.37	2.31	0.869	3.31
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.36	2.23	1.25	2.17
Sulfate (SO4) (mg/L)	81.5	39.7	<10	66.4
Anion - Cation Balance (%)	–3.67	1.4	–4.61	1.22
Anions (meq/L)	2.26	1.27	0.788	2.2
Cations (meq/L)	2.1	1.3	0.718	2.25
Electrical Conductivity (µmhos/cm)	249	159	86	254
pH (SU)	7.25	7.4	7.59	7.65
Total Dissolved Solids (mg/L)	159	113	69	169
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-7. BMT-1 Water Quality 2007

Parameter	1/11/2007	4/17/2007	5/1/2007	8/1/2007
Field Conductivity (µmhos/cm)	120	100	140	227
Field pH (SU)	8.11	7.76	7.37	7.5
Field Temperature (° C)	1.2	2.4	8	15.2
Field Flow Rate (gal/min)	20	190	187	14.2
Calcium (Ca),Dissolved (mg/L)	30.3	11.5	14.7	22.3
Magnesium (Mg),Dissolved (mg/L)	7.32	3.14	4.14	6.7
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	0.008
Gold (Au),Total (mg/L)	<0.001	<0.001	0.005	<0.001
Zinc (Zn),Total (mg/L)	0.058	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	38.6	37.5	16.9	30.3
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	<0.5	<0.5	2	2.25
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	<0.05	5.71	6.53
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.75	1.15	1.56	2.95
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.34	1.51	1.56	3.85
Sulfate (SO4) (mg/L)	72.5	18.2	19.7	48.8
Anion - Cation Balance (%)	3.27	–3.46	1.31	–3.42
Anions (meq/L)	2.14	0.994	1.15	2.04
Cations (meq/L)	2.29	0.927	1.18	1.91
Electrical Conductivity (µmhos/cm)	241	112	151	253
pH (SU)	7.38	7.69	7.25	7.27
Total Dissolved Solids (mg/L)	148	78	110	162
Total Suspended Solids (mg/L)	<10	<10	<10	12

Table D-8. BMT-1 Water Quality 2008 (Page 1 of 2)

Parameter	1/17/2008	4/15/2008	5/23/2008	8/21/2008
Field Conductivity (µmhos/cm)	—	110	—	210
Field pH (SU)	—	8.22	—	7.91
Field Temperature (° C)	—	2.8	—	14.1
Field Flow Rate (gal/min)	—	1.5	—	—
Calcium (Ca),Dissolved (mg/L)	27.8	12.7	10.2	21.6
Copper (Cu),Dissolved (mg/L)	—	—	—	—
Gold (Au),Dissolved (mg/L)	—	—	—	—
Magnesium (Mg),Dissolved (mg/L)	7.4	3.57	1.85	5.9
Silver (Ag),Dissolved (mg/L)	—	—	—	—
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	<0.001	0.001	<0.001	<0.001
Mercury (Hg),Total (mg/L)	—	—	—	—
Zinc (Zn),Total (mg/L)	<0.05	0.053	0.163	<0.05
Bicarbonate (mg/L)	45.2	37	33.1	61.8
Carbonate (mg/L)	0	0	0	0
Chloride (Cl-) (mg/L)	<0.5	<0.5	<0.5	2.5
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	0.063	<0.05	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.8	1.63	0.901	1.63
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	1.99	1.62	1.31	4
Sulfate (SO4) (mg/L)	75.2	23.3	18	37.6
Anion - Cation Balance (%)	–3.4	–2.65	–3	–2.4
Anions (meq/L)	2.31	1.1	0.917	1.87
Cations (meq/L)	2.15	1.04	0.864	1.78

Table D-8. BMT-1 Water Quality 2008 (Page 2 of 2)

Parameter	1/17/2008	4/15/2008	5/23/2008	8/21/2008
Electrical Conductivity (µmhos/cm)	253	124	78.5	223
pH (SU)	7.3	7.57	7.66	7.8
Total Dissolved Solids (mg/L)	162	102	83	142
Total Suspended Solids (mg/L)	<10	53	<10	<10

Table D-9. BMT-1 Water Quality 2009 (Page 1 of 2)

Parameter	1/21/2009	4/9/2009	5/14/2009	8/18/2009
Field Conductivity (µmhos/cm)	—	—	100	169
Field ORP (mV)	—	—	—	169
Field Oxygen (O2) (mg/L)	—	—	—	8.93
Field pH (SU)	—	—	8.18	7.8
Field Temperature (° C)	—	—	4.9	10.3
Field Flow Rate (gal/min)	—	—	1170	63
Calcium (Ca),Dissolved (mg/L)	24	6.85	10.9	—
Copper (Cu),Dissolved (mg/L)	—	—	—	<0.005
Gold (Au),Dissolved (mg/L)	—	—	—	<0.001
Magnesium (Mg),Dissolved (mg/L)	6.61	2.35	3.08	—
Silver (Ag),Dissolved (mg/L)	—	—	—	<0.001
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	—
Copper (Cu),Total (mg/L)	<0.005	0.00663	<0.005	—
Gold (Au),Total (mg/L)	<0.001	<0.001	<0.001	—
Mercury (Hg),Total (mg/L)	—	—	—	<0.0002
Zinc (Zn),Total (mg/L)	<0.05	<0.05	0.0524	—
Bicarbonate (mg/L)	48.6	41.4	43.9	90.1
Carbonate (mg/L)	0	0	0	—
Chloride (Cl-) (mg/L)	0.5	<0.5	<0.5	—
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	—	—	—	1.16
Nitrogen, Ammonia (NH3) (mg/L)	—	—	—	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.4	0.745	0.915	—
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2	2.6	2.18	4.07

Table D-9. BMT-1 Water Quality 2009 (Page 2 of 2)

Parameter	1/21/2009	4/9/2009	5/14/2009	8/18/2009
Sulfate (SO4) (mg/L)	46.5	<10	11.4	25.2
Anion - Cation Balance (%)	3.03	–0.877	–2.23	—
Anions (meq/L)	1.78	0.679	0.957	—
Cations (meq/L)	1.89	0.667	0.915	—
Electrical Conductivity (µmhos/cm)	227	97.9	97.6	241
pH (SU)	7.43	7.74	7.7	7.89
Total Dissolved Solids (mg/L)	136	84	44	146
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-10. BMT-1 Water Quality 2010

Parameter	1/13/2010	4/21/2010	5/11/2010	8/19/2010
Field Conductivity (µmhos/cm)	125	51.5	54	174
Field ORP (mV)	115	52	64	1
Field Oxygen (O2) (mg/L)	11.5	9.89	10.5	7.61
Field pH (SU)	8.41	7.84	7.77	7.52
Field Temperature (° C)	0.25	5.3	4	13.9
Field Flow Rate (gal/min)	30	651	1320	58
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Dissolved (mg/L)	<0.001	<0.001	<0.001	<0.001
Silver (Ag),Dissolved (mg/L)	<0.001	<0.001	<0.001	<0.001
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Bicarbonate (mg/L)	52.2	33.3	36.5	62.7
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.284	0.134	0.111	0.303
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.52	1.31	1.63	3.27
Sulfate (SO4) (mg/L)	65	10	10.3	56
Electrical Conductivity (µmhos/cm)	240	80.9	89	228
pH (SU)	7.61	7.45	7.56	7.79
Total Dissolved Solids (mg/L)	156	83	94	148
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-11. Annie Creek @ USGS Water Quality 2006 (Page 1 of 2)

Parameter	1/6/2006	2/6/2006	4/4/2006	5/8/2006	6/5/2006	7/3/2006	8/8/2006	9/5/2006	10/2/2006	11/2/2006	12/5/2006
Arsenic (As),Dissolved (mg/L)	0.056	0.052	0.048	0.026	0.021	0.034	0.038	0.033	0.052	0.036	0.027
Calcium (Ca),Dissolved (mg/L)	76.3	—	50.6	29.6	—	—	60.6	—	—	—	—
Magnesium (Mg),Dissolved (mg/L)	27.1	—	16.2	9.06	—	—	22.2	—	—	—	—
Arsenic (As),Total (mg/L)	0.056	0.054	0.051	0.03	0.022	0.034	0.043	0.034	0.052	0.035	0.027
Cadmium (Cd),Total (mg/L)	<0.001	—	<0.001	<0.001	—	—	<0.001	—	—	—	—
Copper (Cu),Total (mg/L)	<0.005	—	<0.005	<0.005	—	—	<0.005	—	—	—	—
Gold (Au),Total (mg/L)	0.006	—	0.007	0.004	—	—	0.003	—	—	—	—
Zinc (Zn),Total (mg/L)	<0.05	—	<0.05	<0.05	—	—	<0.05	—	—	—	—
Bicarbonate (mg/L)	286	—	186	99.6	—	—	248	—	—	—	—
Carbonate (mg/L)	0	—	<5	0	—	—	<5	—	—	—	—
Chloride (Cl-) (mg/L)	9.5	—	8.5	5	—	—	6.5	—	—	—	—
Cyanide, Total (mg/L)	0.046	—	0.044	<0.01	—	—	0.014	—	—	—	—
Cyanide, WAD (mg/L)	<0.01	—	<0.01	<0.01	—	—	<0.01	—	—	—	—
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	12.9	13.4	8.1	4.5	4.89	10.2	9.93	9.79	13.3	12.1	9.19
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	3.28	—	3.74	1.88	—	—	2.89	—	—	—	—
Selenium (Se),Total (mg/L)	<0.005	—	<0.005	<0.005	—	—	<0.005	—	—	—	—
Sodium (Na),Dissolved (mg/L)	38.2	—	29.2	11.5	—	—	27.9	—	—	—	—
Sulfate (SO4) (mg/L)	88	—	63.9	29.6	—	—	47.2	—	—	—	—
Anion - Cation Balance (%)	0.458	—	0.24	1.07	—	—	1.62	—	—	—	—

Table D-11. Annie Creek @ USGS Water Quality 2006 (Page 2 of 2)

Parameter	1/6/2006	2/6/2006	4/4/2006	5/8/2006	6/5/2006	7/3/2006	8/8/2006	9/5/2006	10/2/2006	11/2/2006	12/5/2006
Anions (meq/L)	7.71	—	5.2	2.71	—	—	5.94	—	—	—	—
Cations (meq/L)	7.78	—	5.22	2.77	—	—	6.14	—	—	—	—
Electrical Conductivity (µmhos/cm)	726	—	522	297	—	—	588	—	—	—	—
pH (SU)	8.25	—	8.31	8.11	—	—	8.41	—	—	—	—
Total Dissolved Solids (mg/L)	452	—	326	183	—	—	390	—	—	—	—
Total Suspended Solids (mg/L)	<10	—	<10	<10	—	—	<10	—	—	—	—

Table D-12. Annie Creek @ USGS Water Quality 2007 (Page 1 of 2)

Parameter	1/17/07	2/20/07	3/23/07	4/5/07	5/3/07	6/12/07	7/11/07	8/2/07	9/26/07	10/24/07	11/28/07	12/12/07
Field Conductivity (µmhos/cm)	560	560	420	420	380	440	460	748	580	530	600	510
Field ORP (mV)	—	–67	–95	15	1	10	20	—	35	234	265	256
Field Oxygen (O2) (mg/L)	—	8.61	7.18	8.56	8.18	7.97	7.83	—	8.52	3.82	10.7	9.23
Field pH (SU)	8.72	8.76	8.63	8.83	8.7	8.38	8.54	8.67	8.78	8.72	8.72	8.75
Field Temperature (° C)	1	0.8	3.8	1.9	7.9	9.1	12.9	21.5	7	5.4	0.1	1
Field Flow Rate (gal/min)	—	—	1260	868	1110	2770	564	280	130	83.5	83.5	9.87
Arsenic (As),Dissolved (mg/L)	0.032	0.033	0.059	0.051	0.047	0.048	0.031	0.057	0.034	0.034	0.032	0.026
Cadmium (Cd),Dissolved (mg/L)	—	—	—	<0.001	—	—	—	—	—	—	—	—
Calcium (Ca),Dissolved (mg/L)	64.7	—	—	45.5	34.9	—	—	83.1	—	—	—	—
Copper (Cu),Dissolved (mg/L)	—	—	—	—	—	—	—	—	—	—	—	—
Gold (Au),Dissolved (mg/L)	—	—	—	—	—	—	—	—	—	—	—	—
Magnesium (Mg),Dissolved (mg/L)	26.1	—	—	13.1	10.5	—	—	27.9	—	—	—	—
Silver (Ag),Dissolved (mg/L)	—	—	—	—	—	—	—	—	—	—	—	—
Arsenic (As),Total (mg/L)	0.032	0.033	0.059	0.051	0.048	0.05	0.032	0.06	0.036	0.034	0.032	0.026
Cadmium (Cd),Total (mg/L)	<0.001	—	—	—	<0.001	—	—	<0.001	—	—	—	—
Copper (Cu),Total (mg/L)	<0.005	—	—	<0.005	<0.005	—	—	<0.005	—	—	—	—
Gold (Au),Total (mg/L)	0.002	—	—	0.002	0.004	v	—	0.001	—	—	—	—
Mercury (Hg),Total (mg/L)	—	—	—	—	—	—	—	—	—	—	—	—
Zinc (Zn),Total (mg/L)	0.061	—	—	<0.05	<0.05	—	—	<0.05	—	—	—	—
Bicarbonate (mg/L)	257	—	—	162	149	—	—	272	—	—	—	—
Carbonate (mg/L)	0	—	—	0	<5	—	—	10.4	—	—	—	—
Chloride (Cl-) (mg/L)	7.5	—	—	10.8	10.5	—	—	11.5	—	—	—	—

Table D-12. Annie Creek @ USGS Water Quality 2007 (Page 2 of 2)

Parameter	1/17/07	2/20/07	3/23/07	4/5/07	5/3/07	6/12/07	7/11/07	8/2/07	9/26/07	10/24/07	11/28/07	12/12/07
Cyanide, Total (mg/L)	0.022	—	—	0.036	0.02	—	—	0.059	—	—	—	—
Cyanide, WAD (mg/L)	<0.01	—	—	<0.01	<0.01	—	—	0.011	—	—	—	—
Fluoride (mg/L)	—	—	—	—	—	—	—	—	—	—	—	—
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	13.5	13.4	9.06	8.29	6.39	7.6	6.03	14.3	10.2	9.05	9.39	7.95
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	0.056	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	1.2	—	—	3.48	4.08	—	—	4.98	—	—	—	—
Selenium (Se),Total (mg/L)	<0.005	—	—	<0.005	<0.005	—	—	0.005	—	—	—	—
Sodium (Na),Dissolved (mg/L)	22.3	—	—	26.2	27	—	—	40.4	—	—	—	—
Sulfate (SO4) (mg/L)	53.1	—	—	49.6	36.9	—	—	96.3	—	—	—	—
Anion - Cation Balance (%)	–0.932	—	—	–0.0816	–1.02	—	—	1.03	—	—	—	—
Anions (meq/L)	6.49	—	—	4.58	3.96	—	—	8.16	—	—	—	—
Cations (meq/L)	6.37	—	—	4.58	3.88	—	—	8.32	—	—	—	—
Electrical Conductivity (µmhos/cm)	635	—	—	463	414	—	—	778	—	—	—	—
pH (SU)	8.26	—	—	8.27	8.38	—	—	8.49	—	—	—	—
Total Dissolved Solids (mg/L)	373	—	—	278	229	—	—	488	—	—	—	—
Total Suspended Solids (mg/L)	<10	—	—	<10	<10	—	—	<10	—	—	—	—

Table D-13. Annie Creek @ USGS Water Quality 2008 (Page 1 of 2)

Parameter	5/7/2008	8/4/2008	9/4/2008	10/16/2008	11/19/2008	12/5/2008
Field Conductivity (µmhos/cm)	190	—	—	—	—	—
Field pH (SU)	8.7	—	—	—	—	—
Field Temperature (° C)	4.5	—	—	—	—	—
Field Flow Rate (gal/min)	4.7	—	—	—	—	—
Arsenic (As),Dissolved (mg/L)	0.016	0.024	0.0192	0.02	0.0186	0.019
Calcium (Ca),Dissolved (mg/L)	20.6	57.8	—	—	—	—
Magnesium (Mg),Dissolved (mg/L)	6.91	23	—	—	—	—
Arsenic (As),Total (mg/L)	0.021	0.0251	0.0181	0.019	0.019	0.0185
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	—	—	—	—
Copper (Cu),Total (mg/L)	<0.005	<0.005	—	—	—	—
Gold (Au),Total (mg/L)	0.003	<0.001	—	—	—	—
Zinc (Zn),Total (mg/L)	<0.05	<0.05	—	—	—	—
Bicarbonate (mg/L)	82.7	226	—	—	—	—
Carbonate (mg/L)	0	<5	—	—	—	—
Chloride (Cl-) (mg/L)	4.75	6.5	—	—	—	—
Cyanide, Total (mg/L)	0.013	0.016	—	—	—	—
Cyanide, WAD (mg/L)	<0.01	<0.01	—	—	—	—
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	—	—	—	—
Nitrogen, Nitrate (NO3) (mg/L)	2.19	6.52	—	—	—	—
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	—	—	—	—
Potassium (K),Dissolved (mg/L)	1.63	1.97	—	—	—	—
Selenium (Se),Total (mg/L)	<0.005	<0.005	—	—	—	—
Sodium (Na),Dissolved (mg/L)	7.34	14.6	—	—	—	—
Sulfate (SO4) (mg/L)	12.5	50.5	—	—	—	—
Anion - Cation Balance (%)	1.3	0.504	—	—	—	—

Table D-13. Annie Creek @ USGS Water Quality 2008 (Page 2 of 2)

Parameter	5/7/2008	8/4/2008	9/4/2008	10/16/2008	11/19/2008	12/5/2008
Anions (meq/L)	1.91	5.41	—	—	—	—
Cations (meq/L)	1.96	5.46	—	—	—	—
Electrical Conductivity (µmhos/cm)	—	533	—	—	—	—
pH (SU)	—	8.43	—	—	—	—
Total Dissolved Solids (mg/L)	148	336	—	—	—	—
Total Suspended Solids (mg/L)	11	<10	—	—	—	—

Table D-14. Annie Creek @ USGS Water Quality 2009 (Page 1 of 2)

Parameter	1/15/2009	4/30/2009	5/28/2009	6/18/2009	8/18/2009
Field Conductivity (µmhos/cm)	—	230	290	—	331
Field ORP (mV)	—	—	—	—	158
Field Oxygen (O2) (mg/L)	—	—	—	—	10.2
Field pH (SU)	—	8.28	8.46	—	8.49
Field Temperature (° C)	—	3	6.5	—	7.6
Field Flow Rate (gal/min)	—	—	3590	—	346
Arsenic (As),Dissolved (mg/L)	0.0247	—	—	—	—
Cadmium (Cd),Dissolved (mg/L)	—	—	—	—	—
Calcium (Ca),Dissolved (mg/L)	58.6	26.7	24.3	28.7	—
Copper (Cu),Dissolved (mg/L)	—	—	—	—	<0.005
Gold (Au),Dissolved (mg/L)	—	—	—	—	0.001
Magnesium (Mg),Dissolved (mg/L)	20.6	8.2	8.85	11.2	—
Silver (Ag),Dissolved (mg/L)	—	—	—	—	<0.001
Arsenic (As),Total (mg/L)	0.025	0.0096	0.00996	0.0131	0.0179
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	—
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	—
Gold (Au),Total (mg/L)	0.001	0.003	0.016	<0.001	—
Mercury (Hg),Total (mg/L)	—	—	—	—	<0.0002
Zinc (Zn),Total (mg/L)	<0.05	<0.05	<0.05	<0.05	–
Bicarbonate (mg/L)	252	105	114	138	240
Carbonate (mg/L)	0	0	0	0	—
Chloride (Cl-) (mg/L)	5.25	4.25	3.5	3.5	—
Cyanide, Total (mg/L)	0.022	<0.01	<0.01	<0.01	0.017
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	—	—	—	—	0.225
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	—	—	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	5.42	2.58	2.07	1.87	5.21
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05

Table D-14. Annie Creek @ USGS Water Quality 2009 (Page 2 of 2)

Parameter	1/15/2009	4/30/2009	5/28/2009	6/18/2009	8/18/2009
Potassium (K),Dissolved (mg/L)	1.1	1.13	0.954	1.2	—
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	16.5	6.95	5.56	7.05	17
Sulfate (SO4) (mg/L)	18.8	11.5	<10	16.1	23.6
Anion - Cation Balance (%)	2.92	1.57	2.09	–2.54	—
Anions (meq/L)	5.06	2.27	2.12	2.83	—
Cations (meq/L)	5.36	2.34	2.21	2.69	—
Electrical Conductivity (µmhos/cm)	501	232	251	276	506
pH (SU)	8.3	8.05	8.05	8.21	8.37
Total Dissolved Solids (mg/L)	282	131	153	156	263
Total Suspended Solids (mg/L)	<10	<10	<10	<10	<10

Table D-15. Annie Creek @ USGS Water Quality 2010

Parameter	1/22/2010	4/21/2010	5/19/2010	8/20/2010
Field Conductivity (µmhos/cm)	320	104	112	376
Field ORP (mV)	104	108	94	83
Field Oxygen (O2) (mg/L)	11.8	9.98	10.3	8.58
Field pH (SU)	8.39	8.41	8.28	8.53
Field Temperature (° C)	0.29	5.8	5.3	11.1
Field Flow Rate (gal/min)	—	3910	7930	259
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Gold (Au),Dissolved (mg/L)	0.002	<0.001	<0.001	<0.001
Silver (Ag),Dissolved (mg/L)	<0.001	<0.001	<0.001	<0.001
Arsenic (As),Total (mg/L)	0.0183	0.00893	0.0137	0.0141
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Bicarbonate (mg/L)	280	76.1	77.6	259
Cyanide, Total (mg/L)	0.042	<0.01	<0.01	0.027
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.217	0.108	0.124	0.214
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	10.5	0.736	1.36	6.94
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	22.1	4.79	4.31	19.2
Sulfate (SO4) (mg/L)	50.2	<10	14.5	39
Electrical Conductivity (µmhos/cm)	601	163	180	526
pH (SU)	8.34	7.81	7.87	8.45
Total Dissolved Solids (mg/L)	343	112	118	299
Total Suspended Solids (mg/L)	23	<10	16	<10

Table D-16. Lost Camp Water Quality 2006, 2007, and 2008 (Page 1 of 2)

Parameter	6/5/2006	11/2/2006	6/12/2007	11/28/2007	6/3/2008	11/19/2008
Field Conductivity (µmhos/cm)	—	—	110	340	100	—
Field ORP (mV)	—	—	—	273	—	—
Field Oxygen (O2) (mg/L)	—	—	—	9.01	—	—
Field pH (SU)	—	—	8.45	8.19	8.63	—
Field Temperature (° C)	—	—	8.9	0.6	9.1	—
Field Flow Rate (gal/min)	—	—	910	30	–	—
Calcium (Ca),Dissolved (mg/L)	14.1	20.8	14.6	39.9	10.8	24.7
Copper (Cu),Dissolved (mg/L)	—	—	—	—	—	—
Gold (Au),Dissolved (mg/L)	—	—	—	—	—	—
Magnesium (Mg),Dissolved (mg/L)	3.82	5.81	4.05	12.8	3.18	7.43
Silver (Ag),Dissolved (mg/L)	—	—	—	—	—	—
Arsenic (As),Total (mg/L)	<0.005	<0.005	<0.005	0.008	0.00525	0.00726
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	0.002	0.002	<0.001	<0.001	0.003	<0.001
Mercury (Hg),Total (mg/L)	—	—	—	—	—	—
Zinc (Zn),Total (mg/L)	<0.05	0.056	<0.05	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	63.7	88.7	65.1	187	51.3	111
Carbonate (mg/L)	0	0	0	0	0	0
Chloride (Cl-) (mg/L)	3.75	7.25	3.75	3.75	3.25	9.5

Table D-16. Lost Camp Water Quality 2006, 2007, and 2008 (Page 2 of 2)

Parameter	6/5/2006	11/2/2006	6/12/2007	11/28/2007	6/3/2008	11/19/2008
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen, Nitrate (NO3) (mg/L)	<0.05	0.219	0.085	1.92	<0.05	0.085
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	0.534	0.54	0.74	0.94	0.772	0.673
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	2.23	3.2	2.38	5.7	2.39	2.77
Sulfate (SO4) (mg/L)	<10	<10	<10	<10	<10	<10
Anion - Cation Balance (%)	–0.973	–0.187	0.189	0.0837	–0.481	–2.78
Anions (meq/L)	1.15	1.67	1.18	3.31	0.933	2.09
Cations (meq/L)	1.13	1.67	1.18	3.32	0.924	1.98
Electrical Conductivity (µmhos/cm)	123	179	127	351	104	219
pH (SU)	7.96	7.95	7.78	7.84	7.92	7.99
Total Dissolved Solids (mg/L)	66	107	70	191	78	115
Total Suspended Solids (mg/L)	<10	<10	<10	<10	<10	<10

Table D-17. Lost Camp Water Quality 2009 and 2010 (Page 1 of 2)

Parameter	6/10/2009	8/18/2009	10/5/2009	10/6/2009	10/7/2009	8/20/2010
Field Conductivity (µmhos/cm)	150	149	—	—	—	169
Field ORP (mV)	—	152	—	—	—	113
Field Oxygen (O2) (mg/L)	—	9.57	—	—	—	8.06
Field pH (SU)	8.3	8.12	—	—	—	8.02
Field Temperature (° C)	6.7	7.6	—	—	—	10.6
Field Flow Rate (gal/min)	—	120	—	—	—	40
Calcium (Ca),Dissolved (mg/L)	14.1	—	—	—	—	—
Copper (Cu),Dissolved (mg/L)	—	<0.005	—	—	—	<0.005
Gold (Au),Dissolved (mg/L)	—	<0.001	—	—	—	<0.001
Magnesium (Mg),Dissolved (mg/L)	5.12	—	—	—	—	—
Silver (Ag),Dissolved (mg/L)	—	<0.001	—	—	—	<0.001
Arsenic (As),Total (mg/L)	0.00792	<0.005	—	—	—	<0.005
Cadmium (Cd),Total (mg/L)	<0.001	—	—	—	—	—
Copper (Cu),Total (mg/L)	<0.005	—	—	—	—	—
Gold (Au),Total (mg/L)	<0.001	—	—	—	—	—
Mercury (Hg),Total (mg/L)	—	<0.0002	—	—	—	<0.0002
Zinc (Zn),Total (mg/L)	<0.05	—	—	—	—	—
Bicarbonate (mg/L)	68.7	122	—	—	—	131
Carbonate (mg/L)	0	—	—	—	—	—
Chloride (Cl-) (mg/L)	4.75	—	—	—	—	—
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	—	<0.05	—	—	—	0.109
Nitrogen, Ammonia (NH3) (mg/L)	—	<0.05	—	—	—	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.057	0.077	—	—	—	0.236
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	—	—	—	<0.05
Potassium (K),Dissolved (mg/L)	3.03	—	—	—	—	—

Table D-17. Lost Camp Water Quality 2009 (Page 2 of 2)

Parameter	6/10/2009	8/18/2009	10/5/2009	10/6/2009	10/7/2009	8/20/2010
Selenium (Se),Total (mg/L)	<0.005	<0.005	—	—	—	<0.005
Sodium (Na),Dissolved (mg/L)	2.65	3.12	—	—	—	3.6
Sulfate (SO4) (mg/L)	<10	<10	—	—	—	<10
Anion - Cation Balance (%)	2.04	—	—	—	—	—
Anions (meq/L)	1.26	—	—	—	—	—
Cations (meq/L)	1.32	—	—	—	—	—
Electrical Conductivity (µmhos/cm)	133	231	—	—	—	242
pH (SU)	7.88	8	—	—	—	8.07
Total Dissolved Solids (mg/L)	107	107	—	—	—	129
Total Suspended Solids (mg/L)	31	<10	—	—	—	<10

Table D-18. SS-01 Water Quality 2008 and 2009

Parameter	1/22/2008	4/17/2008	3/19/2009
Field Conductivity (µmhos/cm)	560	640	670
Field pH (SU)	8.25	8.13	7.83
Field Temperature (° C)	6	7.5	8.2
Field Flow Rate (gal/min)	—	0.45	4.75
Calcium (Ca),Dissolved (mg/L)	86.1	82.3	—
Magnesium (Mg),Dissolved (mg/L)	17.3	19.9	—
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	—
Arsenic (As),Total Recoverable (mg/L)	0.015	0.013	—
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	<0.001	—
Chromium (Cr),Total Recoverable (mg/L)	<0.001	<0.001	—
Copper (Cu),Total Recoverable (mg/L)	<0.005	<0.005	—
Lead (Pb),Total Recoverable (mg/L)	<0.001	<0.001	—
Nickel (Ni),Total Recoverable (mg/L)	<0.005	<0.005	—
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	—
Zinc (Zn),Total Recoverable (mg/L)	0.053	0.057	—
Nitrogen, Nitrate (NO3) (mg/L)	5.11	6.08	—
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	—
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	—
Sulfate (SO4) (mg/L)	138	217	—
Hardness (mg/L)	286	287	—
pH (SU)	7.79	7.84	7.84
Total Dissolved Solids (mg/L)	387	450	390
Total Suspended Solids (mg/L)	<10	<10	<10

Table D-19. SS-04 Water Quality 2006

Parameter	1/11/2006	4/10/2006	5/17/2006	8/2/2006
Arsenic (As),Dissolved (mg/L)	0.007	0.007	0.013	0.012
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	0.093	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.789	0.297	0.311	0.944
Nitrogen, Nitrate (NO3) (mg/L)	0.365	0.686	0.258	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	37.1	28.2	8.25	14.7
Sulfate (SO4) (mg/L)	97.8	19.3	11.9	208
Electrical Conductivity (µmhos/cm)	690	439	151	677
pH (SU)	7.42	7.5	7.49	7.12
Total Dissolved Solids (mg/L)	365	269	93	453
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-20. SS-04 Water Quality 2007

Parameter	1/3/2007	4/19/2007	5/17/2007	8/16/2007
Field Conductivity (µmhos/cm)	520	230	220	648
Field pH (SU)	7.49	7.76	7.45	7.35
Field Temperature (° C)	3.3	5.4	9.4	13.5
Field Flow Rate (gal/min)	44.7	858	350	51.8
Arsenic (As),Dissolved (mg/L)	0.01	0.01	<0.005	0.02
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.876	0.294	0.403	0.901
Nitrogen, Nitrate (NO3) (mg/L)	0.325	0.263	0.153	0.065
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	34.7	13	11.1	12.7
Sulfate (SO4) (mg/L)	111	17	37.9	223
Electrical Conductivity (µmhos/cm)	574	235	215	696
pH (SU)	7.21	7.6	7.57	7.14
Total Dissolved Solids (mg/L)	314	142	121	443
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-21. SS-04 Water Quality 2008

Parameter	1/30/2008	4/24/2008	5/28/2008	8/28/2008
Field Conductivity (µmhos/cm)	210	340	150	570
Field pH (SU)	7.29	8.4	8.7	6.98
Field Temperature (° C)	4.9	4.2	8.6	13.1
Field Flow Rate (gal/min)	—	256	—	—
Arsenic (As),Dissolved (mg/L)	<0.005	0.01	0.0149	0.0155
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	—	0.371	0.36	0.818
Nitrogen, Nitrate (NO3) (mg/L)	0.753	0.65	0.227	<0.05
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	4.53	22.2	8.13	15.2
Sulfate (SO4) (mg/L)	1100	26.7	5.84	141
Electrical Conductivity (µmhos/cm)	1950	365	165	577
pH (SU)	6.94	7.58	7.66	7.28
Total Dissolved Solids (mg/L)	1720	201	98	366
Total Suspended Solids (mg/L)	233	<10	18	<10

Table D-22. SS-04 Water Quality 2009

Parameter	1/22/2009	4/23/2009	5/20/2009	8/5/2009
Field Conductivity (µmhos/cm)	—	210	140	540
Field pH (SU)	—	7.29	7.47	7.36
Field Temperature (° C)	—	6.7	8.3	12.1
Field Flow Rate (gal/min)	—	2190	—	27
Arsenic (As),Dissolved (mg/L)	0.0124	0.0106	0.013	0.0118
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	0.0947	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	1.27	0.294	0.293	0.702
Nitrogen, Nitrate (NO3) (mg/L)	0.211	0.343	0.163	0.167
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	19.9	9.65	4.8	16.4
Sulfate (SO4) (mg/L)	145	23.3	15.6	85.5
Electrical Conductivity (µmhos/cm)	615	207	125	474
pH (SU)	7.21	7.48	7.59	7.34
Total Dissolved Solids (mg/L)	334	134	92	259
Total Suspended Solids (mg/L)	14	43	<10	<10

Table D-23. SS-04 Water Quality 2010

Parameter	1/19/2010	4/26/2010	5/24/2010	8/12/2010
Field Conductivity (µmhos/cm)	760	113	98.6	—
Field pH (SU)	7.21	7.75	7.47	—
Field Temperature (° C)	2.2	3.9	6.06	—
Field Flow Rate (gal/min)	20.8	1300	1230	—
Arsenic (As),Dissolved (mg/L)	0.005	0.0111	0.0105	0.00635
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	—	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.817	0.288	0.293	0.662
Nitrogen, Nitrate (NO3) (mg/L)	0.479	0.722	0.438	0.169
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	30.8	11	7.67	15.7
Sulfate (SO4) (mg/L)	155	11.6	13.2	109
Electrical Conductivity (µmhos/cm)	714	185	153	482
pH (SU)	7.21	7.57	7.6	7.51
Total Dissolved Solids (mg/L)	393	83	104	306
Total Suspended Solids (mg/L)	49	<10	<10	14

Table D-24. SS-06 Water Quality 2006

Parameter	1/11/2006	4/10/2006	5/8/2006	8/2/2006
Calcium (Ca),Dissolved (mg/L)	86.1	73.1	84.3	101
Magnesium (Mg),Dissolved (mg/L)	42	25.9	24.6	46.8
Mercury (Hg),Total (mg/L)	<0.0002	0.0004	<0.0002	<0.0002
Arsenic (As),Total Recoverable (mg/L)	0.005	0.024	0.024	0.013
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Lead (Pb),Total Recoverable (mg/L)	<0.001	0.002	0.002	<0.001
Nickel (Ni),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	0.005
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Zinc (Zn),Total Recoverable (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	1.95	3.22	3.58	3.02
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Sulfate (SO4) (mg/L)	215	129	167	254
Hardness (mg/L)	388	289	312	445
pH (SU)	8	8.15	8.21	8.05
Total Dissolved Solids (mg/L)	519	377	422	631
Total Suspended Solids (mg/L)	<10	24	17	<10

Table D-25. SS-06 Water Quality 2007

Parameter	1/4/2007	4/26/2007	5/26/2007	8/16/2007
Field Conductivity (µmhos/cm)	700	500	590	709
Field pH (SU)	8.15	8.32	8.35	8.05
Field Temperature (° C)	1	6.4	9.6	16.8
Field Flow Rate (gal/min)	17.9	308	330	138
Calcium (Ca),Dissolved (mg/L)	111	63.9	85.2	77.9
Magnesium (Mg),Dissolved (mg/L)	44.5	25.9	31.6	37.6
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As),Total Recoverable (mg/L)	<0.005	0.005	0.006	0.009
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Lead (Pb),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Nickel (Ni),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Zinc (Zn),Total Recoverable (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	3.47	1.9	2.56	2.13
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Sulfate (SO4) (mg/L)	251	109	182	221
Hardness (mg/L)	460	266	343	349
pH (SU)	7.95	8.15	8.3	7.97
Total Dissolved Solids (mg/L)	576	390	464	527
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-26. SS-06 Water Quality 2008 (Page 1 of 2)

Parameter	1/24/2008	4/18/2008	5/16/2008	8/26/2008
Field Conductivity (µmhos/cm)	730	610	410	740
Field pH (SU)	8.32	8.53	8.77	8.21
Field Temperature (° C)	0.1	3.5	7.9	8.21
Field Flow Rate (gal/min)	9	63.4	4	—
Arsenic (As),Dissolved (mg/L)	—	—	0.00866	—
Barium (Ba),Dissolved (mg/L)	—	—	0.0707	—
Cadmium (Cd),Dissolved (mg/L)	—	—	<0.001	—
Calcium (Ca),Dissolved (mg/L)	84.8	67.6	49.6	87.5
Chromium (Cr),Dissolved (mg/L)	—	—	<0.001	—
Copper (Cu),Dissolved (mg/L)	—	—	<0.005	—
Gold (Au),Dissolved (mg/L)	—	—	0.001	—
Iron (Fe),Dissolved (mg/L)	—	—	0.0516	—
Lead (Pb),Dissolved (mg/L)	—	—	<0.001	—
Magnesium (Mg),Dissolved (mg/L)	35.1	32.1	14.9	37.5
Zinc (Zn),Dissolved (mg/L)	—	—	<0.05	—
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As),Total Recoverable (mg/L)	0.006	<0.005	0.0132	0.00791
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total Recoverable (mg/L)	0.01	<0.005	<0.005	<0.005
Lead (Pb),Total Recoverable (mg/L)	<0.001	<0.001	0.00159	<0.001
Nickel (Ni),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Zinc (Zn),Total Recoverable (mg/L)	<0.05	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	—	—	148	—
Chloride (Cl-) (mg/L)	—	—	2.75	—
Cyanide, Total (mg/L)	—	—	<0.01	—
Cyanide, WAD (mg/L)	—	—	<0.01	—

Table D-26. SS-06 Water Quality 2008 (Page 2 of 2)

Parameter	1/24/2008	4/18/2008	5/16/2008	8/26/2008
Fluoride (mg/L)	—	—	0.31	—
Nitrogen, Nitrate (NO3) (mg/L)	1.76	4.05	2.15	2.96
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	—	—	<0.005	—
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	—	—	4.25	—
Sulfate (SO4) (mg/L)	222	186	95.7	227
Electrical Conductivity (µmhos/cm)	—	—	456	—
Hardness (mg/L)	356	301	185	373
pH (SU)	7.96	8.08	8.2	8.26
Total Dissolved Solids (mg/L)	497	430	287	532
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-27. SS-06 Water Quality 2009

Parameter	1/19/2009	4/22/2009	5/20/2009	8/6/2009
Field Conductivity (µmhos/cm)	—	430	820	820
Field pH (SU)	—	8.19	8.34	8.28
Field Temperature (° C)	—	6.8	10.4	13.8
Field Flow Rate (gal/min)	—	2360	—	76
Calcium (Ca),Dissolved (mg/L)	63.7	48.6	86.2	99.9
Magnesium (Mg),Dissolved (mg/L)	31.6	15	28.8	41.4
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As),Total Recoverable (mg/L)	<0.005	0.0458	0.0103	0.00501
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total Recoverable (mg/L)	<0.001	0.00227	<0.001	<0.001
Copper (Cu),Total Recoverable (mg/L)	<0.005	0.00525	<0.005	<0.005
Lead (Pb),Total Recoverable (mg/L)	<0.001	0.00714	<0.001	<0.001
Nickel (Ni),Total Recoverable (mg/L)	<0.005	0.00645	<0.005	<0.005
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Zinc (Zn),Total Recoverable (mg/L)	<0.05	0.0834	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	1.18	1.7	2.59	2.75
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Sulfate (SO4) (mg/L)	188	72.2	180	246
Hardness (mg/L)	289	183	334	420
pH (SU)	8.05	8.01	8.24	8.17
Total Dissolved Solids (mg/L)	464	274	451	574
Total Suspended Solids (mg/L)	<10	46	<10	<10

Table D-28. SS-06 Water Quality 2010

Parameter	1/21/2010	4/21/2010	5/26/2010	8/26/2010
Field Conductivity (µmhos/cm)	900	367	415	664
Field ORP (mV)	—	62	—	206
Field Oxygen (O2) (mg/L)	—	9.36	—	—
Field pH (SU)	8.28	8.39	8.17	8.49
Field Temperature (° C)	0.9	7.3	6.8	8.2
Field Flow Rate (gal/min)	35	207	705	12.6
Calcium (Ca),Dissolved (mg/L)	94.7	60	79.8	107
Magnesium (Mg),Dissolved (mg/L)	46.2	22	22.7	41.3
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic (As),Total Recoverable (mg/L)	<0.005	0.0105	0.0101	0.00688
Cadmium (Cd),Total Recoverable (mg/L)	—	<0.001	<0.001	<0.001
Chromium (Cr),Total Recoverable (mg/L)	—	<0.001	<0.001	<0.001
Copper (Cu),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Lead (Pb),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Nickel (Ni),Total Recoverable (mg/L)	—	<0.005	<0.005	0.00764
Silver (Ag),Total Recoverable (mg/L)	<0.001	<0.001	<0.001	<0.001
Zinc (Zn),Total Recoverable (mg/L)	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	2.61	2.23	2.84	3.09
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	—	—	—	—
Selenium (Se),Total Recoverable (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	—	—	—	—
Sulfate (SO4) (mg/L)	277	122	158	289
Electrical Conductivity (µmhos/cm)	—	—	—	—
Hardness (mg/L)	427	240	293	437
pH (SU)	8.09	8.13	8.02	8.13
Total Dissolved Solids (mg/L)	577	352	416	630
Total Suspended Solids (mg/L)	<10	<10	<10	<10

Table D-29. SS-12 Water Quality 2006

Parameter	4/11/2006	5/17/2006	8/2/2006
Arsenic (As),Dissolved (mg/L)	0.005	0.008	0.022
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.158	0.154	0.16
Nitrogen, Nitrate (NO3) (mg/L)	4.89	1.03	7.42
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	3.51	2.14	7.71
Sulfate (SO4) (mg/L)	142	37.8	352
Electrical Conductivity (µmhos/cm)	565	197	1,020
pH (SU)	7.79	7.62	7.6
Total Dissolved Solids (mg/L)	367	131	761
Total Suspended Solids (mg/L)	<10	<10	<10

Table D-30. SS-12 Water Quality 2007

Parameter	1/4/2007	4/17/2007	5/26/2007	8/16/2007
Field Conductivity (µmhos/cm)	950	260	320	971
Field pH (SU)	7.98	8	7.8	8.04
Field Temperature (° C)	0.7	8.1	6.9	14.5
Field Flow Rate (gal/min)	11.1	299	279	201
Arsenic (As),Dissolved (mg/L)	0.006	0.009	0.006	0.011
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.155	0.161	0.127	0.164
Nitrogen, Nitrate (NO3) (mg/L)	12.1	1.52	2.3	8.08
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	8.96	2.77	2.97	6.8
Sulfate (SO4) (mg/L)	414	65.9	88.3	363
Electrical Conductivity (µmhos/cm)	1170	274	346	1,050
pH (SU)	7.7	7.52	7.88	7.89
Total Dissolved Solids (mg/L)	844	180	224	752
Total Suspended Solids (mg/L)	<10	40	16	14

Table D-31. SS-12 Water Quality 2008

Parameter	1/22/2008	4/22/2008	5/28/2008	8/28/2008	9/16/2008
Field Conductivity (µmhos/cm)	1,460	760	160	580	—
Field pH (SU)	8.04	8.01	8.06	7.87	—
Field Temperature (° C)	–0.3	7.2	8.7	10.4	—
Field Flow Rate (gal/min)	—	44.9	—	—	—
Arsenic (As),Dissolved (mg/L)	0.009	0.005	0.00897	0.0116	—
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005	—
Zinc (Zn),Dissolved (mg/L)	<0.05	0.082	<0.05	<0.05	—
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	—
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01	—
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	—
Fluoride (mg/L)	0.189	0.203	0.141	0.158	—
Nitrogen, Nitrate (NO3) (mg/L)	16.4	4.65	0.73	3.93	—
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	—
Selenium (Se),Dissolved (mg/L)	0.005	<0.005	<0.005	<0.005	—
Sodium (Na),Dissolved (mg/L)	10.4	6.65	1.94	5.65	—
Sulfate (SO4) (mg/L)	626	271	40.2	182	—
Electrical Conductivity (µmhos/cm)	1,520	832	174	636	—
pH (SU)	7.57	7.9	7.63	7.99	—
Total Dissolved Solids (mg/L)	1,160	586	138	434	—
Total Suspended Solids (mg/L)	24	<10	<10	17	—
Gross Alpha (pCi/L)	—	—	—	—	5.1
Radium-226 (pCi/L)	—	—	—	—	<0.3
Radium-228 (pCi/L)	—	—	—	—	<0.6

Table D-32. SS-12 Water Quality 2009

Parameter	1/27/2009	4/22/2009	5/19/2009	8/5/2009
Field Conductivity (µmhos/cm)	—	210	160	770
Field pH (SU)	—	7.76	7.79	7.66
Field Temperature (° C)	—	5.7	7.4	19.9
Field Flow Rate (gal/min)	—	6,380	963	21
Arsenic (As),Dissolved (mg/L)	0.00907	0.00666	0.00597	0.013
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	0.1	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.183	0.152	0.156	0.168
Nitrogen, Nitrate (NO3) (mg/L)	9.12	0.837	0.46	3.85
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	0.123
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	7.79	2.12	1.91	5.63
Sulfate (SO4) (mg/L)	413	39.6	16.9	238
Electrical Conductivity (µmhos/cm)	1,130	204	158	714
pH (SU)	7.81	7.55	7.71	7.54
Total Dissolved Solids (mg/L)	833	148	109	482
Total Suspended Solids (mg/L)	<10	11	<10	11

Table D-33. SS-12 Water Quality 2010

Parameter	1/19/2010	4/13/2010	5/25/2010	8/17/2010
Field Conductivity (µmhos/cm)	1,280	345	109	622
Field ORP (mV)				39
Field Oxygen (O2) (mg/L)				6.8
Field pH (SU)	7.93	7.86	7.67	8
Field Temperature (° C)	0.8	8.1	7.1	17.9
Field Flow Rate (gal/min)	2.1	325	1,510	167
Arsenic (As),Dissolved (mg/L)	0.00777	0.00578	0.00861	0.0101
Copper (Cu),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Dissolved (mg/L)	<0.05	<0.05	<0.05	<0.05
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.183	0.153	0.149	0.143
Nitrogen, Nitrate (NO3) (mg/L)	11.5	2.65	0.698	5.58
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05
Selenium (Se),Dissolved (mg/L)	<0.005	<0.005	<0.005	<0.005
Sodium (Na),Dissolved (mg/L)	8.55	4.2	2.81	6.57
Sulfate (SO4) (mg/L)	471	138	35.1	254
Electrical Conductivity (µmhos/cm)	1,230	501	166	731
pH (SU)	7.94	7.86	7.54	7.99
Total Dissolved Solids (mg/L)	900	338	124	4.1.1 98
Total Suspended Solids (mg/L)	<10	89	<10	4.1.2 4

Table D-34. SS-14A Water Quality 2008 and 2009

Parameter	4/18/2008	9/16/2008	3/19/2009
Field Conductivity (µmhos/cm)	730	—	900
Field pH (SU)	8.21	—	7.57
Field Temperature (° C)	5.5	—	4.7
Field Flow Rate (gal/min)	1	—	0.84
Calcium (Ca),Dissolved (mg/L)	79.1	—	—
Magnesium (Mg),Dissolved (mg/L)	37.6	—	—
Mercury (Hg),Total (mg/L)	<0.0002	—	—
Arsenic (As),Total Recoverable (mg/L)	0.006	—	—
Cadmium (Cd),Total Recoverable (mg/L)	<0.001	—	—
Chromium (Cr),Total Recoverable (mg/L)	<0.001	—	—
Copper (Cu),Total Recoverable (mg/L)	<0.005	—	—
Lead (Pb),Total Recoverable (mg/L)	<0.001	—	—
Nickel (Ni),Total Recoverable (mg/L)	<0.005	—	—
Silver (Ag),Total Recoverable (mg/L)	<0.001	—	—
Zinc (Zn),Total Recoverable (mg/L)	<0.05	—	—
Nitrogen, Nitrate (NO3) (mg/L)	4.99	—	—
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	—	—
Selenium (Se),Total Recoverable (mg/L)	<0.005	—	—
Sulfate (SO4) (mg/L)	250	—	—
Hardness (mg/L)	352	—	—
pH (SU)	7.97	—	7.88
Total Dissolved Solids (mg/L)	516	—	563
Total Suspended Solids (mg/L)	<10	—	<10
Gross Alpha (pCi/L)	—	9.9	—
Radium-226 (pCi/L)	—	0.5	—
Radium-228 (pCi/L)	—	<0.6	—

Table D-35. SS-20 Water Quality 2009 (Page 1 of 2)

Parameter	11/3/2009	12/16/2009
Calcium (Ca),Dissolved (mg/L)	39	28.7
Magnesium (Mg),Dissolved (mg/L)	9.45	6.69
Aluminum (Al),Total (mg/L)	0.0598	0.149
Antimony (Sb),Total (mg/L)	<0.005	<0.005
Arsenic (As),Total (mg/L)	0.0126	0.00999
Barium (Ba),Total (mg/L)	0.598	0.523
Beryllium (Be),Total (mg/L)	<0.001	<0.001
Cadmium (Cd),Total (mg/L)	<0.001	<0.001
Chromium (Cr),Total (mg/L)	<0.001	<0.001
Cobalt (Co),Total (mg/L)	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005
Gold (Au),Total (mg/L)	0.003	0.001
Iron (Fe),Total (mg/L)	<0.05	0.16
Lead (Pb),Total (mg/L)	<0.001	<0.001
Lithium (Li),Total (mg/L)	—	—
Manganese (Mn),Total (mg/L)	<0.01	0.011
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002
Molybdenum (Mo),Total (mg/L)	<0.001	<0.001
Nickel (Ni),Total (mg/L)	<0.005	<0.005
Silver (Ag),Total (mg/L)	<0.001	<0.001
Strontium (Sr),Total (mg/L)	0.193	0.142
Vanadium (V),Total (mg/L)	<0.005	<0.005
Zinc (Zn),Total (mg/L)	<0.05	<0.05
Bicarbonate (mg/L)	101	83
Boron (B),Total (mg/L)	0.0467	0.0243
Carbonate (mg/L)	0	0
Chloride (Cl-) (mg/L)	103	75
Cyanide, Free (mg/L)	<0.01	<0.01

Table D-35. SS-20 Water Quality 2009 (Page 2 of 2)

Parameter	11/3/2009	12/16/2009
Cyanide, Total (mg/L)	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01
Fluoride (mg/L)	0.269	0.262
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	2.28	1.13
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	—	2.23
Selenium (Se),Total (mg/L)	<0.005	<0.005
Silicon (Si),Total (mg/L)	6.77	3.42
Sodium (Na),Dissolved (mg/L)	—	40.4
Sulfate (SO4) (mg/L)	<10	<10
Alkalinity (mg/L)	82.9	68
Anion - Cation Balance (%)	—	0.512
Anions (meq/L)	—	3.76
Cations (meq/L)	—	3.8
Electrical Conductivity (µmhos/cm)	503	413
Hardness (mg/L)	136	99.2
pH (SU)	7.68	7.43
Total Dissolved Solids (mg/L)	257	204
Total Suspended Solids (mg/L)	<10	<10
Turbidity (NTU)	0.6	2.3

Table D-36. SS-20 Water Quality 2010 (Page 1 of 2)

Parameter	1/21/2010	3/16/2010	4/27/2010	5/19/2010	6/17/2010	7/28/2010
Field Conductivity (µmhos/cm)	550	600	164	182	197	215
Field ORP (mV)	—	—	—	92	116	–
Field Oxygen (O2) (mg/L)	—	—	—	8.54	7.08	–
Field pH (SU)	7.8	6.9	7.38	8.12	7.77	6.92
Field Temperature (° C)	2.6	5.3	4.8	5.2	7.6	10.3
Field Flow Rate (gal/min)	0.14	2	113	26	95	2
Calcium (Ca),Dissolved (mg/L)	43	38.4	17.5	24.3	25.6	24.8
Magnesium (Mg),Dissolved (mg/L)	9.04	8.13	4.66	5.04	5.16	4.9
Aluminum (Al),Total (mg/L)	3.6	0.218	1.14	0.924	1.41	0.195
Antimony (Sb),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic (As),Total (mg/L)	0.0483	0.00678	0.0169	0.0205	0.021	0.015
Barium (Ba),Total (mg/L)	0.774	0.475	0.227	0.178	0.234	0.325
Beryllium (Be),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total (mg/L)	0.00653	<0.001	0.0014	0.00119	0.00165	<0.001
Cobalt (Co),Total (mg/L)	0.00211	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	0.00703	<0.005	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	0.005	<0.001
Iron (Fe),Total (mg/L)	3.89	0.148	0.735	0.517	0.771	0.12
Lead (Pb),Total (mg/L)	0.00676	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (Li),Total (mg/L)	0.044	0.002	0.004	0.00502	0.0022	<0.002
Manganese (Mn),Total (mg/L)	0.164	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (Mo),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni),Total (mg/L)	0.00817	<0.005	<0.005	<0.005	<0.005	<0.005
Silver (Ag),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium (Sr),Total (mg/L)	0.169	0.15	0.0938	0.101	0.114	0.0982
Vanadium (V),Total (mg/L)	0.00944	<0.005	<0.005	<0.005	<0.005	<0.005

Table D-36. SS-20 Water Quality 2010 (Page 2 of 2)

Parameter	1/21/2010	3/16/2010	4/27/2010	5/19/2010	6/17/2010	7/28/2010
Zinc (Zn),Total (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	68.8	55	55.1	67.8	80.6	94
Boron (B),Total (mg/L)	<0.02	<0.02	<0.02	0.0456	0.0201	<0.02
Carbonate (mg/L)	0	0	0	0	0	0
Chloride (Cl-) (mg/L)	138	140	53.8	46.3	45	39.2
Cyanide, Free (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.225	0.254	0.317	0.418	0.401	0.305
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	1.26	1.55	0.679	0.569	0.537	0.521
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.45	2.07	1.74	1.89	1.97	1.87
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silicon (Si),Total (mg/L)	5.69	7.85	11.6	7.96	9.8	7.71
Sodium (Na),Dissolved (mg/L)	44.6	57.1	30	24.1	26.4	30.6
Sulfate (SO4) (mg/L)	10.6	<10	<10	<10	<10	<10
Alkalinity (mg/L)	56.4	45.1	45.1	55.6	66.1	77.1
Anion - Cation Balance (%)	–4.34	1.46	2.35	4.68	4.51	5.58
Anions (meq/L)	5.34	4.97	2.49	2.48	2.65	2.7
Cations (meq/L)	4.9	5.12	2.61	2.72	2.9	3.02
Electrical Conductivity (µmhos/cm)	533	575	290	288	300	305
Hardness (mg/L)	145	129	62.9	81.4	85.2	82.1
pH (SU)	7.54	7.48	7.02	7.42	7.13	7.04
Total Dissolved Solids (mg/L)	286	341	178	176	170	170
Total Suspended Solids (mg/L)	99	<10	<10	<10	<10	<10
Turbidity (NTU)	50	2.8	12	7.8	9.6	2.4

Table D-37. SS-05 Water Quality 2004

Parameter	5/2004
Field Conductivity (µmhos/cm)	250
Field pH (SU)	7.8
Field Temperature (° C)	9
Field Flow Rate (gal/min)	278.28

APPENDIX E

WATER-QUALITY STATISTICS BY SITE

Table E-1. DWD-1 Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	12	N/A	N/A	140	63	105	140	194	41.3	243
Field ORP (mV)	N/A	5	N/A	N/A	80	37	59	87	98	27	128
Field Oxygen (O2) (mg/L)	N/A	5	N/A	N/A	9.46	1.14	8.6	9.96	10.2	7.75	10.6
Field pH (SU)	N/A	12	N/A	N/A	7.58	0.32	7.4	7.64	7.71	6.87	8.04
Field Temperature (° C)	N/A	12	N/A	N/A	6.7	5.1	3.4	4.9	11.8	-1.2	13.7
Field Flow Rate (gal/min)	N/A	11	N/A	N/A	657	911	42	149	977	1.5	2810
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	15	15	100	19.4	9.75	10.35	21.1	26.3	6.08	35.8
Copper (Cu),Dissolved (mg/L)	0.005	5	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Dissolved (mg/L)	0.001	5	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (Mg),Dissolved (mg/L)	0.5	15	15	100	5.4	2.69	2.92	5.42	6.48	1.94	10.2
Silver (Ag),Dissolved (mg/L)	0.001	5	1	20	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00148
Potassium (K),Dissolved (mg/L)	0.5	15	15	100	2.11	0.9	1.29	2.39	2.64	0.97	3.43
Sodium (Na),Dissolved (mg/L)	0.5	20	20	100	2.76	0.8	2.01	2.76	3.31	1.1	4.65
Metals, Total											
Arsenic (As),Total (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd),Total (mg/L)	0.001	15	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Total (mg/L)	0.005	15	6	40	< 0.005	< 0.005	< 0.005	< 0.005	0.00625	< 0.005	0.00952
Gold (Au),Total (mg/L)	0.001	15	8	53.3	0.003	0.004	< 0.001	0.001	0.003	< 0.001	0.014
Mercury (Hg),Total (mg/L)	0.0002	5	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc (Zn),Total (mg/L)	0.05	15	11	73.3	0.0696	0.058	< 0.05	0.0609	0.073	< 0.05	0.242

Table E-1. DWD-1 Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Bicarbonate (mg/L)	10	20	20	100	28.9	14.5	17.9	28.6	32.3	13.2	65.7
Carbonate (mg/L)	5	15	0	0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride (Cl-) (mg/L)	0.5	15	11	73.3	1.05	0.79	< 0.5	0.75	1.5	< 0.5	2.75
Cyanide, Total (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	5	5	100	0.525	0.306	0.247	0.566	0.694	0.231	0.98
Nitrogen, Ammonia (NH3) (mg/L)	0.05	5	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.05	20	14	70	0.729	1.72	< 0.05	0.302	0.563	< 0.05	7.88
Nitrogen, Nitrite (NO2) (mg/L)	0.05	20	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Total (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	20	18	90	47.9	34.3	16.3	52.6	63.6	< 10	117
Physical Properties											
Anion - Cation Balance (%)	N/A	15	N/A	N/A	-0.454	3.32	-3.05	-1.33	2.77	-5.32	5.47
Anions (meq/L)	N/A	15	N/A	N/A	1.6	0.761	0.9	1.7	2.03	0.519	2.98
Cations (meq/L)	N/A	15	N/A	N/A	1.58	0.746	0.819	1.68	2.01	0.566	2.85
Electrical Conductivity (µmhos/cm)	5	20	20	100	185	83.8	103	202	242	65	330
pH (SU)	N/A	20	N/A	N/A	7.25	0.32	7.14	7.24	7.45	6.46	7.78
Total Dissolved Solids (mg/L)	50	20	20	100	126	< 50	84	131	155	51	207
Total Suspended Solids (mg/L)	10	20	3	15	< 10	11	< 10	< 10	< 10	< 10	42

Table E-2. BMT-1 Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	12	N/A	N/A	132	55	100	123	172	51.5	227
Field ORP (mV)	N/A	5	N/A	N/A	80	64	39	64	129	1	169
Field Oxygen (O2) (mg/L)	N/A	5	N/A	N/A	9.69	1.49	8.6	9.89	10.8	7.61	11.5
Field pH (SU)	N/A	12	N/A	N/A	7.87	0.32	7.64	7.82	8.15	7.37	8.41
Field Temperature (° C)	N/A	12	N/A	N/A	7	5.3	2.6	5.1	12.1	0.25	15.2
Field Flow Rate (gal/min)	N/A	11	N/A	N/A	337	487	23	63	536	1.5	1320
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	15	15	100	18.2	8.1	11.1	15.6	25.8	6.85	30.3
Copper (Cu),Dissolved (mg/L)	0.005	5	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Dissolved (mg/L)	0.001	5	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (Mg),Dissolved (mg/L)	0.5	15	15	100	4.9	2.12	3.1	4.46	7.13	1.85	7.41
Silver (Ag),Dissolved (mg/L)	0.001	5	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Potassium (K),Dissolved (mg/L)	0.5	15	15	100	1.95	0.939	0.974	1.63	2.8	0.745	3.37
Sodium (Na),Dissolved (mg/L)	0.5	20	20	100	2.29	0.88	1.59	2.17	2.6	1.25	4.07
Metals, Total											
Arsenic (As),Total (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd),Total (mg/L)	0.001	15	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Total (mg/L)	0.005	15	2	13.3	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.008
Gold (Au),Total (mg/L)	0.001	15	6	40	0.001	0.001	< 0.001	< 0.001	0.003	< 0.001	0.005
Mercury (Hg),Total (mg/L)	0.0002	5	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc (Zn),Total (mg/L)	0.05	15	4	26.7	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.163

Table E-2. DWD-1 Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	n Analyzed	n Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Bicarbonate (mg/L)	10	20	20	100	42.8	15.7	34	38.1	49.2	16.9	90.1
Carbonate (mg/L)	5	15	0	0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride (Cl-) (mg/L)	0.5	15	4	26.7	0.7	0.8	< 0.5	< 0.5	< 0.5	< 0.5	2.5
Cyanide, Total (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	5	5	100	0.398	0.434	0.128	0.284	0.517	0.111	1.16
Nitrogen, Ammonia (NH3) (mg/L)	0.05	5	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.05	20	4	20	0.638	1.88	< 0.05	< 0.05	< 0.05	< 0.05	6.53
Nitrogen, Nitrite (NO2) (mg/L)	0.05	20	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Total (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	20	18	90	36.8	25.6	14.7	31.4	61	< 10	81.5
Physical Properties											
Anion - Cation Balance (%)	N/A	15	N/A	N/A	-1.299	2.63	-3.42	-2.4	1.29	-4.61	3.27
Anions (meq/L)	N/A	15	N/A	N/A	1.5	0.6	0.966	1.27	2.12	0.679	2.31
Cations (meq/L)	N/A	15	N/A	N/A	1.5	0.603	0.918	1.3	2.1	0.667	2.29
Electrical Conductivity (µmhos/cm)	5	20	20	100	174	71.6	97.8	191	241	78.5	254
pH (SU)	N/A	20	N/A	N/A	7.55	0.2	7.4	7.58	7.7	7.25	7.89
Total Dissolved Solids (mg/L)	50	20	20	100	119	< 50	84	125	152	< 50	169
Total Suspended Solids (mg/L)	10	20	2	10	< 10	11	< 10	< 10	< 10	< 10	53

Table E-3. Annie Creek @ USGS Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	20	N/A	N/A	408	170	305	420	545	104	748
Field ORP (mV)	N/A	15	N/A	N/A	81	110	11	83	145	-95	265
Field Oxygen (O2) (mg/L)	N/A	15	N/A	N/A	8.76	1.85	8.02	8.58	10.1	3.82	11.8
Field pH (SU)	N/A	20	N/A	N/A	8.59	0.17	8.44	8.65	8.72	8.28	8.83
Field Temperature (° C)	N/A	20	N/A	N/A	5.8	5.2	1	5.4	7.8	0.1	21.5
Field Flow Rate (gal/min)	N/A	16	N/A	N/A	1450	2149	107	455	2015	4.7	7930
Metals, Dissolved											
Arsenic (As),Dissolved (mg/L)	0.005	32	32	100	0.035	0.013	0.0253	0.034	0.048	0.016	0.059
Cadmium (Cd),Dissolved (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calcium (Ca),Dissolved (mg/L)	1	14	14	100	47.3	20.3	28.7	48.1	60.6	20.6	83.1
Copper (Cu),Dissolved (mg/L)	0.005	5	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Dissolved (mg/L)	0.001	5	2	40	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.002
Magnesium (Mg),Dissolved (mg/L)	0.5	14	14	100	16.5	7.7	9.06	14.7	23	6.91	27.9
Silver (Ag),Dissolved (mg/L)	0.001	5	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Potassium (K),Dissolved (mg/L)	0.5	14	14	100	2.39	1.3	1.2	1.92	3.48	0.954	4.98
Sodium (Na),Dissolved (mg/L)	0.5	19	19	100	18.3	11.2	7.12	17	27	4.31	40.4
Metals, Total											
Arsenic (As),Total (mg/L)	0.005	40	40	100	0.032	0.0149	0.019	0.032	0.042	0.00893	0.06
Cadmium (Cd),Total (mg/L)	0.001	13	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Total (mg/L)	0.005	14	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Total (mg/L)	0.001	14	12	85.7	0.004	0.004	0.001	0.003	0.004	< 0.001	0.016
Mercury (Hg),Total (mg/L)	0.0002	5	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc (Zn),Total (mg/L)	0.05	14	1	7.14	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.061

Table E-3. Annie Creek @ USGS Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Bicarbonate (mg/L)	10	19	19	100	185	77.2	107	186	256	76.1	286
Carbonate (mg/L)	5	14	1	7.14	< 5	< 5	< 5	< 5	< 5	< 5	10.4
Chloride (Cl-) (mg/L)	0.5	14	14	100	7	2.8	4.75	6.5	9.5	3.5	11.5
Cyanide, Total (mg/L)	0.01	19	13	68.4	0.021	0.017	< 0.01	0.017	0.034	< 0.01	0.059
Cyanide, WAD (mg/L)	0.01	19	1	5.26	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.011
Fluoride (mg/L)	0.05	5	5	100	0.178	0.057	0.12	0.214	0.219	0.108	0.225
Nitrogen, Ammonia (NH3) (mg/L)	0.05	38	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.05	40	40	100	7.7	3.92	5.03	8	10.4	0.736	14.3
Nitrogen, Nitrite (NO2) (mg/L)	0.05	40	1	2.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.056
Selenium (Se),Total (mg/L)	0.005	19	1	5.26	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Sulfate (SO4) (mg/L)	10	19	17	89.5	37.2	26.7	14.9	36.9	50.4	< 10	96.3
Physical Properties											
Anion - Cation Balance (%)	N/A	14	N/A	N/A	0.588	1.4	-0.0816	0.77	1.57	-2.54	2.92
Anions (meq/L)	N/A	14	N/A	N/A	4.6	2.05	2.71	4.82	5.94	1.91	8.16
Cations (meq/L)	N/A	14	N/A	N/A	4.65	2.08	2.69	4.9	6.14	1.96	8.32
Electrical Conductivity (µmhos/cm)	5	18	18	100	455	185	276	504	588	163	778
pH (SU)	N/A	18	N/A	N/A	8.24	0.19	8.11	8.29	8.38	7.81	8.49
Total Dissolved Solids (mg/L)	50	19	19	100	266	115	154	278	341	112	488
Total Suspended Solids (mg/L)	10	19	3	15.8	< 10	< 10	< 10	< 10	< 10	< 10	23

Table E-4. Lost Camp Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	6	N/A	N/A	170	87	110	150	169	100	340
Field ORP (mV)	N/A	3	N/A	N/A	179	83	123	152	243	113	273
Field Oxygen (O2) (mg/L)	N/A	3	N/A	N/A	8.88	0.76	8.3	9.01	9.43	8.06	9.57
Field pH (SU)	N/A	6	N/A	N/A	8.3	0.22	8.12	8.2	8.45	8.02	8.63
Field Temperature (° C)	N/A	6	N/A	N/A	7.3	3.5	6.7	8.3	9.1	0.6	10.6
Field Flow Rate (gal/min)	N/A	4	N/A	N/A	275	425	35	80	515	30	910
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	8	8	100	22	11.2	14.1	17.7	31.1	10.8	39.9
Copper (Cu),Dissolved (mg/L)	0.005	2	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Dissolved (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (Mg),Dissolved (mg/L)	0.5	8	8	100	6.65	3.53	3.93	5.47	9	3.18	12.8
Silver (Ag),Dissolved (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Potassium (K),Dissolved (mg/L)	0.5	8	8	100	1	0.831	0.61	0.75	0.86	0.534	3.03
Sodium (Na),Dissolved (mg/L)	0.5	10	10	100	3.4	1.26	2.39	2.95	3.6	2.23	5.7
Metals, Total											
Arsenic (As),Total (mg/L)	0.005	10	5	50	0.00539	< 0.005	< 0.005	< 0.005	0.00792	< 0.005	0.013
Cadmium (Cd),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Total (mg/L)	0.005	8	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Gold (Au),Total (mg/L)	0.001	8	4	50	0.001	0.001	< 0.001	0.001	0.002	< 0.001	0.003
Mercury (Hg),Total (mg/L)	0.0002	2	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc (Zn),Total (mg/L)	0.05	8	1	12.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.056

Table E-4. Lost Camp Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Bicarbonate (mg/L)	10	10	10	100	106	46.8	65.1	99.9	131	51.3	187
Carbonate (mg/L)	5	8	0	0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride (Cl-) (mg/L)	0.5	8	8	100	5.2	2.17	3.75	4.25	6.4	3.25	9.5
Cyanide, Total (mg/L)	0.01	13	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	13	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	2	1	50	0.067	0.059	< 0.05	0.067	0.109	< 0.05	0.109
Nitrogen, Ammonia (NH3) (mg/L)	0.05	2	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.05	10	8	80	0.418	0.676	0.057	0.085	0.236	< 0.05	1.92
Nitrogen, Nitrite (NO2) (mg/L)	0.05	10	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Total (mg/L)	0.005	10	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	10	0	0	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Physical Properties											
Anion - Cation Balance (%)	N/A	8	N/A	N/A	-0.298	1.34	-0.727	-0.23	0.136	-2.78	2.04
Anions (meq/L)	N/A	8	N/A	N/A	1.83	0.909	1.17	1.47	2.57	0.933	3.31
Cations (meq/L)	N/A	8	N/A	N/A	1.82	0.902	1.15	1.5	2.51	0.924	3.32
Electrical Conductivity (µmhos/cm)	5	10	10	100	203	85	127	199	242	104	351
pH (SU)	N/A	10	N/A	N/A	7.92	0.1	7.84	7.94	7.99	7.76	8.07
Total Dissolved Solids (mg/L)	50	11	11	100	121	< 50	85	107	169	66	191
Total Suspended Solids (mg/L)	10	11	1	9.09	< 10	< 10	< 10	< 10	< 10	< 10	31

Table E-5. SS-01 Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	3	N/A	N/A	623	57	580	640	663	560	670
Field pH (SU)	N/A	3	N/A	N/A	8.07	0.22	7.91	8.13	8.22	7.83	8.25
Field Temperature (° C)	N/A	3	N/A	N/A	7.2	1	6	7.5	8	6	8.2
Field Flow Rate (gal/min)	N/A	2	N/A	N/A	2.6	3.04	0.45	2.6	4.75	0.45	4.75
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	2	2	100	84.2	2.7	82.3	84.2	86.1	82.3	86.1
Magnesium (Mg),Dissolved (mg/L)	0.5	2	2	100	18.6	1.8	17.3	18.6	19.9	17.3	19.9
Metals, Total											
Mercury (Hg),Total (mg/L)	0.0002	2	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Metals, Total Recoverable											
Arsenic (As),Total Recoverable (mg/L)	0.005	2	2	100	0.014	< 0.005	0.013	0.014	0.015	0.013	0.015
Cadmium (Cd),Total Recoverable (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr),Total Recoverable (mg/L)	0.001	2	0	0	0.0015	0.0014	< 0.001	0.0015	0.0025	< 0.001	0.0025
Copper (Cu),Total Recoverable (mg/L)	0.005	2	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Lead (Pb),Total Recoverable (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel (Ni),Total Recoverable (mg/L)	0.005	2	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silver (Ag),Total Recoverable (mg/L)	0.001	2	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc (Zn),Total Recoverable (mg/L)	0.05	2	2	100	0.055	< 0.05	0.053	0.055	0.057	0.053	0.057

Table E-5. SS-01 Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Nitrogen, Nitrate (NO3) (mg/L)	0.05	2	2	100	5.6	0.69	5.11	5.6	6.08	5.11	6.08
Nitrogen, Nitrite (NO2) (mg/L)	0.05	2	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Total Recoverable (mg/L)	0.005	2	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	2	2	100	178	56	138	178	217	138	217
Physical Properties											
Hardness (mg/L)	N/A	2	N/A	N/A	287	1	286	287	287	286	287
pH (SU)	N/A	3	N/A	N/A	7.82	0.03	7.8	7.84	7.84	7.79	7.84
Total Dissolved Solids (mg/L)	50	3	3	100	409	< 50	388	390	435	387	450
Total Suspended Solids (mg/L)	10	3	0	0	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Table E-6. SS-04 Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	14	N/A	N/A	339	222	150	225	540	98.6	760
Field pH (SU)	N/A	14	N/A	N/A	7.57	0.46	7.29	7.46	7.75	6.98	8.7
Field Temperature (° C)	N/A	14	N/A	N/A	7.3	3.7	4.2	6.4	9.4	2.2	13.5
Field Flow Rate (gal/min)	N/A	10	N/A	N/A	633	740	44.7	303	1230	20.8	2190
Metals, Dissolved											
Arsenic (As),Dissolved (mg/L)	0.005	20	18	90	0.0103	< 0.005	0.007	0.0106	0.013	< 0.005	0.02
Copper (Cu),Dissolved (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn),Dissolved (mg/L)	0.05	20	2	10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.0947
Sodium (Na),Dissolved (mg/L)	0.5	20	20	100	16.3	9.67	8.95	13.9	21	4.53	37.1
Metals, Total											
Mercury (Hg),Total (mg/L)	0.0002	19	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Non-Metallics											
Cyanide, Total (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	20	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	19	19	100	0.578	0.304	0.295	0.403	0.818	0.288	1.27
Nitrogen, Nitrate (NO3) (mg/L)	0.05	20	18	90	0.324	0.229	0.165	0.261	0.459	< 0.05	0.753
Nitrogen, Nitrite (NO2) (mg/L)	0.05	20	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Dissolved (mg/L)	0.005	20	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	20	20	100	128	239	16	61.7	143	< 10	1100

Table E-6. SS-04 Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Physical Properties											
Electrical Conductivity (µmhos/cm)	5	20	20	100	484	406	196	457	646	125	1950
pH (SU)	N/A	20	N/A	N/A	7.4	0.2	7.21	7.49	7.58	6.94	7.66
Total Dissolved Solids (mg/L)	50	20	20	100	315	354	113	264	366	83	1720
Total Suspended Solids (mg/L)	10	20	6	30	22	51	< 10	< 10	14	< 10	233

Table E-7. SS-06 Water-Quality Statistics (Page 1 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	14	N/A	N/A	624	176	430	655	740	367	900
Field ORP (mV)	N/A	1	N/A	N/A	62	0	62	62	62	62	62
Field Oxygen (O2) (mg/L)	N/A	1	N/A	N/A	9.36	0	9.36	9.36	9.36	9.36	9.36
Field pH (SU)	N/A	14	N/A	N/A	8.31	0.18	8.19	8.3	8.35	8.05	8.77
Field Temperature (° C)	N/A	14	N/A	N/A	7.1	4.8	3.5	7.1	9.6	0.1	16.8
Field Flow Rate (gal/min)	N/A	12	N/A	N/A	354	663	26.5	107	319	4	2360
Metals, Dissolved											
Arsenic (As),Dissolved (mg/L)	0.005	1	1	100	0.00866	< 0.005	0.00866	0.00866	0.00866	0.00866	0.00866
Barium (Ba),Dissolved (mg/L)	0.005	1	1	100	0.0707	< 0.005	0.0707	0.0707	0.0707	0.0707	0.0707
Cadmium (Cd),Dissolved (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calcium (Ca),Dissolved (mg/L)	1	19	19	100	79.2	17.1	64.8	84.3	87.2	48.6	111
Chromium (Cr),Dissolved (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (Cu),Dissolved (mg/L)	0.005	1	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Magnesium (Mg),Dissolved (mg/L)	0.5	20	20	100	24.3	5.8	22	25.3	28.8	14.9	32.1
Zinc (Zn),Dissolved (mg/L)	0.05	2	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Metals, Total											
Mercury (Hg),Total (mg/L)	0.0002	18	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002

Table E-7. SS-06 Water-Quality Statistics (Page 2 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Metals, Total Recoverables											
Arsenic (As),Total Recoverable (mg/L)	0.005	19	15	78.9	0.0108	0.0106	0.005	0.00791	0.012	< 0.005	0.0458
Cadmium (Cd),Total Recoverable (mg/L)	0.001	18	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr),Total Recoverable (mg/L)	0.001	18	1	5.56	0.001	< 0.001	< 0.001	< 0.001	0.00227	< 0.001	0.0025
Copper (Cu),Total Recoverable (mg/L)	0.005	19	2	10.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.01
Lead (Pb),Total Recoverable (mg/L)	0.001	20	4	20	0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.00714
Nickel (Ni),Total Recoverable (mg/L)	0.005	18	2	11.1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Silver (Ag),Total Recoverable (mg/L)	0.001	20	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc (Zn),Total Recoverable (mg/L)	0.05	18	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Non-Metallics											
Bicarbonate (mg/L)	10	1	1	100	148	< 10	148	148	148	148	148
Chloride (Cl-) (mg/L)	0.5	1	1	100	2.75	< 0.5	2.75	2.75	2.75	2.75	2.75
Cyanide, Total (mg/L)	0.01	1	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	1	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	2	2	100	0.31	< 0.05	0.31	0.31	0.31	0.31	0.31
Nitrogen, Nitrate (NO3) (mg/L)	0.05	20	20	100	2.68	0.7	2.15	2.58	3.22	1.7	4.05
Nitrogen, Nitrite (NO2) (mg/L)	0.05	18	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Dissolved (mg/L)	0.005	2	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table E-7. SS-06 Water-Quality Statistics (Page 3 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Selenium (Se),Total Recoverable (mg/L)	0.005	18	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	20	20	100	177	65	122	187	222	72.2	277
Physical Properties											
Hardness (mg/L)	N/A	20	N/A	N/A	275	55	240	291	312	183	343
pH (SU)	N/A	18	N/A	N/A	8.06	0.1	7.97	8.05	8.09	7.95	8.26
Total Dissolved Solids (mg/L)	50	20	20	100	386	63	352	403	430	274	464
Total Suspended Solids (mg/L)	10	18	2	11.1	< 10	< 10	< 10	< 10	< 10	< 10	17

Table E-8. SS-12 Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	15	N/A	N/A	597	427	223	580	905	109	1460
Field ORP (mV)	N/A	1	N/A	N/A	39	0	39	39	39	39	39
Field Oxygen (O2) (mg/L)	N/A	1	N/A	N/A	6.8	0	6.8	6.8	6.8	6.8	6.8
Field pH (SU)	N/A	15	N/A	N/A	7.9	0.14	7.79	7.93	8.01	7.66	8.06
Field Temperature (° C)	N/A	15	N/A	N/A	8.2	5.8	6	7.4	10	-0.3	19.9
Field Flow Rate (gal/min)	N/A	12	N/A	N/A	850	1798	33	240	644	2.1	6380
Metals, Dissolved											
Arsenic (As),Dissolved (mg/L)	0.005	19	19	100	0.00887	< 0.005	0.006	0.00861	0.0098	0.005	0.022
Copper (Cu),Dissolved (mg/L)	0.005	19	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn),Dissolved (mg/L)	0.05	19	2	10.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.1
Sodium (Na),Dissolved (mg/L)	0.5	19	19	100	5.21	2.72	2.78	5.63	7.48	1.91	10.4
Metals, Total											
Mercury (Hg),Total (mg/L)	0.0002	19	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Non-Metallics											
Cyanide, Total (mg/L)	0.01	19	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	19	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	19	19	100	0.161	< 0.05	0.152	0.158	0.167	0.127	0.203
Nitrogen, Nitrate (NO3) (mg/L)	0.05	19	19	100	5.14	4.55	1.15	3.93	7.92	0.46	16.4
Nitrogen, Nitrite (NO2) (mg/L)	0.05	19	1	5.26	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.123
Selenium (Se),Dissolved (mg/L)	0.005	19	1	5.26	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Sulfate (SO4) (mg/L)	10	19	19	100	220	179	46.6	182	360	16.9	626

Table E-8. SS-12 Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Physical Properties											
Electrical Conductivity (µmhos/cm)	5	19	19	100	664	428	222	636	1043	158	1520
pH (SU)	N/A	19	N/A	N/A	7.74	0.17	7.58	7.71	7.89	7.52	7.99
Total Dissolved Solids (mg/L)	50	19	19	100	474	322	156	434	759	109	1160
Total Suspended Solids (mg/L)	10	19	9	47.4	41	113	< 10	11	17	< 10	500
Radionuclides											
Gross Alpha (pCi/L)	N/A	1	N/A	N/A	5.1	0	5.1	5.1	5.1	5.1	5.1
Radium-226 (pCi/L)	N/A	1	N/A	N/A	0.3	0	0.3	0.3	0.3	0.3	0.3
Radium-228 (pCi/L)	N/A	1	N/A	N/A	0.6	0	0.6	0.6	0.6	0.6	0.6

Table E-9. SS-14A Water-Quality Statistics (Page 1 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	2	N/A	N/A	815	120	730	815	900	730	900
Field pH (SU)	N/A	2	N/A	N/A	7.89	0.45	7.57	7.89	8.21	7.57	8.21
Field Temperature (° C)	N/A	2	N/A	N/A	5.1	0.6	4.7	5.1	5.5	4.7	5.5
Field Flow Rate (gal/min)	N/A	2	N/A	N/A	0.92	0.11	0.84	0.92	1	0.84	1
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	1	1	100	79.1	< 1	79.1	79.1	79.1	79.1	79.1
Magnesium (Mg),Dissolved (mg/L)	0.5	1	1	100	37.6	< 0.5	37.6	37.6	37.6	37.6	37.6
Metals, Total											
Mercury (Hg),Total (mg/L)	0.0002	1	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Metals, Total Recoverable											
Arsenic (As),Total Recoverable (mg/L)	0.005	1	1	100	0.006	< 0.005	0.006	0.006	0.006	0.006	0.006
Cadmium (Cd),Total Recoverable (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr),Total Recoverable (mg/L)	0.001	1	0	0	0.0025	< 0.001	0.0025	0.0025	0.0025	0.0025	0.0025
Copper (Cu),Total Recoverable (mg/L)	0.005	1	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Lead (Pb),Total Recoverable (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel (Ni),Total Recoverable (mg/L)	0.005	1	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silver (Ag),Total Recoverable (mg/L)	0.001	1	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc (Zn),Total Recoverable (mg/L)	0.05	1	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Table E-9. SS-14A Water-Quality Statistics (Page 2 of 2)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Nonmetallics											
Nitrogen, Nitrate (NO3) (mg/L)	0.05	1	1	100	4.99	< 0.05	4.99	4.99	4.99	4.99	4.99
Nitrogen, Nitrite (NO2) (mg/L)	0.05	1	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Selenium (Se),Total Recoverable (mg/L)	0.005	1	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate (SO4) (mg/L)	10	1	1	100	250	< 10	250	250	250	250	250
Physical Properties											
Hardness (mg/L)	N/A	1	N/A	N/A	352	0	352	352	352	352	352
pH (SU)	N/A	2	N/A	N/A	7.93	0.06	7.88	7.93	7.97	7.88	7.97
Total Dissolved Solids (mg/L)	50	2	2	100	540	< 50	516	540	563	516	563
Total Suspended Solids (mg/L)	10	2	0	0	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Radionuclides											
Gross Alpha (pCi/L)	N/A	1	N/A	N/A	9.9	0	9.9	9.9	9.9	9.9	9.9
Radium-226 (pCi/L)	N/A	1	N/A	N/A	0.5	0	0.5	0.5	0.5	0.5	0.5
Radium-228 (pCi/L)	N/A	1	N/A	N/A	0.6	0	0.6	0.6	0.6	0.6	0.6

Table E-10. SS-20 Water-Quality Statistics (Page 1 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Field											
Field Conductivity (µmhos/cm)	N/A	6	N/A	N/A	318	200	182	206	550	164	600
Field ORP (mV)	N/A	2	N/A	N/A	104	17	92	104	116	92	116
Field Oxygen (O2) (mg/L)	N/A	2	N/A	N/A	7.81	1.03	7.08	7.81	8.54	7.08	8.54
Field pH (SU)	N/A	6	N/A	N/A	7.48	0.5	6.92	7.57	7.8	6.9	8.12
Field Temperature (° C)	N/A	6	N/A	N/A	6	2.7	4.8	5.3	7.6	2.6	10.3
Field Flow Rate (gal/min)	N/A	6	N/A	N/A	40	51	2	14	95	0.14	113
Metals, Dissolved											
Calcium (Ca),Dissolved (mg/L)	1	8	8	100	30.2	8.9	24.6	27.2	39	17.5	43
Magnesium (Mg),Dissolved (mg/L)	0.5	8	8	100	6.63	1.98	4.97	5.93	8.59	4.66	9.45
Potassium (K),Dissolved (mg/L)	0.5	7	7	100	2.03	< 0.5	1.88	1.97	2.19	1.74	2.45
Sodium (Na),Dissolved (mg/L)	0.5	7	7	100	36.2	11.8	27.3	30.6	43.6	24.1	57.1
Metals, Total											
Aluminum (Al),Total (mg/L)	0.01	8	8	100	0.962	1.18	0.172	0.571	1.27	0.0598	3.6
Antimony (Sb),Total (mg/L)	0.005	8	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Arsenic (As),Total (mg/L)	0.005	8	8	100	0.0189	0.0129	0.0113	0.016	0.0208	0.00678	0.0483
Barium (Ba),Total (mg/L)	0.005	8	8	100	0.417	0.21	0.231	0.4	0.561	0.178	0.774
Beryllium (Be),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr),Total (mg/L)	0.001	8	4	50	0.0016	0.00205	< 0.001	< 0.001	0.0015	< 0.001	0.00653
Cobalt (Co),Total (mg/L)	0.001	8	1	12.5	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.00211
Copper (Cu),Total (mg/L)	0.005	8	1	12.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00703
Gold (Au),Total (mg/L)	0.001	8	3	37.5	0.001	0.002	< 0.001	< 0.001	0.002	< 0.001	0.005
Iron (Fe),Total (mg/L)	0.05	8	7	87.5	0.796	1.283	0.134	0.339	0.753	< 0.05	3.89

Table E-10. SS-20 Water-Quality Statistics (Page 2 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Lead (Pb),Total (mg/L)	0.001	8	1	12.5	0.0013	0.0022	< 0.001	< 0.001	< 0.001	< 0.001	0.00676
Lithium (Li),Total (mg/L)	0.02	6	5	83.3	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.044
Manganese (Mn),Total (mg/L)	0.01	8	2	25	0.026	0.056	< 0.01	< 0.01	< 0.01	< 0.01	0.164
Mercury (Hg),Total (mg/L)	0.0002	8	0	0	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum (Mo),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel (Ni),Total (mg/L)	0.005	8	1	12.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00817
Silver (Ag),Total (mg/L)	0.001	8	0	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Strontium (Sr),Total (mg/L)	0.001	8	8	100	0.133	0.0366	0.0996	0.128	0.16	0.0938	0.193
Vanadium (V),Total (mg/L)	0.005	8	1	12.5	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.00944
Zinc (Zn),Total (mg/L)	0.05	8	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Non-Metallics											
Bicarbonate (mg/L)	10	8	8	100	75.7	17	61.5	74.7	89	55	101
Boron (B),Total (mg/L)	0.02	8	4	50	0.0221	< 0.02	< 0.02	< 0.02	0.035	< 0.02	0.0467
Carbonate (mg/L)	5	8	0	0	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride (Cl-) (mg/L)	0.5	8	8	100	80	41.8	45.7	64	121	39.2	140
Cyanide, Free (mg/L)	0.02	8	0	0	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Cyanide, Total (mg/L)	0.01	8	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide, WAD (mg/L)	0.01	8	0	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	0.05	8	8	100	0.306	0.07	0.258	0.287	0.359	0.225	0.418
Nitrogen, Ammonia (NH3) (mg/L)	0.05	8	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.05	8	8	100	1.07	0.624	0.553	0.9	1.41	0.521	2.28
Nitrogen, Nitrite (NO2) (mg/L)	0.05	8	0	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Table E-10. SS-20 Water-Quality Statistics (Page 3 of 3)

Constituent	PQL	*n* Analyzed	*n* Detected	% Detected	Mean	StDev	Q1	Median	Q3	Minimum	Maximum
Selenium (Se),Total (mg/L)	0.005	8	0	0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silicon (Si),Total (mg/L)	1	8	8	100	7.6	2.47	6.23	7.78	8.9	3.42	11.6
Sulfate (SO4) (mg/L)	10	8	1	12.5	< 10	< 10	< 10	< 10	< 10	< 10	10.6
Physical Properties											
Alkalinity (mg/L)	10	8	8	100	62	13.9	50.4	61.3	73	45.1	82.9
Anion - Cation Balance (%)	N/A	7	N/A	N/A	2.11	3.39	0.749	2.35	4.64	-4.34	5.58
Anions (meq/L)	N/A	7	N/A	N/A	3.48	1.23	2.53	2.7	4.67	2.48	5.34
Cations (meq/L)	N/A	7	N/A	N/A	3.6	1.05	2.77	3.02	4.6	2.61	5.12
Electrical Conductivity (µmhos/cm)	5	8	8	100	401	121	295	359	518	288	575
Hardness (mg/L)	N/A	8	N/A	N/A	102.6	30.2	81.8	92.2	133	62.9	145
pH (SU)	N/A	8	N/A	N/A	7.34	0.25	7.09	7.43	7.51	7.02	7.68
Total Dissolved Solids (mg/L)	50	8	8	100	223	65	173	191	272	170	341
Total Suspended Solids (mg/L)	10	8	1	12.5	17	33	< 10	< 10	< 10	< 10	99
Turbidity (NTU)	0.2	8	8	100	11	16	2.3	5.3	11	0.6	50

APPENDIX F

BOXPLOTS

RSI-1924-10-048

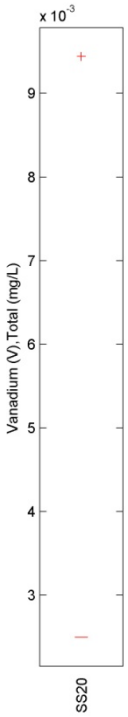

Figure F-1. Boxplot of Vanadium.

RSI-1924-10-049

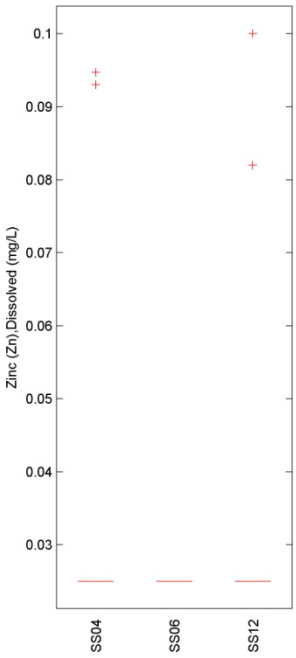

Figure F-2. Boxplot of Dissolved Zinc.

RSI-1924-10-050

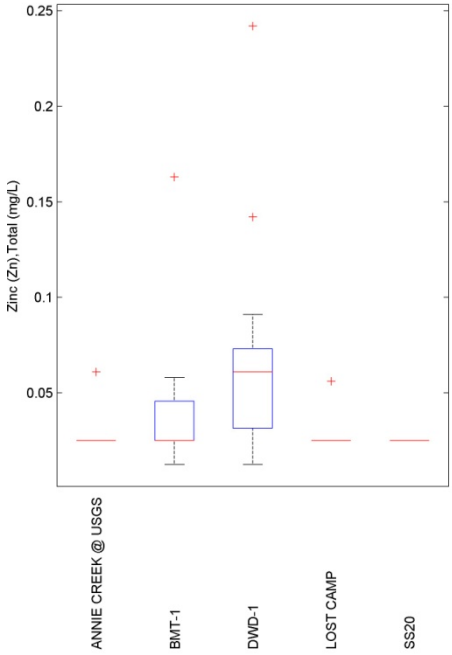

Figure F-3. Boxplot of Total Zinc.

RSI-1924-10-051

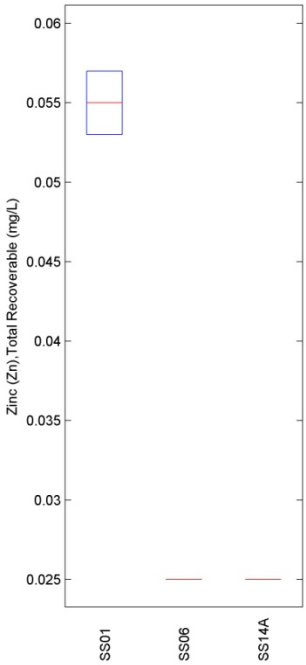

Figure F-4. Boxplot of Total Recoverable Zinc.

RSI-1924-10-052

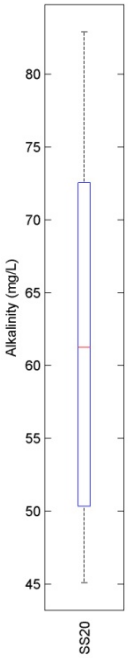

Figure F-5. Boxplot of Alkalinity.

RSI-1924-10-053

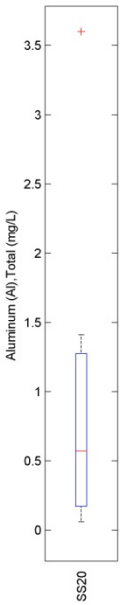

Figure F-6. Boxplot of Aluminum.

RSI-1924-10-054

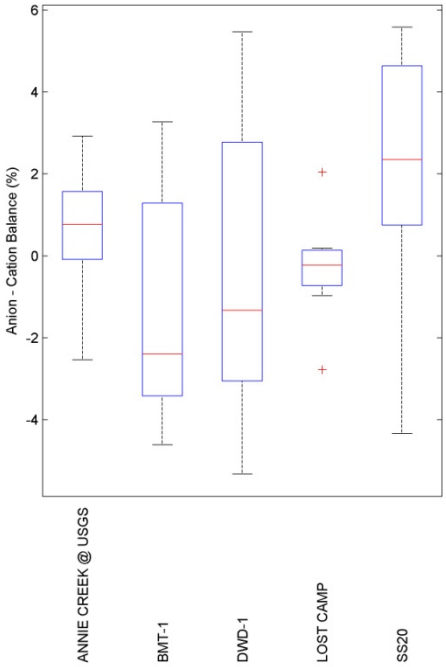

Figure F-7. Boxplot of Anion-Cation Balance.

RSI-1924-10-055

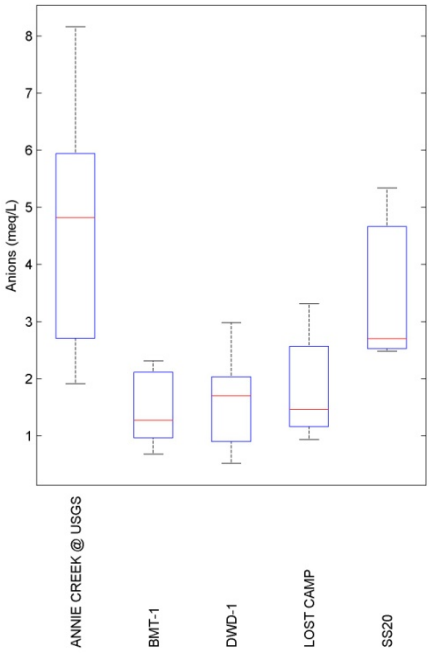

Figure F-8. Boxplot of Anions.

RSI-1924-10-056

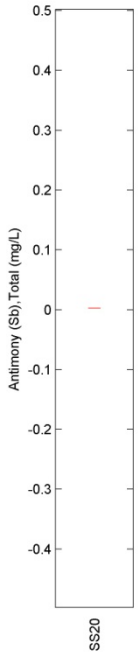

Figure F-9. Boxplot of Total Atimony.

RSI-1924-10-057

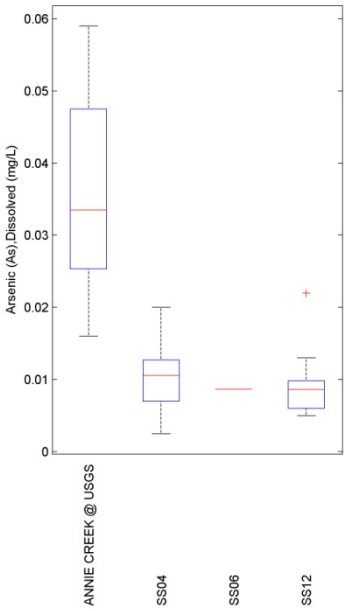

Figure F-10. Boxplot of Dissolved Arsenic.

RSI-1924-10-058

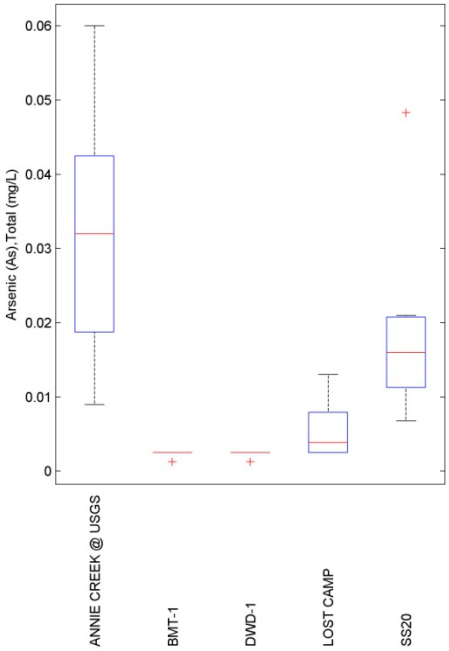

Figure F-11. Boxplot of Total Arsenic.

RSI-1924-10-059

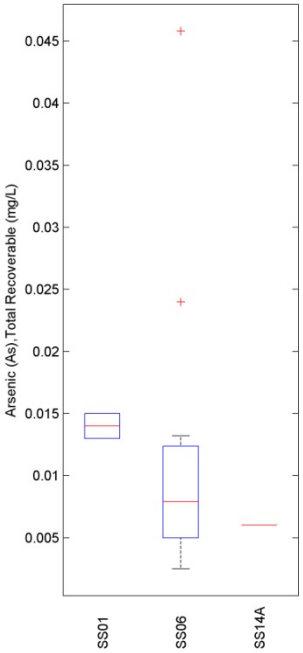

Figure F-12. Boxplot of Total Recoverable Arsenic.

RSI-1924-10-060

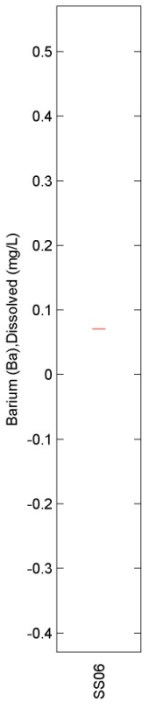

Figure F-13. Boxplot of Dissolve Barium.

RSI-1924-10-061

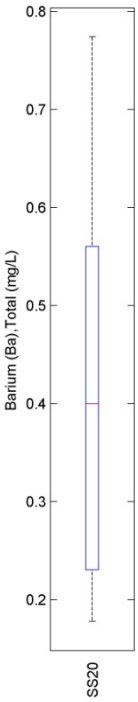

Figure F-14. Boxplot of Total Barium.

RSI-1924-10-062

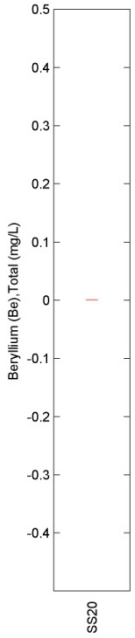

Figure F-15. Boxplot of Total Beryllium.

RSI-1924-10-063

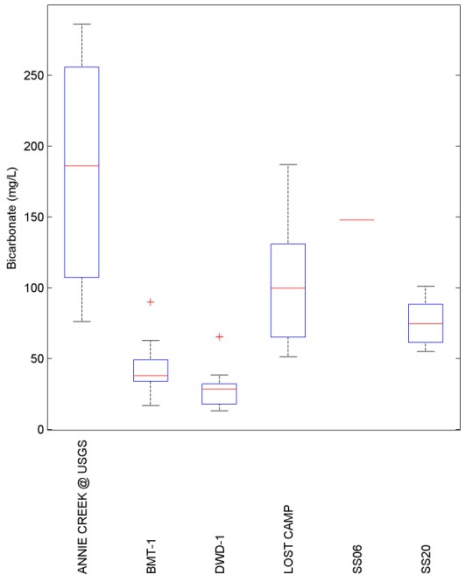

Figure F-16. Boxplot of Bicarbonate.

RSI-1924-10-064

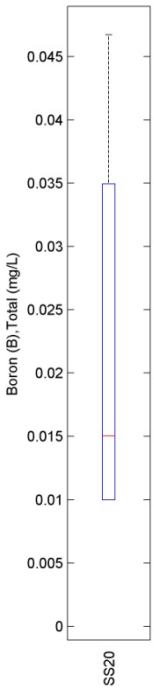

Figure F-17. Boxplot of Boron.

RSI-1924-10-065

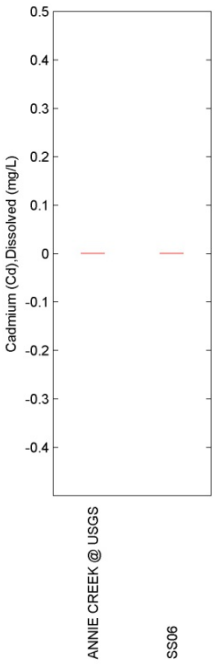

Figure F-18. Boxplot of Dissolved Cadmium.

RSI-1924-10-066

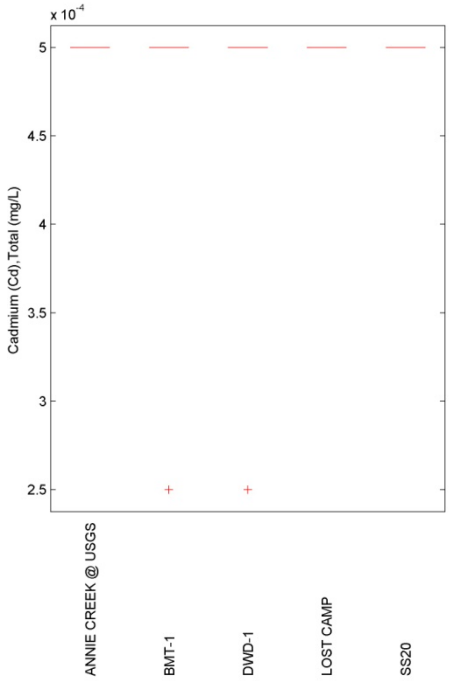

Figure F-19. Boxplot of Total Cadmium.

RSI-1924-10-067

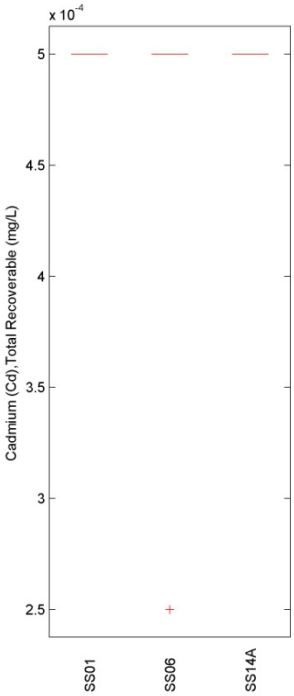

Figure F-20. Boxplot of Total Recoverable Cadmium.

RSI-1924-10-068

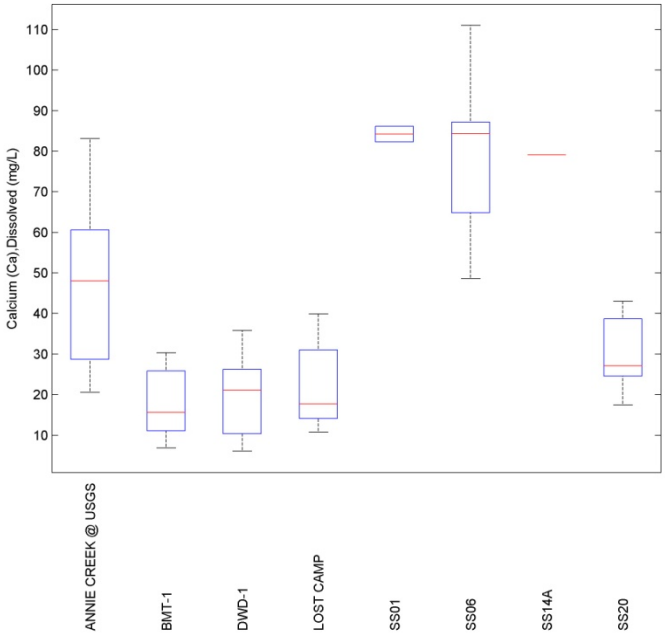

Figure F-21. Boxplot of Dissolved Calcium.

RSI-1924-10-069

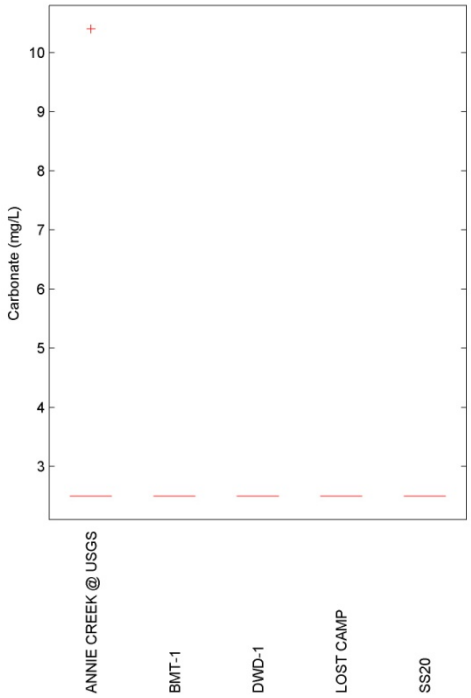

Figure F-22. Boxplot of Carbonate.

RSI-1924-10-070

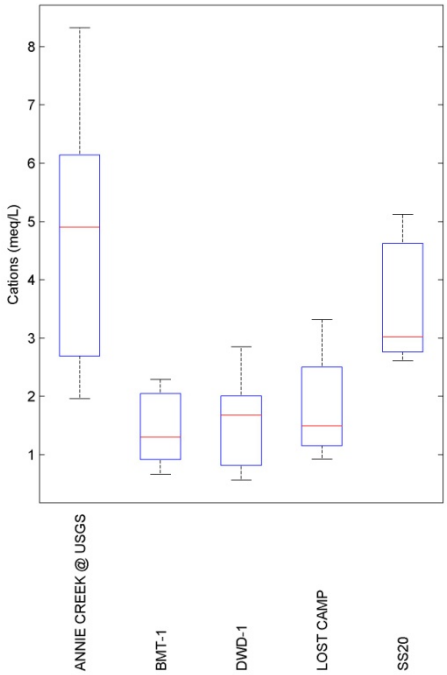

Figure F-23. Boxplot of Cations.

RSI-1924-10-071

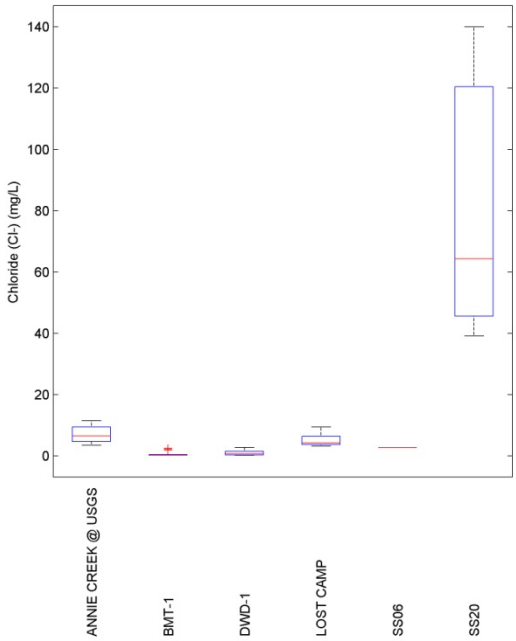

Figure F-24. Boxplot of Chloride.

RSI-1924-10-072

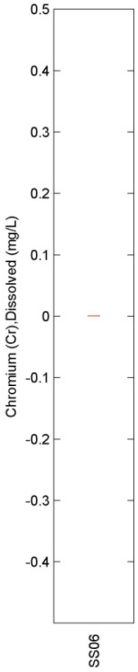

Figure F-25. Boxplot of Dissolved Chromium.

RSI-1924-10-073

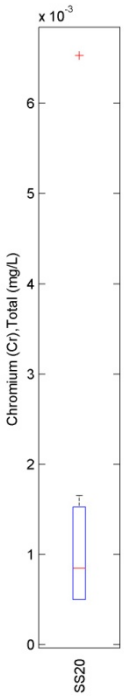

Figure F-26. Boxplot of Total Chromium.

RSI-1924-10-074

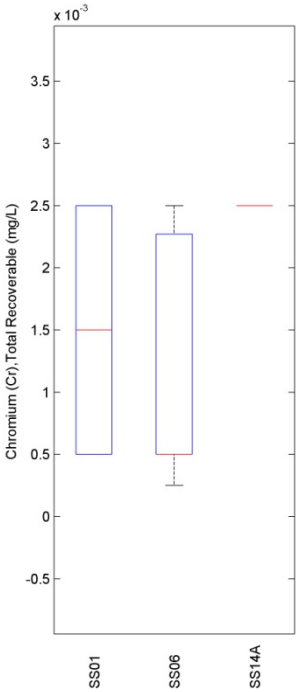

Figure F-27. Boxplot of Total Recoverable Chromium.

RSI-1924-10-075

Figure F-28. Boxplot of Total Cobalt.

RSI-1924-10-076

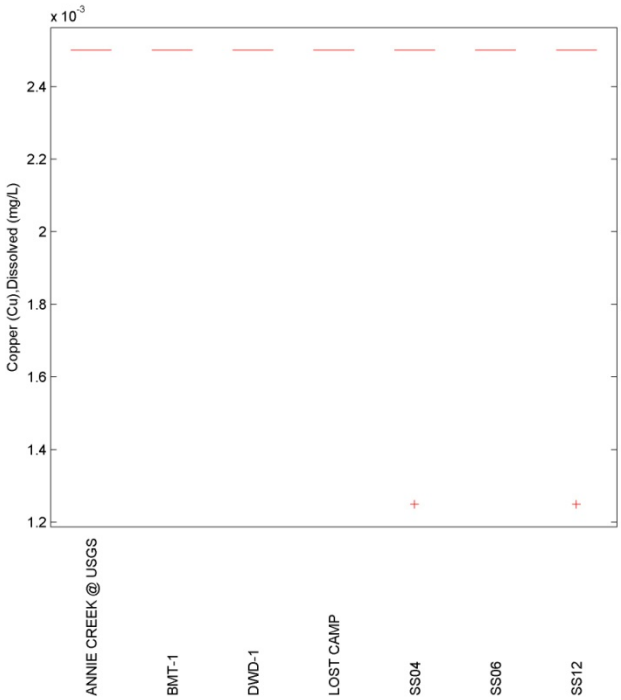

Figure F-29. Boxplot of Dissolved Copper.

RSI-1924-10-077

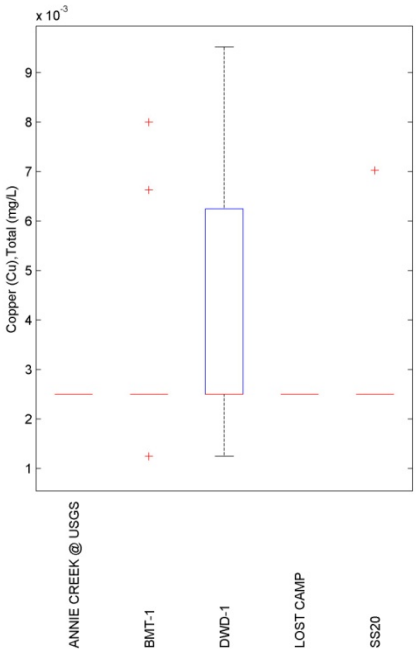

Figure F-30. Boxplot of Total Copper.

RSI-1924-10-078

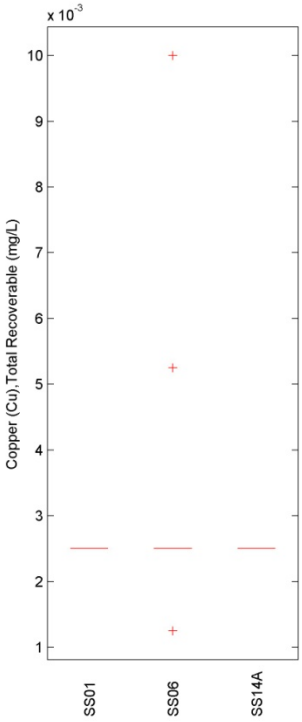

Figure F-31. Boxplot of Total Recoverable Copper.

RSI-1924-10-079

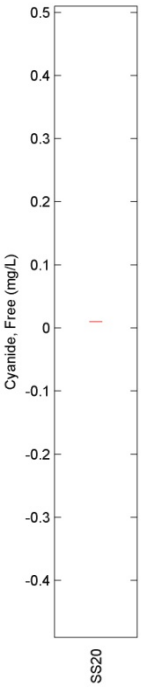

Figure F-32. Boxplot of Free Cyanide.

RSI-1924-10-080

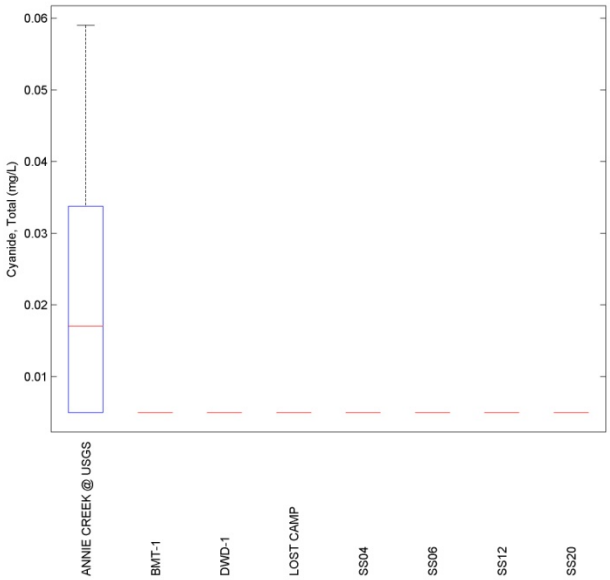

Figure F-33. Boxplot of Total Cyanide.

RSI-1924-10-081

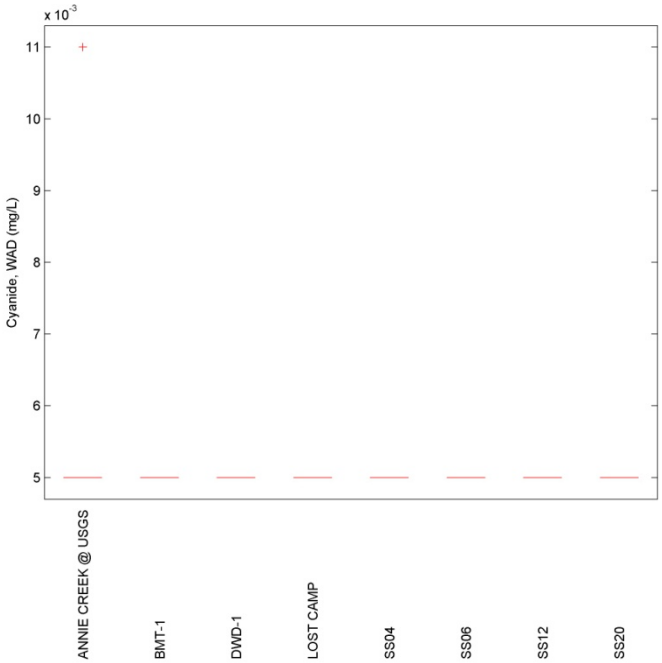

Figure F-34. Boxplot of Cyanide.

RSI-1924-10-082

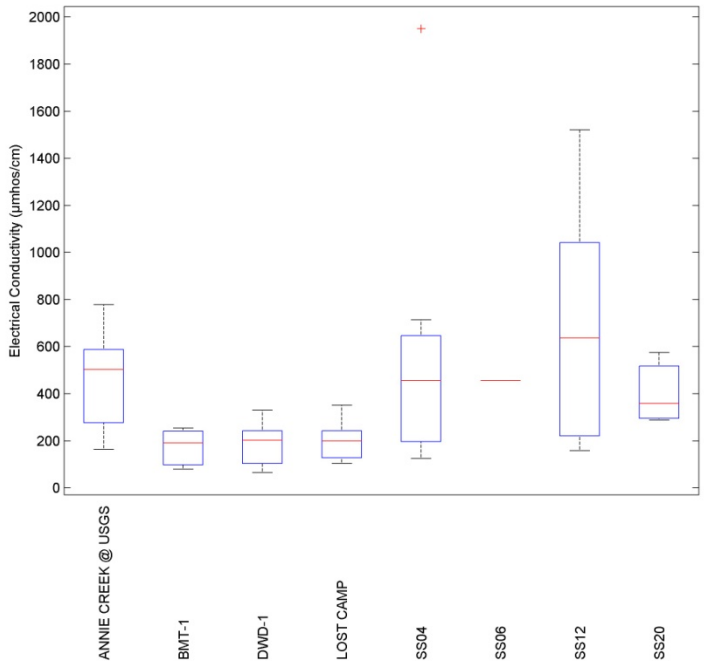

Figure F-35. Boxplot of Electrical Conductivity.

RSI-1924-10-083

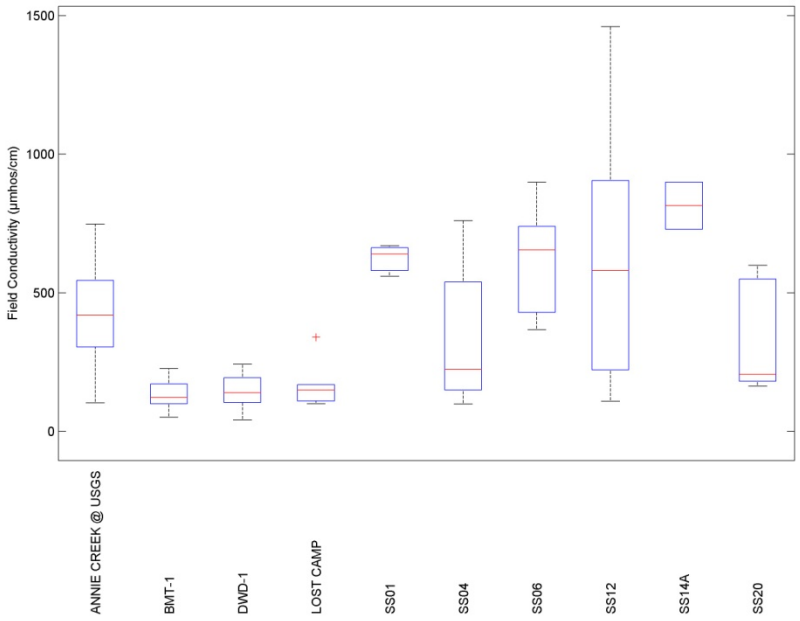

Figure F-36. Boxplot of Field Conductivity.

RSI-1924-10-084

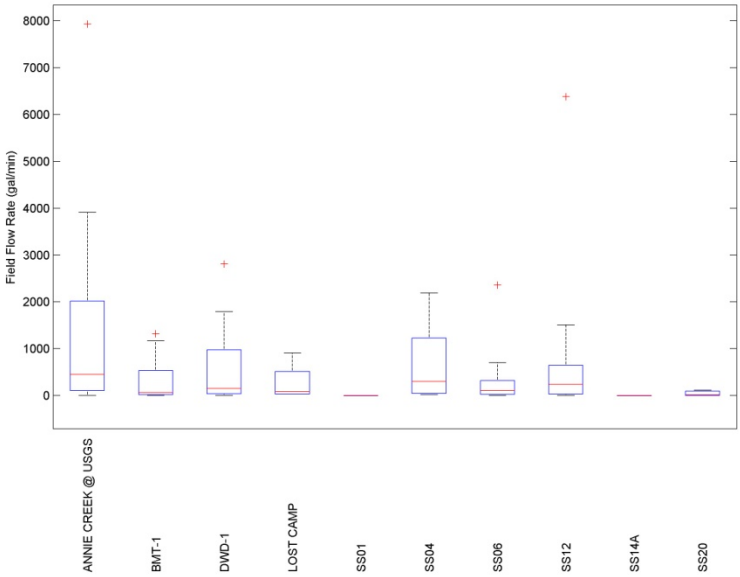

Figure F-37. Boxplot of Field Flow Rate.

RSI-1924-10-085

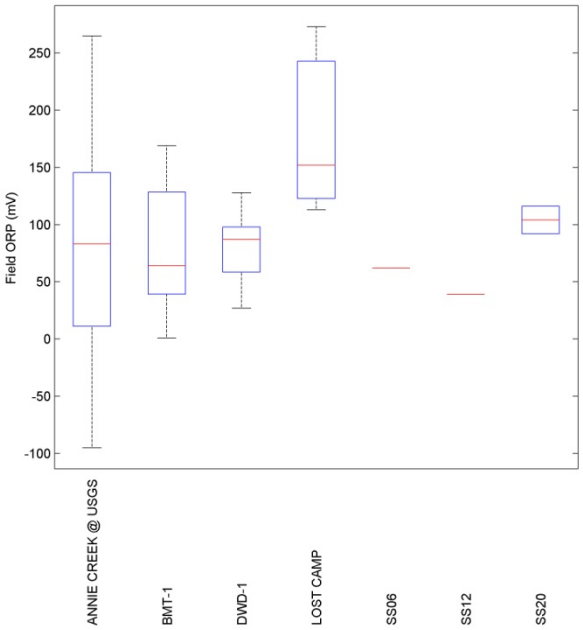

Figure F-38. Boxplot of Field ORP.

RSI-1924-10-086

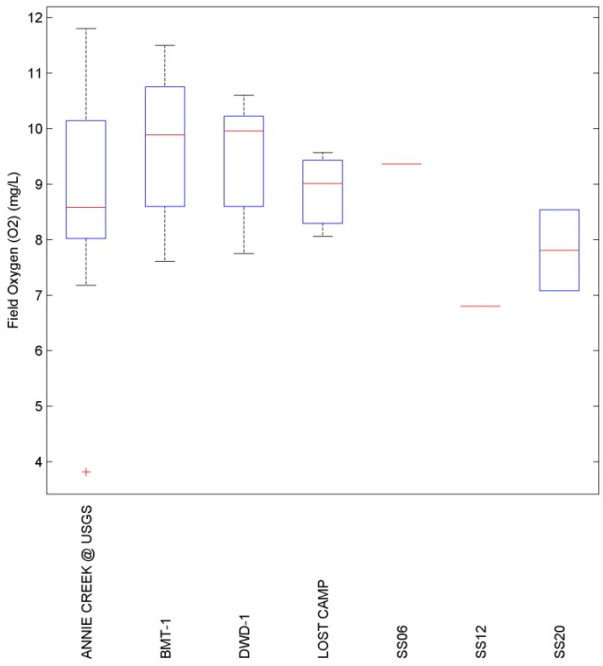

Figure F-39. Boxplot of Field Oxygen.

RSI-1924-10-087

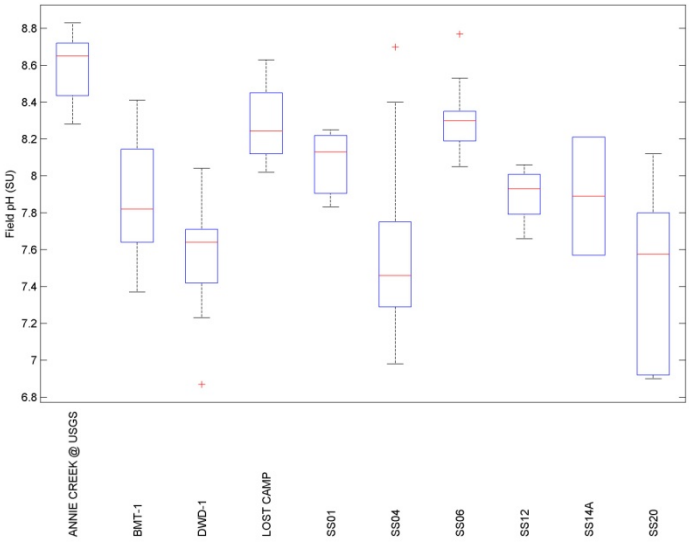

Figure F-40. Boxplot of Field pH.

RSI-1924-10-088

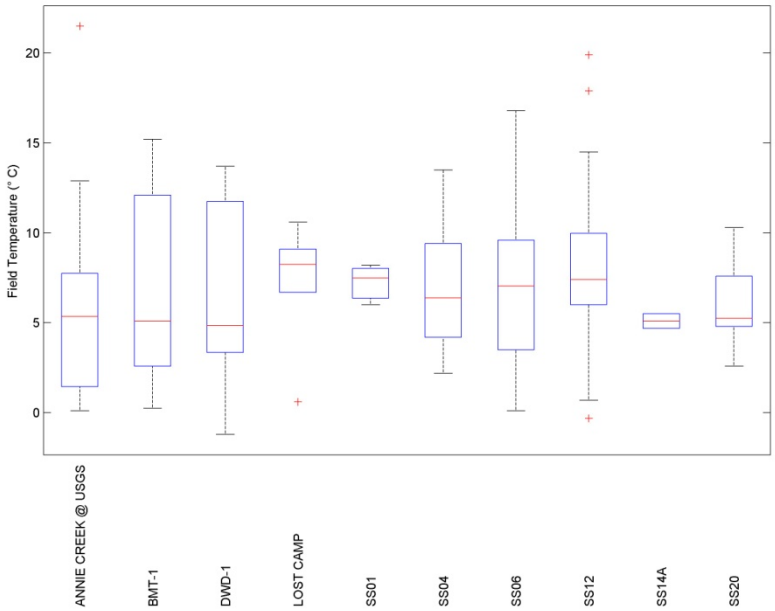

Figure F-41. Boxplot of Field Temperature.

RSI-1924-10-089

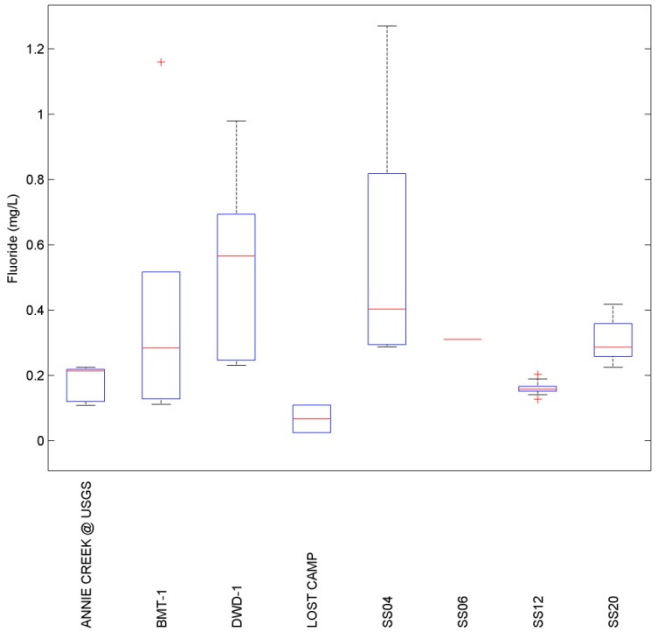

Figure F-42. Boxplot of Fluoride.

RSI-1924-10-090

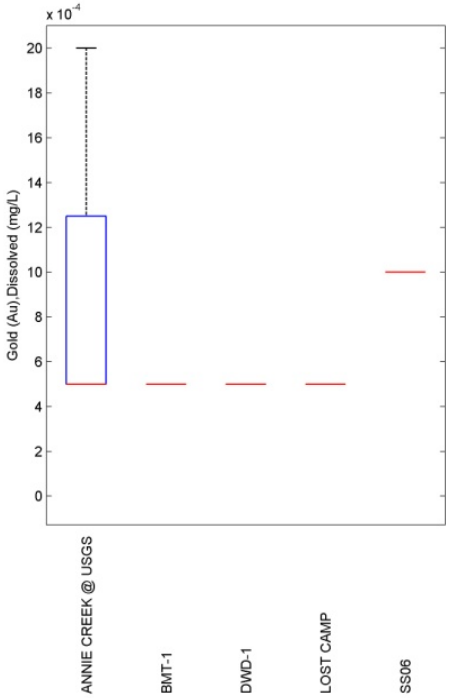

Figure F-43. Boxplot of Dissolved Gold.

RSI-1924-10-091

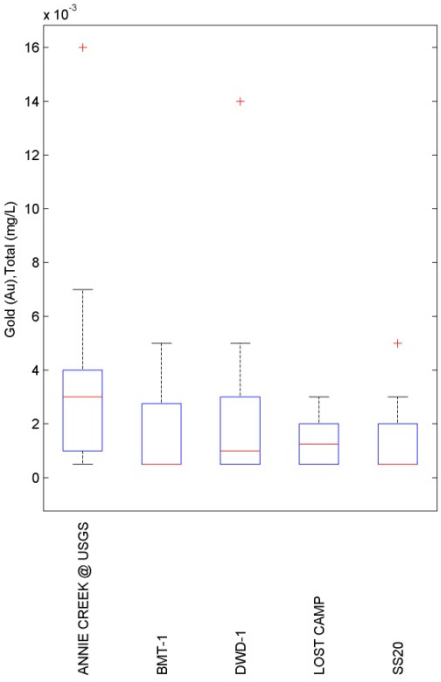

Figure F-44. Boxplot of Gold.

RSI-1924-10-092

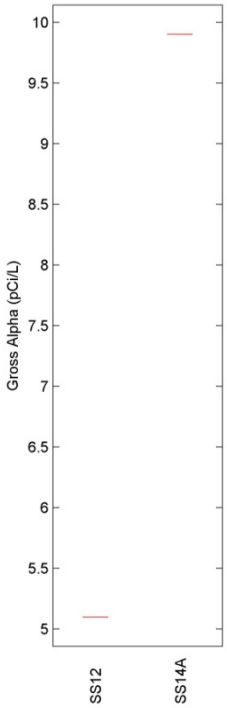

Figure F-45. Boxplot of Gross Alpha.

RSI-1924-10-093

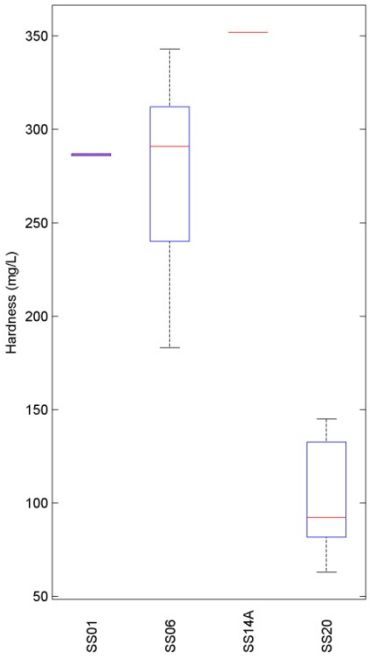

Figure F-46. Boxplot of Hardness.

RSI-1924-10-094

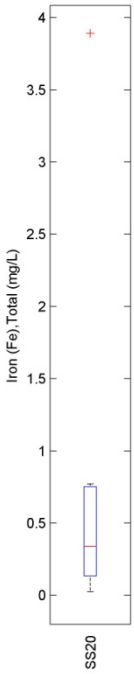

Figure F-47. Boxplot of Total Iron.

RSI-1924-10-095

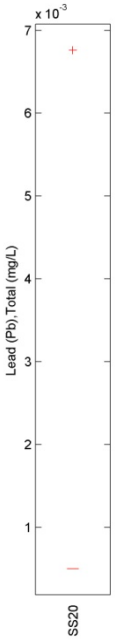

Figure F-48. Boxplot of Total Lead.

RSI-1924-10-096

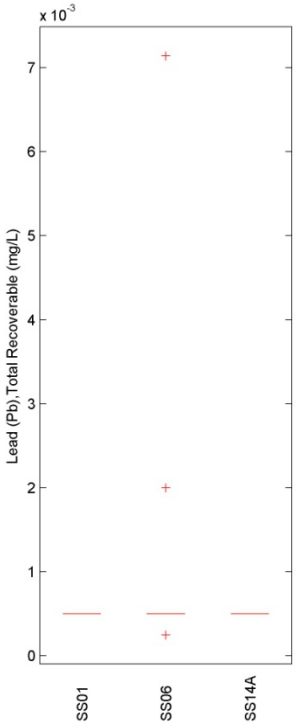

Figure F-49. Boxplot of Total Recoverable Lead.

RSI-1924-10-097

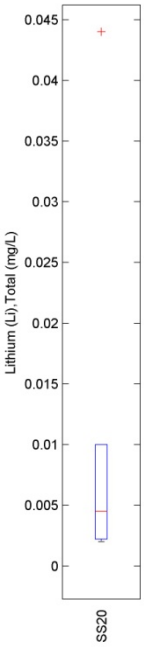

Figure F-50. Boxplot of Total Lithium.

RSI-1924-10-098

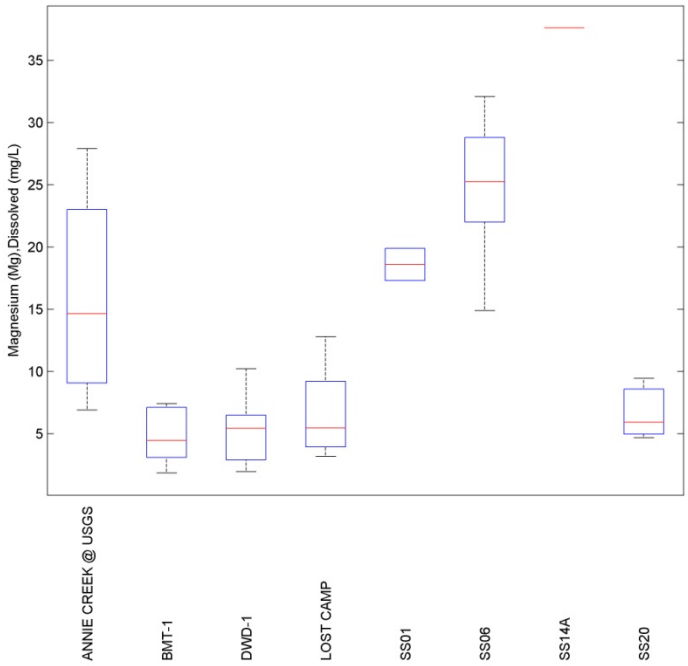

Figure F-51. Boxplot of Dissolved Magnesium.

RSI-1924-10-099

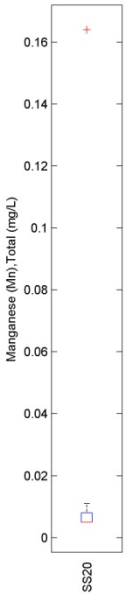

Figure F-52. Boxplot of Total Manganese.

RSI-1924-10-100

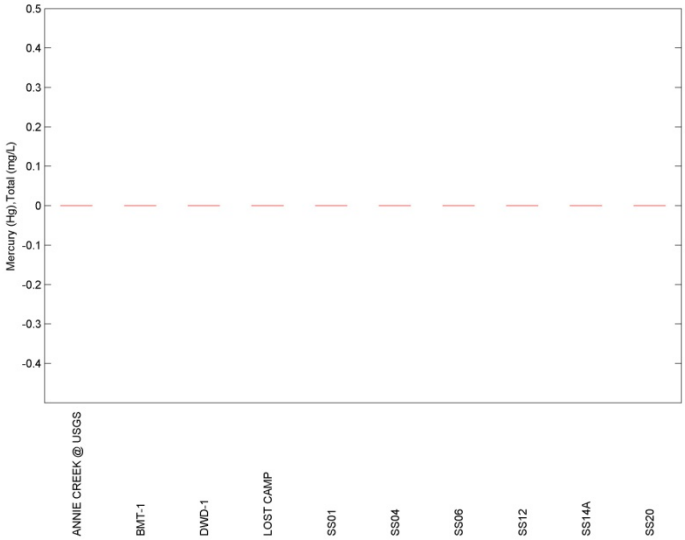

Figure F-53. Boxplot of Total Mercury.

RSI-1924-10-101

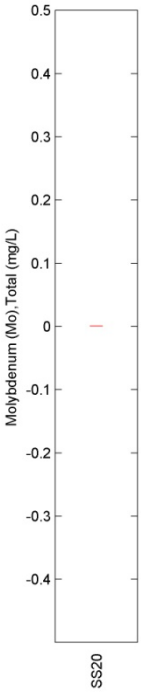

Figure F-54. Boxplot of Molybdenum.

RSI-1924-10-102

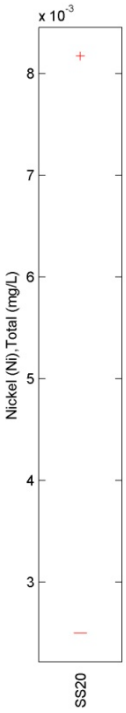

Figure F-55. Boxplot of Total Nickel.

RSI-1924-10-103

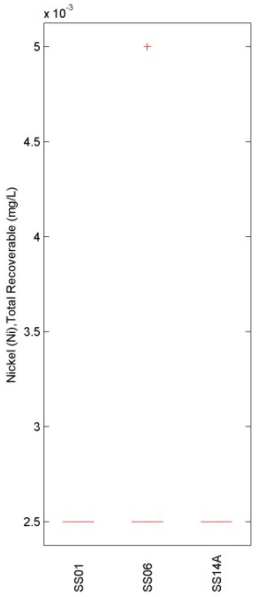

Figure F-56. Boxplot of Total Recoverable Nickel.

RSI-1924-10-104

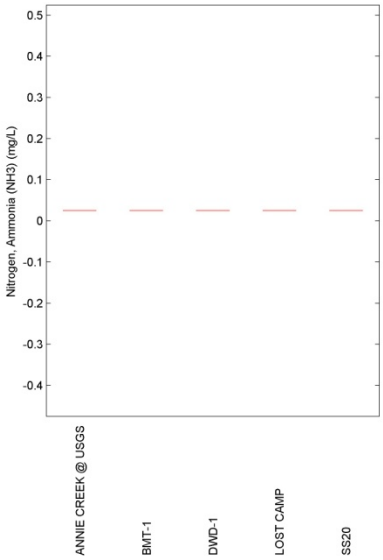

Figure F-57. Boxplot of Nitrogen, Ammonia.

RSI-1924-10-105

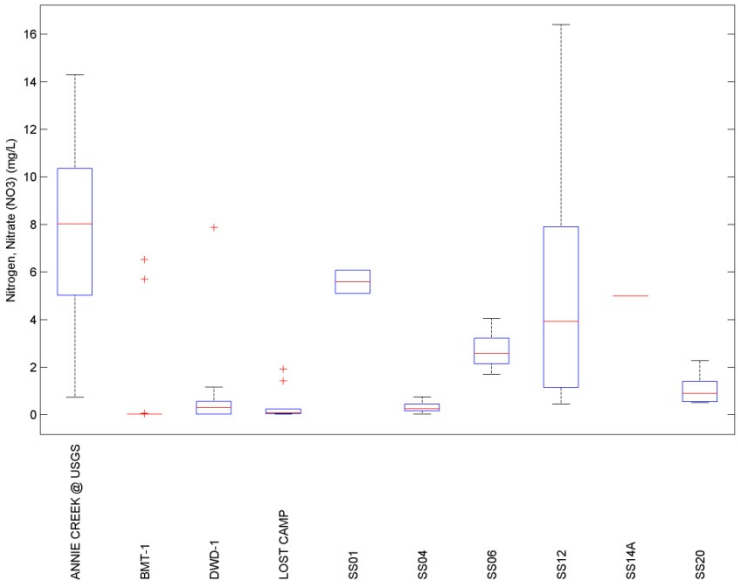

Figure F-58. Boxplot of Nitrogen, Nitrate.

RSI-1924-10-106

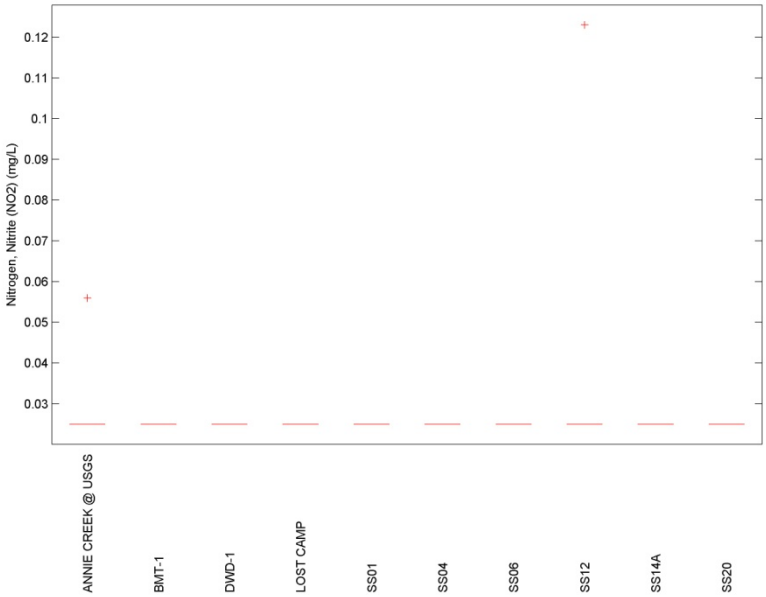

Figure F-59. Boxplot of Nitrogen, Nitrate.

RSI-1924-10-107

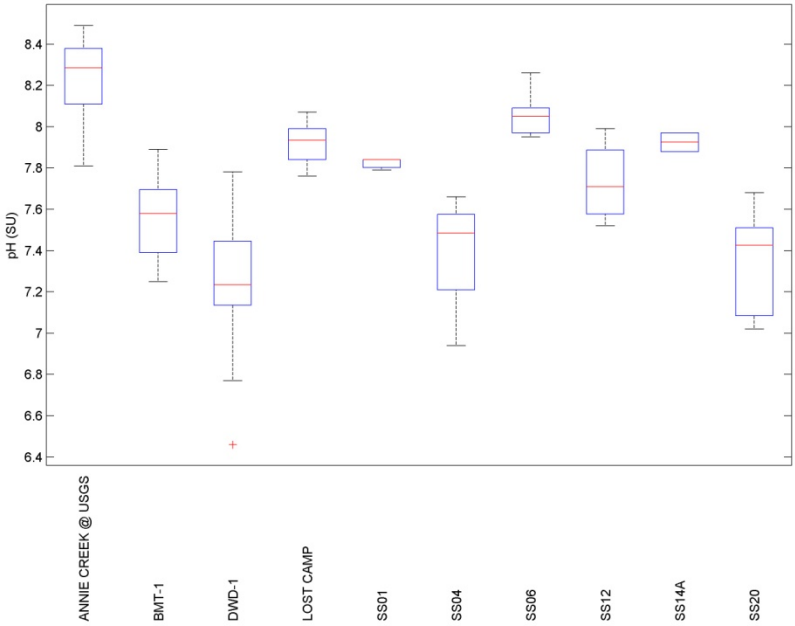

Figure F-60. Boxplot of pH.

RSI-1924-10-108

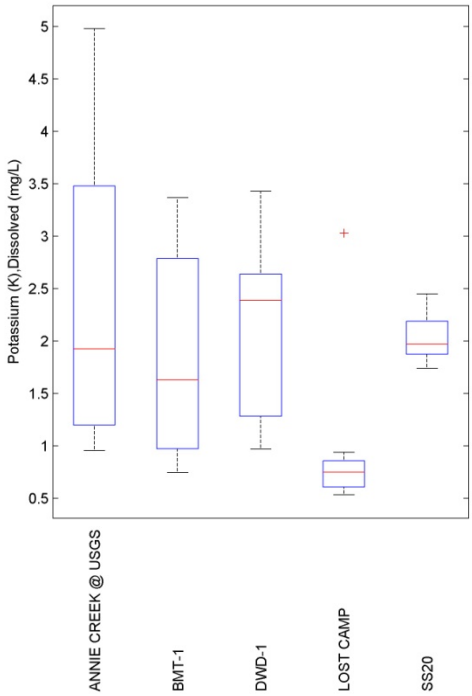

Figure F-61. Boxplot of Dissolved Potassium.

RSI-1924-10-109

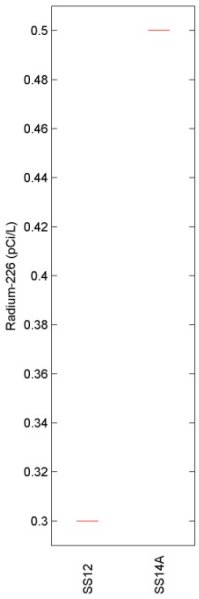

Figure F-62. Boxplot of Radium-226.

RSI-1924-10-110

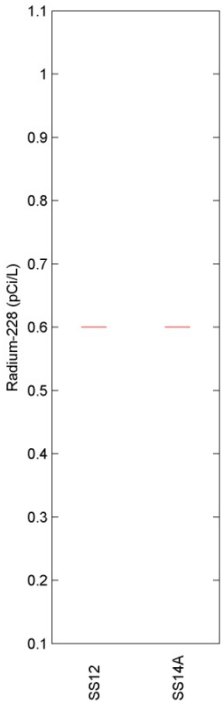

Figure F-63. Boxplot of Radium-228.

RSI-1924-10-111

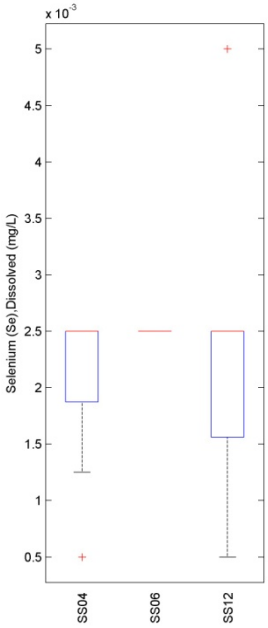

Figure F-64. Boxplot of Dissolved Selenium.

RSI-1924-10-112

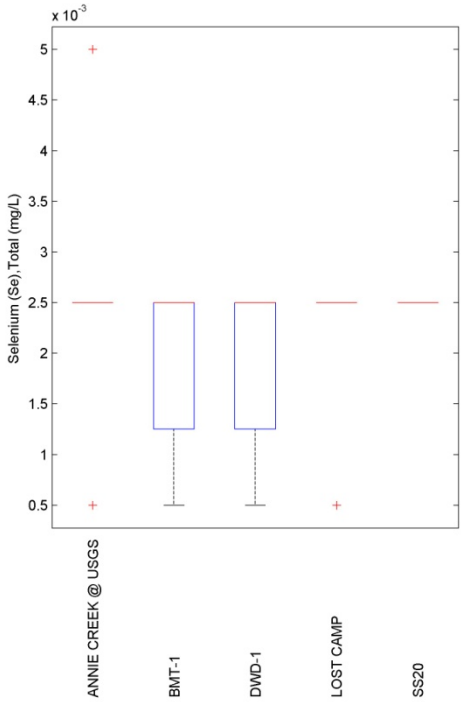

Figure F-65. Boxplot of Total Selenium.

RSI-1924-10-113

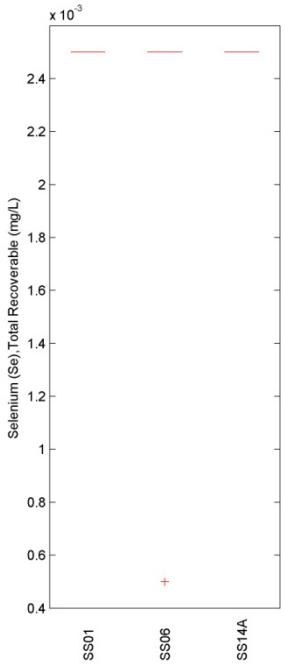

Figure F-66. Boxplot of Total Recoverable Selenium.

RSI-1924-10-114

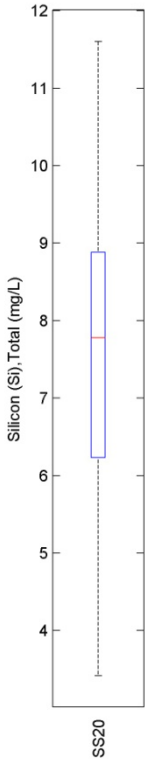

Figure F-67. Boxplot of Silicon.

RSI-1924-10-115

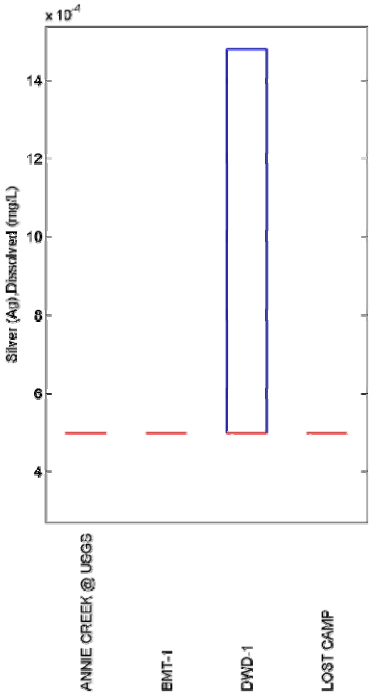

Figure F-68. Boxplot of Silver.

RSI-1924-10-116

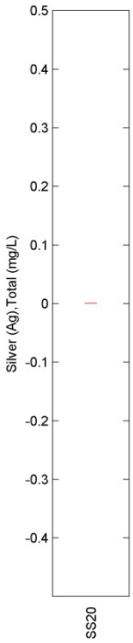

Figure F-69. Boxplot of Total Silver.

RSI-1924-10-117

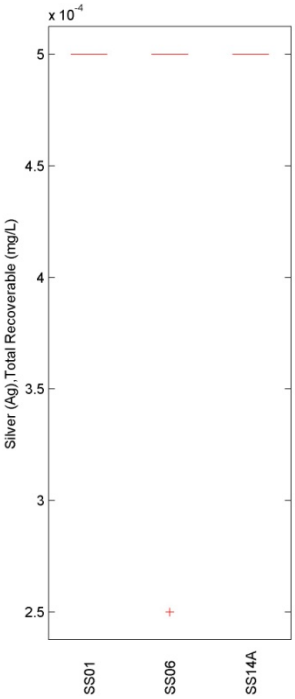

Figure F-70. Boxplot of Total Recoverable Silver.

RSI-1924-10-118

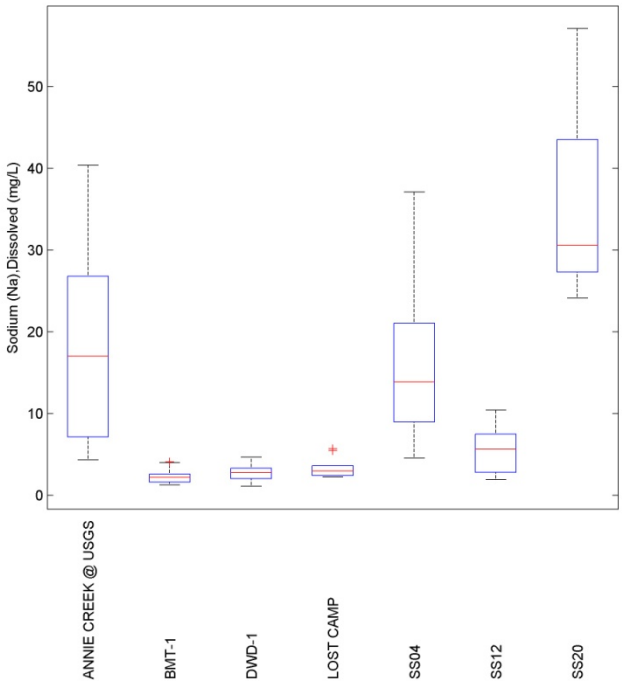

Figure F-71. Boxplot of Dissolved Sodium.

RSI-1924-10-119

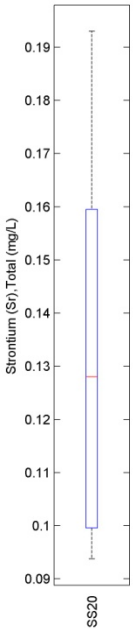

Figure F-72. Boxplot of Total Strontium.

RSI-1924-10-120

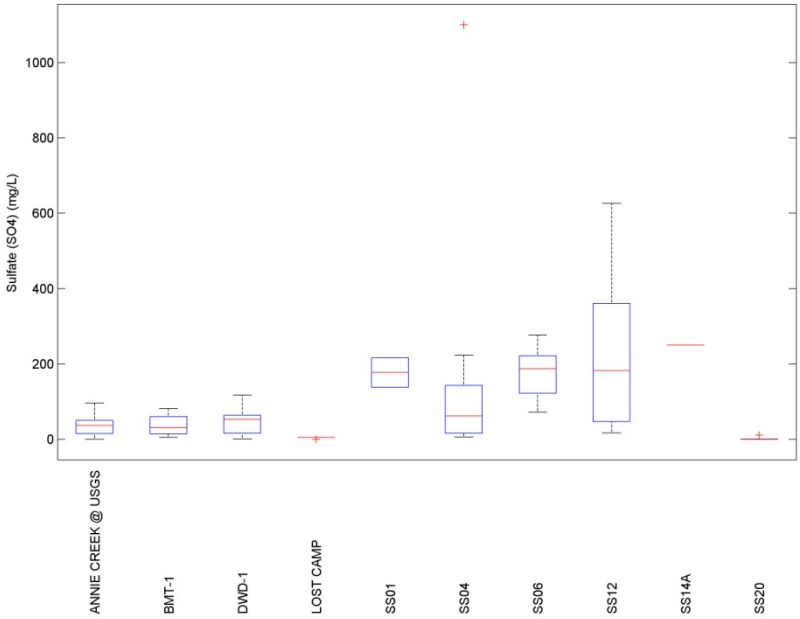

Figure F-73. Boxplot of Sulfate.

RSI-1924-10-121

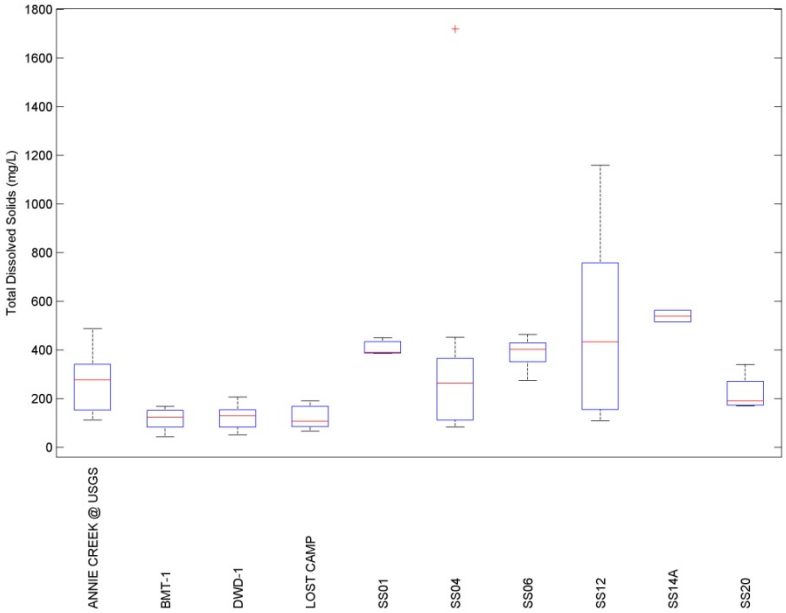

Figure F-74. Boxplot of Total Dissolved Solids.

RSI-1924-10-122

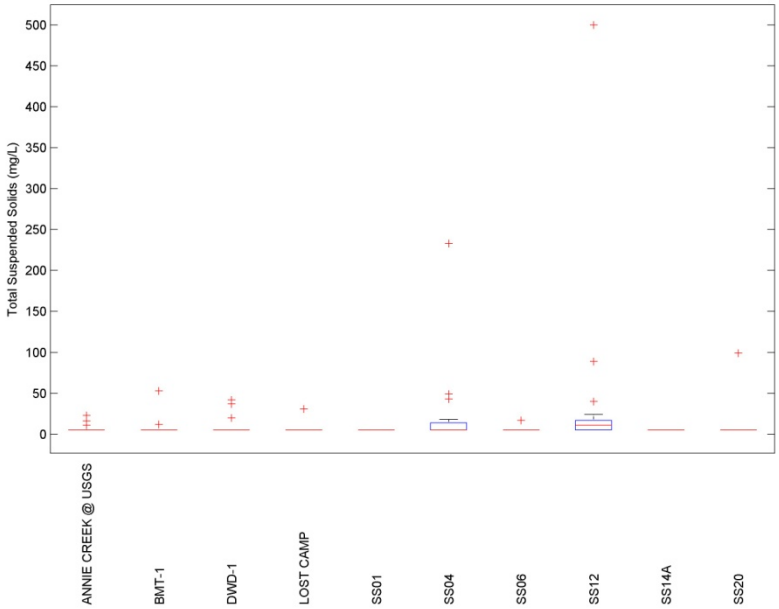

Figure F-75. Boxplot of Total Suspended Solids.

RSI-1924-10-123

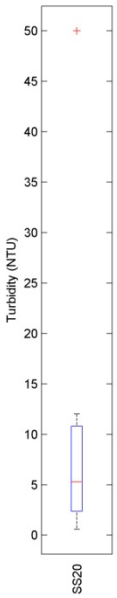

Figure F-76. Boxplot of Turbidity.

APPENDIX G
USGS FIELD DATA STATISTICS

Table G-1. U.S. Geological Survey Flow Data Statistics

Flow Stats (cfs)	Annie Creek Near Lead, SD	Deadwood Creek at Central City, SD	Whitetail Creek at Lead, SD
Min	0.01	0.25	n/a
Max	98	128	n/a
n	1243	1261	n/a
Mean	2.2	4.3	n/a
StDev	5.4	9.6	n/a

Table G-2. U.S. Geological Survey Water Temperature Statistics

Water Temperature Stats (°C)	Annie Creek near Lead, SD	Deadwood Creek at Central City, SD	Whitetail Creek at Lead, SD
Min	0	0	3.1
Max	15.4	17	13.1
n	22	35	14
Mean	5.9	6.9	7.6
StDev	5.0	4.8	3.2

Table G-3. U.S. Geological Survey Conductivity Statistics

Conductivity Stats (µS/cm @25°C)	Annie Creek near Lead, SD	Deadwood Creek at Central City, SD	Whitetail Creek at Lead, SD
Min	133	157	373
Max	877	1520	701
n	21	34	14
Mean	486.7	567.7	533.1
StDev	216.6	326.9	113.3

ADDITIONAL SURFACE WATER-QUALITY DATA

Note: Radiological data were not included in the surface water characterization report and are provided here. Also, additional water-quality data collected during late 2010 were not available at the time the surface water characterization report was prepared. The water-quality tables presented here are replacement tables for those in the report and contain all water-quality data available for 2010 as of January 15, 2011.

Table 1. Radiological Data for New Surface Water-Quality Sites

Parameter	SS-05	SS-20
	10/11/2010	11/10/2009
Gross Alpha (pCi/L)	2[u]	5.3
Gross Alpha precision (±) (pCi/L)	1.6	1.6
Gross Alpha MDC (pCi/L)	2.5	2.1
Gross Beta (pCi/L)	4.7	2.3[u]
Gross Beta precision (±) (pCi/L)	1.5	1.8
Gross Beta MDC (pCi/L)	2.4	3
Radium 226 (pCi/L)	–0.09[u]	1.9
Radium 226 precision (±) (pCi/L)	0.07	0.2
Radium 226 MDC (pCi/L)	0.2	0.1
Radium 228 (pCi/L)	0.7[u]	1[u]
Radium 228 precision (±) (pCi/L)	0.7	0.8
Radium 228 MDC (pCi/L)	1.2	1.2
Radon 222 (pCi/L)	<100	6,250
Radon 222 precision (±) (pCi/L)	–	130

U = Not detected at minimum detectable concentration.

Table 2. Updated SS-05 Water Quality 2010 (Page 1 of 2)

Parameter	10/7/2010	11/17/2010	12/16/2010
Field Conductivity (µmhos/cm)	363	630	337
Field ORP (mV)	86	96	135
Field Oxygen (O2) (mg/L)	8.49	12.2	10.4
Field pH (SU)	7.84	8.23	7.93
Field Temperature (° C)	10.9	1.3	0.4
Field Flow Rate (gal/min)	2.6	65	55
Calcium (Ca),Dissolved (mg/L)	61.7	81.6	78.3
Magnesium (Mg),Dissolved (mg/L)	17.2	17.5	19.1
Aluminum (Al),Total (mg/L)	0.0384	0.0396	0.0492
Antimony (Sb),Total (mg/L)	<0.005	<0.005	<0.005
Arsenic (As),Total (mg/L)	0.0065	0.00527	0.00522
Barium (Ba),Total (mg/L)	0.196	0.21	0.176
Beryllium (Be),Total (mg/L)	<0.001	<0.001	<0.001
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001
Chromium (Cr),Total (mg/L)	<0.001	<0.001	0.00108
Cobalt (Co),Total (mg/L)	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	<0.001	<0.001	<0.001
Iron (Fe),Total (mg/L)	0.0526	0.0549	<0.05
Lead (Pb),Total (mg/L)	<0.001	<0.001	<0.001
Lithium (Li),Total (mg/L)	<0.002	0.01	0.00847
Manganese (Mn),Total (mg/L)	<0.01	<0.01	<0.01
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002
Molybdenum (Mo),Total (mg/L)	<0.001	<0.001	<0.001
Nickel (Ni),Total (mg/L)	<0.005	<0.005	<0.005
Silver (Ag),Total (mg/L)	<0.001	<0.001	<0.001
Strontium (Sr),Total (mg/L)	0.335	0.294	0.299
Vanadium (V),Total (mg/L)	<0.005	<0.005	<0.005
Zinc (Zn),Total (mg/L)	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	228	150	150
Boron (B),Total (mg/L)	0.0284	<0.02	0.0265
Carbonate (mg/L)	0	0	0
Chloride (Cl–) (mg/L)	15.3	29.4	24.8
Cyanide, Free (mg/L)	<0.01	<0.01	<0.01
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.369	0.288	0.283

Table 2. Updated SS-05 Water Quality 2010 (Page 2 of 2)

Parameter	10/7/2010	11/17/2010	12/16/2010
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	0.096	0.104	0.296
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	4.02	2.5	2.58
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005
Silicon (Si),Total (mg/L)	6.99	5.96	6.06
Sodium (Na),Dissolved (mg/L)	19.1	20.4	16.8
Sulfate (SO4) (mg/L)	64.5	147	163
Alkalinity (mg/L)	187	123	123
Anion – Cation Balance (%)	–1.02	0.721	–2.42
Anions (meq/L)	5.54	6.37	6.59
Cations (meq/L)	5.43	6.46	6.27
Electrical Conductivity (µmhos/cm)	521	612	638
Hardness (mg/L)	225	276	274
pH (SU)	7.98	8.02	7.83
Total Dissolved Solids (mg/L)	312	369	384
Total Suspended Solids (mg/L)	<10	<10	<10
Turbidity (NTU)	0.3	0.25	0.4

Table 3. Updated SS-20 Water Quality 2010 (Page 1 of 2)

Parameter	1/21/2010	3/16/2010	4/27/2010	5/19/2010	6/17/2010	7/28/2010	10/29/2010
Field Conductivity (µmhos/cm)	550	600	164	182	197	215	839
Field ORP (mV)	–	–	–	92	116	–	150
Field Oxygen (O2) (mg/L)	–	–	–	8.54	7.08	–	7.42
Field pH (SU)	7.8	6.9	7.38	8.12	7.77	6.92	7.29
Field Temperature (°C)	2.6	5.3	4.8	5.2	7.6	10.3	10
Field Flow Rate (gal/min)	0.14	2	113	26	95	2	–
Calcium (Ca),Dissolved (mg/L)	43	38.4	17.5	24.3	25.6	24.8	20.6
Magnesium (Mg), Dissolved (mg/L)	9.04	8.13	4.66	5.04	5.16	4.9	5.47
Alúmina (Al),Total (mg/L)	3.6	0.218	1.14	0.924	1.41	0.195	0.384
Antimony (Sb),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic (As),Total (mg/L)	0.0483	0.00678	0.0169	0.0205	0.021	0.015	0.0155
Barium (Ba),Total (mg/L)	0.774	0.475	0.227	0.178	0.234	0.325	0.381
Beryllium (Be),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr),Total (mg/L)	0.00653	<0.001	0.0014	0.00119	0.00165	<0.001	<0.001
Cobalt (Co),Total (mg/L)	0.00211	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (Cu),Total (mg/L)	0.00703	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Gold (Au),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001
Iron (Fe),Total (mg/L)	3.89	0.148	0.735	0.517	0.771	0.12	0.269
Lead (Pb),Total (mg/L)	0.00676	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (Li),Total (mg/L)	0.044	0.002	0.004	0.00502	0.0022	<0.002	0.006
Manganese (Mn),Total (mg/L)	0.164	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (Hg),Total (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (Mo),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni),Total (mg/L)	0.00817	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver (Ag),Total (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium (Sr),Total (mg/L)	0.169	0.15	0.0938	0.101	0.114	0.0982	0.114
Vanadium (V),Total (mg/L)	0.00944	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc (Zn),Total (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bicarbonate (mg/L)	68.8	55	55.1	67.8	80.6	94	86.4

Table 3. Updated SS-20 Water Quality 2010 (Page 2 of 2)

Parameter	1/21/2010	3/16/2010	4/27/2010	5/19/2010	6/17/2010	7/28/2010	10/29/2010
Boron (B),Total (mg/L)	<0.02	<0.02	<0.02	0.0456	0.0201	<0.02	0.02
Carbonate (mg/L)	0	0	0	0	0	0	0
Chloride (Cl-) (mg/L)	138	140	53.8	46.3	45	39.2	48.2
Cyanide, Free (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, Total (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, WAD (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride (mg/L)	0.225	0.254	0.317	0.418	0.401	0.305	0.288
Nitrogen, Ammonia (NH3) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate (NO3) (mg/L)	1.26	1.55	0.679	0.569	0.537	0.521	1.01
Nitrogen, Nitrite (NO2) (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium (K),Dissolved (mg/L)	2.45	2.07	1.74	1.89	1.97	1.87	2.01
Selenium (Se),Total (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silicon (Si),Total (mg/L)	5.69	7.85	11.6	7.96	9.8	7.71	8.67
Sodium (Na),Dissolved (mg/L)	44.6	57.1	30	24.1	26.4	30.6	33.7
Sulfate (SO4) (mg/L)	10.6	<10	<10	<10	<10	<10	<10
Alkalinity (mg/L)	56.4	45.1	45.1	55.6	66.1	77.1	70.8
Anion - Cation Balance (%)	–4.34	1.46	2.35	4.68	4.51	5.58	2.24
Anions (meq/L)	5.34	4.97	2.49	2.48	2.65	2.7	2.86
Cations (meq/L)	4.9	5.12	2.61	2.72	2.9	3.02	2.99
Electrical Conductivity (µmhos/cm)	533	575	290	288	300	305	344
Hardness (mg/L)	145	129	62.9	81.4	85.2	82.1	74
pH (SU)	7.54	7.48	7.02	7.42	7.13	7.04	6.99
Total Dissolved Solids (mg/L)	286	341	178	176	170	170	180
Total Suspended Solids (mg/L)	99	<10	<10	<10	<10	<10	<10
Turbidity (NTU)	50	2.8	12	7.8	9.6	2.4	2.8