OGMCOAL DNR <ogmcoal@utah.gov>

Bear Canyon- Water Monitoring Data

1 message

Steve Christensen <stevechristensen@utah.gov> Wed, Apr 13, 2016 at 3:09 PM
To: Spencer Shumate <jshumate@osmre.gov>, Christine Belka <cbelka@osmre.gov>, Howard Strand <hstrand@osmre.gov>, Thomas Medlin <tmedlin@osmre.gov>, "Matt, Duane" <dmatt@osmre.gov>, Daron Haddock <daronhaddock@utah.gov>, Dana Dean <danadean@utah.gov>, Alan Boehms <aboehms@osmre.gov>, Keenan Storrar <kstorrar@utah.gov>, OGMCOAL DNR <ogmcoal@utah.gov>, Steve Demczak <stevedemczak@utah.gov>

Good afternoon,

As we discussed on the call yesterday, I'm e-mailing Bear Canyon water monitoring information to the group.

Attached are the following:
1) Plate 7-4, Water Monitoring. The plate depicts the locations of all of Bear Canyon's water monitoring sites.
2) A spreadsheet of all the data we have in our database for surface water monitoring sites BC-1, BC-2, BC-3 and BC-4.
3) Water quality data review from Keenan Storrar (assigned Bear Canyon hydrologist).

If you have any questions, please call me (801) 538-5350. For hydrologic/water monitoring data queries, call Keenan Storrar (801) 538-5345.

Regards,
Steve

–
Steve Christensen
Utah Division of Oil, Gas and Mining
1594 W North Temple, Suite 1210
Salt Lake City, Utah 84116
(801) 538-5350
stevechristensen@utah.gov

3 attachments

PLATE 7 - 4.pdf
4804K

Bear CanyonWTMon Data.xlsx
297K

Bear Canyon Water Quality Report_April2016.pdf
1649K

LEGEND

- FOREST SERVICE BOUNDARY
- BEAR CANYON PERMIT
- FEDERAL LEASE BOUNDARIES
- DISTURBED AREA
- HISTORIC WATER SAMPLE SITE — FBC-1
- GROUND WATER SAMPLE SITE — SBC-1
- WELL WATER SAMPLE SITE — MW-117
- SURFACE WATER SAMPLE SITE — BC-1
- PERENNIAL STREAM
- NON-PERENNIAL STREAM
- SECTION LINE
- CROSS SECTION
- FAULT LINE
- HIAWATHA COAL SEAM OUTLINE
- BLIND COAL SEAM OUTLINE
- TANK COAL SEAM OUTLINE

ONLY MONITORED SPRINGS ARE SHOWN

SEE PLATES 7J-1 AND 7J-2 FOR CROSS-SECTIONS
SEE PLATE 7-5 FOR WATERSHED AREAS
SEE PLATES 7-1 FOR HYDROLOGY

REV.	DATE	REMARKS	APPR.
1	12-07-92	DH-1A, DH-2, DH-3 Added (92S)	2-09-93
2	11-20-92	Shower House Proposal Added (92H)	12-08-92
3	12-07-92	Federal Lease Monitor Points Added (92T)	3-02-93
4	09-29-93	Proposed DH-4 Added	10-26-93
5	10-22-93	Tank Seam Disturbed Area Added (93B)	7-22-94
6	8-14-95	SBC-10, Federal Lease Info. Removed	9-25-95
7	12-2-97	U-024316 Added to Permit Area/Monitoring Points Added (97-1)	2-13-98
8	6/25/01	WHR Monitoring Points/Cross-Sections Added (SR98-1)	7/03/01
9	01/04/07	Mohrland Lease/Fee Addition	4/03/07
10	08/24/10	SBC-23 Deactivated	8/24/10

INCORPORATED
SEP 08 2010
Div. of Oil, Gas & Mining

RECEIVED
OCT 04 2010
DIV. OF OIL, GAS & MINING

REGISTERED PROFESSIONAL ENGINEER
NO. 0871709110
CRAIG J. HAWE
STATE OF UTAH

9-30-10

CO-OP MINING CO.

HUNTINGTON, UTAH

WATER MONITORING

SCALE:	DRAWN BY:	DATE:
1" = 1000'	C. Reynolds	08-24-10

BEAR CANYON | PLATE 7-4

Pre- and Post-Spill Water Quality Analysis

Bear Canyon Mine, C/015/025

By: Keenan Storrar, Hydrologist

BACKGROUND

The Bear Canyon mine has an extensive water monitoring program. Surface water quantity and quality parameters are sampled once a quarter upstream, downstream and within the permit area. The surface water monitoring sites focused on within this report are: BC-1 for Upper Bear Creek; BC-2 on Lower Bear Creek; BC-3 on the Lower Right Fork of Bear Creek; and BC-4 on the Upper Right Fork of Bear Creek (Figure 1, attached Table 7-14). To give a broad picture of water quantity and quality at this site I have graphed five years of data and when needed I have focused in on the previous two year time period. These data are graphed through the 4th quarter of 2015, which the operator was required to submit by the end of the 1st quarter of 2016. All data used here are downloaded from our water monitoring database at:
<http://linux3.ogm.utah.gov/cgi-bin/appx-ogm.cgi>

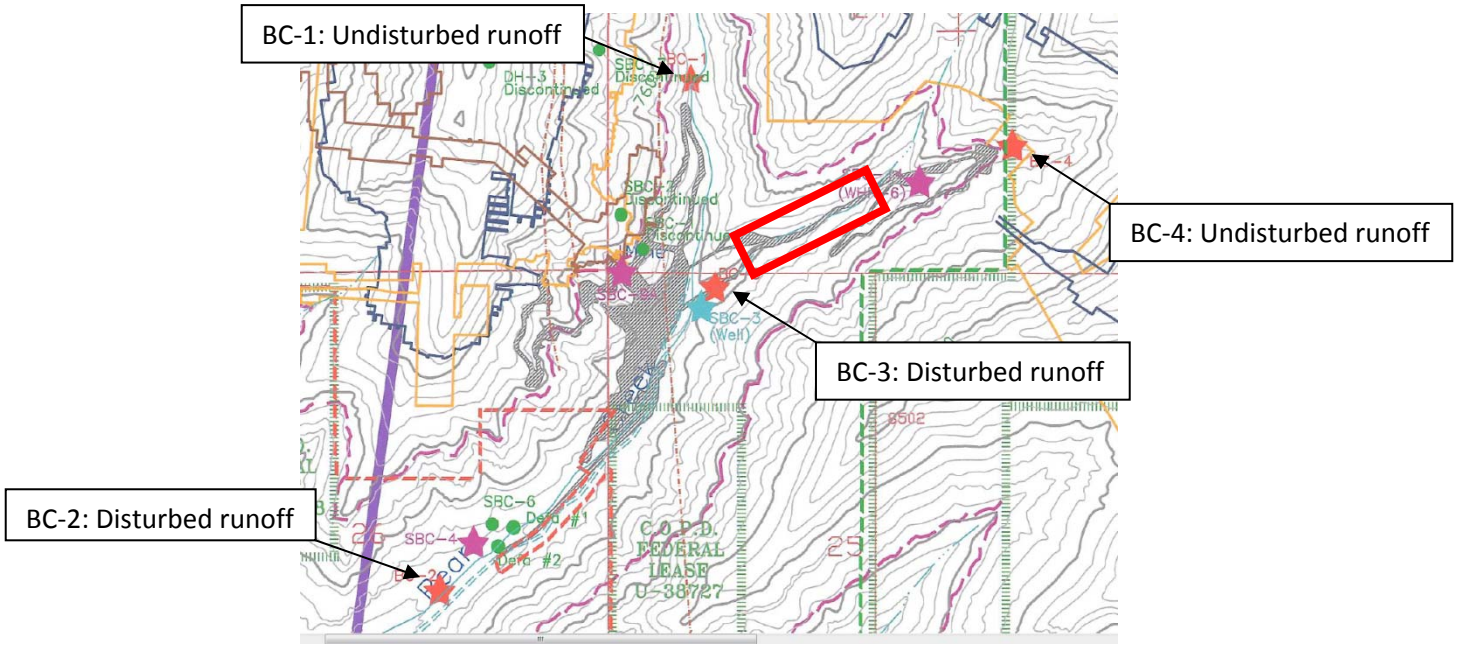

Figure 1: Drawing 7-4 showing water quality monitoring sites at the Bear Canyon mine. Surface water monitoring points are delineated with red stars. Red box highlights the zone where coal has encroached on the stream-buffer.

Water monitoring sites BC-1, BC-2, BC-3, and BC-4 are able to accurately capture surface impacts to the hydrologic balance within and down gradient of the permit area. BC-1 and BC-4 serve to measure background water quality levels as they are up-gradient of all mining operations or receive only undisturbed flow. BC-2 serves to detect impacts to the surface hydrologic balance downstream of the mine. BC-3 and BC-4 serve to measure ephemeral runoff draining from Wild Horse Ridge. The red box on Figure 1 shows the area between BC-3 and BC-4 where coal has spilled off the beltline and down into the stream-buffer zone below.

The majority of surface flow through the site is measured at BC-1 and BC-2 because as stated earlier BC-3 and BC-4 are in an ephemeral drainage (Figure 2). BC-2 is heavily influenced by mine water discharge into the creek at UPDES outfall 004. Mine water discharge at UPDES outfall 004 is typically 40 to 80 gpm.

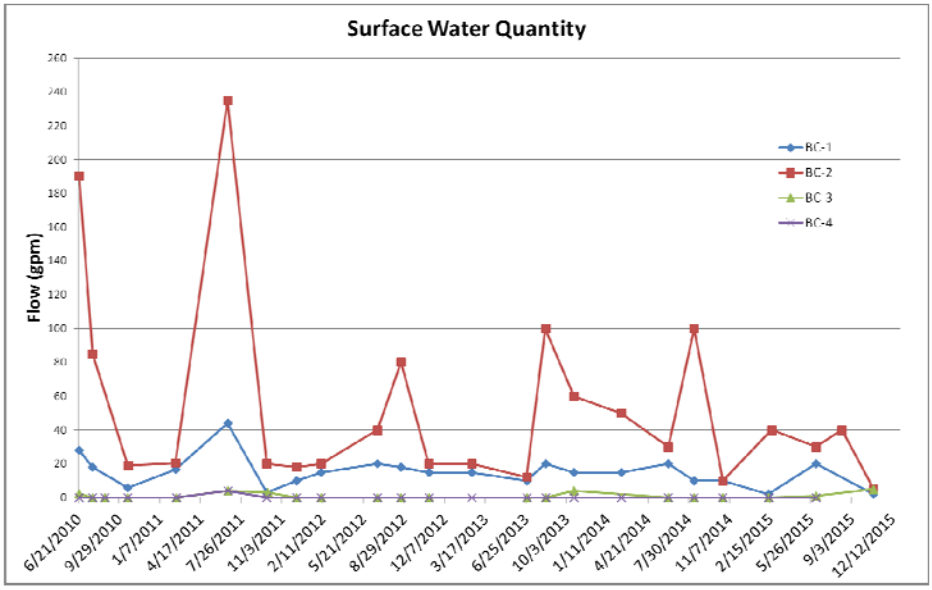

Figure 2. Water quantity at surface water monitoring points. BC-2 is downstream of UPDES outfall 004-Mine Water Discharge.

WATER QUALITY CONCERNS

A primary concern of our program is to analyze impacts of coal mining on the hydrologic balance and act prevent and/or mitigate impacts when they are detected. In order to detect and quantify any and all impacts we require water quality testing for a host of parameters (attached Table 7-17). At Bear Canyon, where coal has spilled into the ephemeral stream and within the stream buffer zone, we are primarily concerned with sediment loading to Bear Creek (Turnpenny and Williams, 1980). Sediment loading is quantified by measuring Total Suspended Solids, or TSS (mg/L) in the stream. TSS (mg/L) is graphed below for the past 5 years (Figure 3). Note: BC-4 has been excluded because flow has only been measured once at this location.

The graph in Figure 3 shows TSS varies widely and often spikes when runoff is elevated during the monsoon season from July through early-October. It appears mine water discharge to Bear Canyon between sampling points BC-1 and BC-2 helps dilute TSS (mg/L) and improve water quality in the stream.

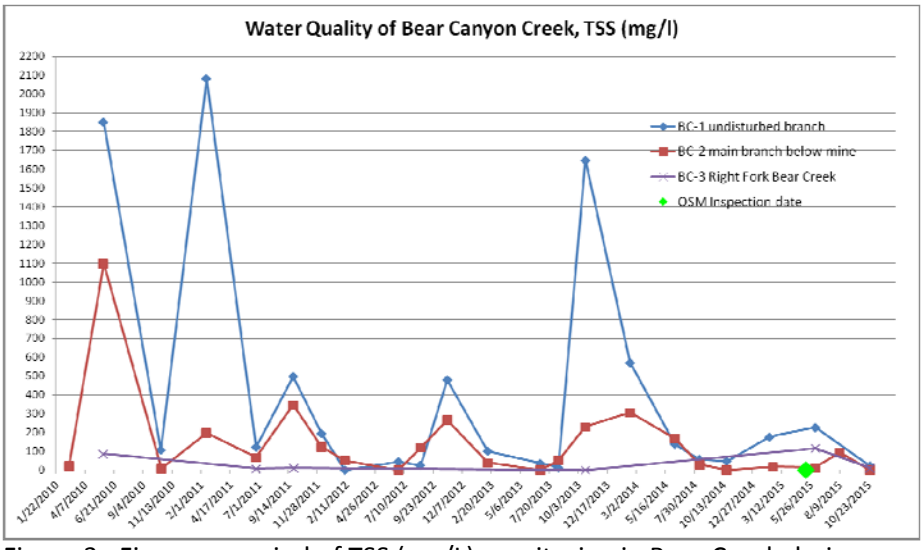

Figure 3. Five year period of TSS (mg/L) monitoring in Bear Creek drainage.

Taking a closer look at the last 2 years of data (Figure 4), there have been no major spikes in TSS (mg/L) at the water monitoring locations. It appears disturbance along the Right Fork of Bear Creek is having little or no impact of chronic sediment loading on the main branch of Bear Creek measured at BC-2.

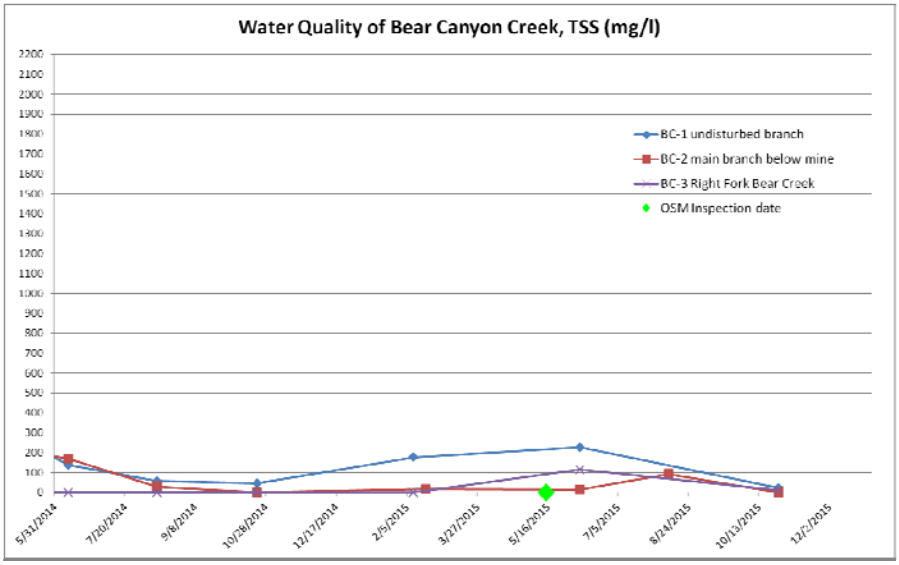

Figure 4. Two year period of TSS (mg/L) monitoring in Bear Creek drainage.

SUMMARY

Focusing on TSS (mg/L) in Bear Creek shows sedimentation levels are low, indicating no chronic sediment loading is occurring from the coal spills in the Right Fork. Chronic sediment loading is a primary concern because it is shown to cause high mortality rates in aquatic wildlife (Maturana *et al.*, 2013). In my quarterly water reports I will continue to monitor TSS (mg/L) within Bear Creek and make a determination if degradation to the stream is occurring.

Literature Citied

A. W. H. Turnpenny and R. Williams, Effects of sedimentation on the gravels of an industrial river system. *Journal of Fish Biology.* 1980

O. Maturana, D. Tonina, J. McKean, J. Buffington, C. Luce, D. Caamano, Modeling the effects of pulsed versus chronic sand inputs on salmonid spawning habitat in a low-grdient gravel-bed river. *Earth Surface Processes and Landforms.* 2013

Table 7-14 Water Monitoring Matrix: Operational Phase of Mining

Location		Status	Jan	Feb	Mar	May	June	July	Aug[3]	Sept	Oct	Nov	Dec
Streams													
BC-1	(Upper Bear Creek)	Active		oper		oper.			oper.		oper.		
BC-2	(Lower Bear Creek)	Active		oper		oper.			oper.		oper		
BC-3	(Lower Rt Fork Bear Creek)	Active		oper		oper.			oper.		oper.		
BC-4	(Upper Rt Fork Bear Creek)	Active		oper		oper.			oper.		oper.		
CK-1	(Upper Cedar Creek)	Active		oper		oper.			oper.		oper.		
CK-2	(Lower Cedar Creek)	Active		oper		oper.			oper.		oper.		
MH-1	(Lower McCadden Hollow Creek)	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
MH-2	(Upper McCadden Hollow Creek)	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
FC-1	(Lower Left Fork Fish Creek)[7]	Active				field[5]			field		field		
FC-2	(Lower Right Fork Fish Creek)[7]	Active T16NR & E Sec 17 or 20				field[5]			field		field		
FC-3	(Right Fork Fish Creek Property Line)[7]	Active T16NR & E Sec 17 or 18				field[5]			field		field		
FC-4	(Upper Right Fork Fish Creek)[7]	Active T16NR & E Sec 7 or 18				field[5]			field		field		
FC-5	(Mud Spring)[7]	Inactive; initiate when mining T16N R & E Sec 7				field[5]			field		field		
FC-6	(Upper Left Fork Fish Creek)[7]	Active T16N R & E Sec 18,19 or 20				field[5]			field		field		
FC-7	(Water Right Upper Left Fork Fish Creek)	Active T16N R & E Sec 18,19 or 20				field[5]			field		field		
FC-8	(Water Right Upper Left Fork Fish Creek)	Active T16N R & E Sec 18,19 or 20				field[5]			field		field		
Springs													
SBC-4	(Big Bear Springs)[4]	Active		oper		oper.			oper.		oper.		
SBC-5	(Birch Spring)[4]	Active		oper		oper.			oper.		oper.		
SBC-9a	(Hiawatha Seam)	Active		oper		oper.			oper.		oper.		
SBC-12	(16-7-13-1)[8]	Inactive; initiate when mining begins Mohrland				field[5]			field		field		
SBC-14	(WHR-6)	Active				oper.			oper.		oper.		
SBC-15	(WHR-5)[8]	Active				field[5]			field		field		
SBC-16	(WHR-4)[6,7,8]	Active				field[5]			field		field		
SBC16A	[7,8]	Active				field[5]			field		field		
SBC-16B	[7,8]	Active				field[5]			field		field		
SBC-17	(16-7-24-4)	Active		oper		oper.			oper.		oper.		
SBC-18	(WHR-2)[7,8,9]	Active				field[5]			field		field		
SBC-20	(16-8-18-4)[8,9]	Active				field[5]			field		field		
SBC-21	(16-8-18-1)[7,8,9]	Active				field[5]			field		field		
SBC-22	(Stockwater Trough)[8,9]	Active				field[5]			field		field		
SCC-1	(16-8-20-1)[8,9]	Inactive; initiate when active mining in Mine #4 or Mohrland area is within 500				field[5]			field		field		
SCC-2	(16-8-18-5)[7,8,9]	Active				field[5]			field		field		
SCC-3	(Mohrland Portal)[8]	Active				field[5]			field		field		
SCC-5	(16-8-7-3)[8,9]	Inactive; initiate when active mining in Mohrland area is within 500 feet				field[5]			field		field		
SMH-1	(FBC-6)[8]	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
SMH-2	(FBC-5)[8]	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
SMH-3	(FBC-13)[8]	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
SMH-4	(FBC-4)[8]	Inactive - Initiate if mining in Lease U 46481 or U-024316				field[5]			field		field		
SMH-5	(Stockwater Trough)[8]	Active				field[5]			field		field		
Wells													
SBC-3	(Creek Well)	Active		oper		oper.			oper.		oper.		
SDH-2	(Well Sec. 11, T16S, R7E)	Inactive - Initiate if mining in Lease U 46481 or U-024316				level[5]			level		level		
SDH-3	(Well Sec. 10, T16S, R7E)	Inactive - Initiate if mining in Lease U 46481 or U-024316				level[5]			level		level		
MW-114	(Well Sec. 18, T16S, R8E)	Active				level[5]			level		level		
MW-117	(Well Sec. 12, T16S, R8E)	Active				level[5]			level		level		

Notes:
1. See Tables 7-13 and 7-17 for listing of water quality monitoring parameters.
2. oper. = operational base = baseline
3. Expanded List parameters taken in August of year 5 prior to each permit renewal.
4. SBC-4 and SBC-5 shall also be tested for oil and grease
5. First sample to be taken in May or June, when Gentry Mountain is accessible.
6. A comment will be made regarding the level of the pond feeding the spring.
7. Weekly monitoring to begin one month prior to mining in area and continue until one month after. Monthly monitoring will then be done for an additional six months at which time it will resume its normal schedule.
8. Weekly flow monitoring to begin one month prior to mining in area and continue until one month after. Monthly monitoring will then be done for an additional six months at which time it will resume its normal schedule.
9. Initiate when active mining in # 4 Mine or Mohrland area is within 500 ft.

Table 7-16 Surface Water Sampling

	Baseline Monitoring	Operational Monitoring	Post-mining Monitoring
Type of Sampling Site	Surface Water Bodies	Surface Water Bodies	Surface Water Bodies
Field Measurements and Parameters (Table 7.1-7)	Performed during water level/flow measurements.	Performed during water level/flow measurements.	Performed during water level/flow measurements
Sample Frequency	Quarterly for lakes, reservoirs and impoundments (water level and quality); monthly flow measurements and quarterly water quality measurements (one sample at low flow and high flow each) for perennial streams. Monthly flow and water quality measurements during period of flow for intermittent streams. Sampling for ephemeral streams determined at pre-design conference.	Quarterly for lakes, reservoirs and impoundments (water level and quality); quarterly flow and semi-annual water quality measurements (one WQ sample at low flow and high flow each) for perennial streams. Quarterly flow and water quality measurements during period of flow for intermittent and streams.	Two per annum for perennial streams (high & low flow); two per annum during snowmelt and rainfall for intermittent streams.
Sampling Duration	Three years (one complete year of data befoe submission of PAP).	Every year until two years after surface reclamation activities have ceased.	Every year until termination of bonding.
Type of Data Collected and Reported	Flow and/or water levels and water quality	Flow and/or water levels and water quality	Flow and/or water levels and water quality per operational parameters.
Comments	All field measurements should be performed concurrently with water level/flow measurements.	All field measurements should be performed concurrently with water level/flow measurements.	All field measurements should be performed concurrently with water level/flow measurements
Additional Comments		For every fifth year preceding re-permitting, one sample at low flow and high flow each should be taken fr expanded water quality parameters. The construction monitoring prgram will be conducted on a site-specific basis in addition to the operational monitoring.	

Table 7-17 Surface Water Quality Parameter List

Field Measurements:

	*	-		Water Levels or Flow
	*	-		pH
	*	-		Specific Conductivity (µmhos/cm)
	*	-		Temperature (°C)

Laboratory Measurements: (mg/L) (Major, minor ions and trace elements are to be analyzed in dissolved form only

	*	-	^	Dissolved Oxygen
#	*	-	^	Total Settleable Solids
#	*	-	^	Total Suspended Solids
	*	-	^	Total Dissolved Solids
		-	^	Total Hardness (as $CaCO_3$)
		-		Aluminum (Al)
		-		Arsenic (As)
		-	^	Boron (B)
		-	^	Carbonate (CO_3)
		-	^	Bicarbonate (HCO_3)
		-		Cadmium (Cd)
		-	^	Calcium (Ca)
		-	^	Chloride (Cl)
		-		Copper (Cu)
	*	-	^	Iron (Fe) (Total and Dissolved)
		-		Lead (Pb)
		-	^	Magnesium (Mg)
	*	-	^	Manganese (Mn) (Total and Dissolved)
		-		Molybdenum (Mo)
		-		Nitrogen, Ammonia (NH_3)
		-		Nitrite (NO_2)
		-		Nitrate (NO_3)
		-	^	Potassium (K)
		-		Phosphate (PO_4)
		-	^	Selenium (Se)
		-	^	Sodium (Na)
		-	^	Specific Conductivity (µmhos/cm)
		-	^	Sulfate (SO_4)
		-		Zinc (Zn)
#	*	-	^	Oil and Grease (if visible sheen)
		-	^	Cation-Anion Balance

Sampling Period:

- \- Baseline
- * Operation, Post-mining
- # Construction
- ^ Expanded List