Standard Mine Site
Sampling Activities Report

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Sampling Activities Report – Standard Mine Site – Gunnison County, Colorado

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Acronym List

°C	Degrees Celsius
BERA	Baseline Ecological Risk Assessment
BMI	Benthic Macroinvertebrate
CDOW	Colorado Division of Wildlife
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
DOC	Dissolved Organic Carbon
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
ESAT	Environmental Services Assistance Team
GPS	Global Positioning System
HDPE	High-density Polyethylene
HHRA	Human Health Risk Assessment
L	Liter
mL	Milliliter
ORP	Oxidation Reduction Potential
oz	Ounce
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBP	Rapid Bioassessment Protocol
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SAR	Sampling Activities Report
SI	Site Inspection
SOP	Standard Operating Procedure
SRC	Syracuse Research Corporation
TAL	Target Analyte List
USFS	United States Forest Service
USGS	United States Geological Survey

1.0 INTRODUCTION

This document is the Sampling Activities Report (SAR) for a series of surface water, sediment, toxicity, and ecological investigations conducted in June and September of 2007 at the Standard Mine Site (CERCLIS ID# CO0002378230). The site is located outside the town of Crested Butte in Gunnison County, Colorado. Sampling was performed in support of the Remedial Investigation/Feasibility Study (RI/FS) of the Standard Mine. Additionally, data collected in 2007 followed similar protocols to the site investigation fieldwork conducted in 2005 and 2006 in support of the Human Health and Baseline Ecological Risk Assessments (HHRA and BERA [USEPA, 2008]).

The 2007 investigations included the following activities: surface water sampling, sediment sampling, macroinvertebrate assemblage assessment, fish population survey, surface water toxicity testing, and sediment toxicity testing.
Results of the macroinvertebrate identification are included in Appendix A. The Colorado Division of Wildlife (CDOW) Fisheries Inventory report is included in Appendix B. Surface water and sediment toxicity testing results, including analytical data for samples collected during the testing periods, are included in separate toxicity reports and will not be addressed in this document. Appendix C includes the Aquatic Toxicity Testing Report for Standard Mine and Appendix D includes the Sediment Toxicity Testing Report for the Standard Mine. Any deviations from the approved site work plan are documented in the Sampling Trip Report for June and September 2007, included in Appendix E of this SAR.

Under United States Environmental Protection Agency (EPA) Contract Number EP-W-06-033, Techlaw, Inc. was issued Technical Direction Form JS09 to prepare and implement a Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) for environmental media contaminated by metals at the Standard Mine site. These investigations were performed in accordance with the requirements outlined in the Final SAP/QAPP for the Standard Mine site (ESAT, 2007).

This SAR includes the following sections: Introduction (Section 1.0), Sampling Activities and Procedures (Section 2.0), Sample Quality Control (Section 3.0), Field Changes and/or Corrective Actions (Section 4.0), Analytical Results (Section 5.0), and References (Section 6.0).

1.1 Site Background and Description

The Standard Mine was part of the Ruby Mining District located in Gunnison County in southwestern Colorado near the town of Crested Butte. Historic mining activities started in 1874, with the most significant operations occurring in 1931. The mine primarily extracted lead, zinc, silver, and gold until 1966 when it was abandoned.

The mine consists of many open unmarked adits and shafts giving access to 8,400 feet of mine workings on six levels. The former mine is near a popular hiking trail and has no access restrictions. Wastes at this mining site are estimated to be 53,560 cubic yards of waste rock and 29,340 cubic yards of mill tailings, as well as seasonably variable amounts of water flowing out of the adits. The site is a mixed ownership site consisting of private claims and United States Forest Service (USFS) land.

In 1999, a two-phase Site Inspection (SI) was conducted of the Ruby Mining District. Phase I was conducted in June 1999 to assess the environmental conditions during the high stream flow regime (spring runoff), and Phase II was conducted in September 1999 to assess the environmental conditions during the low stream flow regime (URS, 2000). The 1999 SI was limited to surface water since, according to the United States Geological Survey ([USGS], 1980), there are no extensive aquifer systems associated with the Ruby Mining District.

SI results revealed elevated concentrations of the following metals during total metals analyses of the surface waters from Coal Creek and its tributaries: aluminum (Al), antimony (Sb), arsenic (As), beryllium (Be), cadmium (Cd), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), nickel (Ni), thallium (Tl), and zinc (Zn). In 2005 and 2006, several sampling events were conducted at the site in order to evaluate temporal and geospatial changes in stream contaminant concentrations (surface water, sediment, and porewater), evaluate previously unidentified watershed influences and biological tissue contaminant concentrations, evaluate existing macroinvertebrate assemblage, and evaluate toxicity to benthic and aquatic organisms. This data was utilized for the analysis of site conditions in the HHRA and BERA, documents that were finalized in March of 2008 following the response to stakeholder comments on the external review draft.

In 2006 and 2007, EPA removal activities and preliminary remedial actions took place at the site. These included draining and covering the surface impoundment, removing a dilapidated mill, removing the remaining railroad infrastructure, and diverting Elk Creek to the western side of the site in an effort to reduce inputs from adit drainage. The EPA also constructed a mine waste repository on USFS land, removed the tailings impoundment and waste rock from levels 1, 2, and 3 to the repository, and conducted site stabilization and drainage control measures.

In 2007, the Remedial program created a passive treatment bioreactor pilot study to ascertain the effectiveness of this technology at remediating acid mine drainage from the Level 1 Adit. Additionally, several revegetation test plots were installed on waste rock located at Level 98 to determine the ratio of soil amendments that is most effective for establishing plant growth on mine waste piles.

1.2 Objective

The 2007 investigations were conducted in support of three objectives: to evaluate changes in the temporal and geospatial distribution of contaminants following removal activities that occurred in 2006 and 2007, to determine the surface water contaminants of potential concern in upper wetland areas at Levels 98 and 5, and to support the RI/FS being conducted at the site. The specific dates when sampling activities were conducted are June 11-13, 2007 and September 17-20, 2007. Each event involved sampling at stations previously identified in past site investigations, in addition to three opportunistic samples taken in June and ten upper wetland samples taken in September. Results from the June and September 2007 sampling activities will be compared to results from previous years as part of a biological monitoring program to further the analysis of conditions at the Standard Mine site. The following data was collected during these investigations:

- Real-time field water quality parameters – pH, conductivity, dissolved oxygen, temperature, and Global Positioning System (GPS) locations (as needed)
- Stream flows – using Marsh-McBirney flow meters or existing flume gauges
- Surface water, including streams, adit discharges, and wetlands – dissolved metals, total recoverable metals, dissolved organic carbon (DOC), anions, and alkalinity
- Sediment – total recoverable metals and total mercury
- Macroinvertebrate assemblage – species identification and count
- Fish population survey – species identification and count
- Toxicity testing – surface water and sediment collected for laboratory toxicity tests

2.0 SAMPLING ACTIVITIES AND PROCEDURES

Field activities at the Standard Mine site took place during June and September of 2007. Specific activities included the following:

- June 11-13
    - Real-time field water quality parameters
    - Stream flow
    - Surface water sampling
- September 17-20
    - Real-time field water quality parameters
    - Stream flow
    - Surface water sampling
    - Bulk sediment

- Surface water and sediment for toxicity testing
- Macroinvertebrate assemblage evaluation
- Fish population survey (conducted by CDOW)

This section outlines the overall management of samples, including sample identification methodology, sampling and analysis performed for each event, and sample documentation.

2.1 Sample Handling and Identification

Samples were collected, placed in containers, processed, and preserved in accordance with the EPA Region 8 Field Sampling Protocols (surface water samples), Bioassessment Protocols for Use in Streams and Wadeable Rivers (macroinvertebrate samples), and EPA Environmental Response Team Standard Operating Procedure (SOP) #2016 (sediment samples) as outlined in the Final SAP/QAPP for the Standard Mine site (ESAT, 2007). Sample tags, labels, and chain of custody records were completed in accordance with the EPA Region 8 Field Sampling Protocols.

Samples collected during these events were identified by the stream name followed by a station number. For example, locations in Coal Creek were identified as Coal – XX, with the station number corresponding to its location along the stream. Likewise, locations along Elk Creek, Splain's Gulch, and the Standard Mine were identified as Elk-XX, SP-XX and SM-XX, respectively. Duplicate samples were identified with the letters "DUP" immediately following the sample name/number. Three opportunistic samples were collected during the June 2007 event; their stations were identified as Elk-12, SM-SEEP-01 and SM-SEEP-02. Wetland locations near Standard Mine at the Level 5 Adit and Level 98 Adit were identified as Level 5 WL-X, and so forth. Table 2.1-1 includes detailed site descriptions for each sample location. Figures 2.1-1 and 2.1-2 provide aerial photographs of the surface water sampling locations and wetland sampling locations, respectively. For those locations not previously identified in past site investigations, sample location coordinates were collected in the field using a GPS unit.

Surface water and bulk sediment samples for metals analysis and toxicity testing were properly preserved, placed on ice, and submitted to ESAT at the Region 8 laboratory for Target Analyte List (TAL) metals analysis (total recoverable and dissolved), anions and alkalinity, and DOC. Toxicity testing waters were collected by ESAT contractors the weekend prior to the September activities during a storm event with heavy rainfall. CDOW assumed responsibility for the identification of and biomass results from fish collected at the designated stations during the same timeframe of September 11-13. Macroinvertebrate samples were properly preserved and submitted to Syracuse Research Corporation (SRC) for sorting, counting, and identification by a subcontractor (GEI Consultants, Inc.).

2.2 Surface Water Sampling

Surface water samples were collected during each event at locations along Coal Creek, Splain's Gulch, Elk Creek, the Copley Lake Outflow, the Standard Mine Adit as it passes through the flume, and the wetland locations near Standard Mine at the Level 5 and Level 98 Adits. Note that not all water bodies were sampled during each field event. Surface water samples were collected by immersing certified clean 250-mL high-density polyethylene (HDPE) bottles directly into the stream, triple rinsing, and pouring the first water samples into two 250-mL HDPE Nalgene filter units for dissolved metals and DOC. The 250-mL HDPE bottles were then immersed directly into the stream at the same location, triple rinsed, and two additional water samples were collected for total recoverable metals and anions/alkalinity. At the station location, surface water samples were filtered for dissolved metals and DOC.

The sampling team returned to the field vehicle for sample processing. Total and dissolved metals samples were preserved with nitric acid, DOC samples were preserved with phosphoric acid, and alkalinity/anion samples were kept on ice. After preservation, all samples were placed in a cooler with ice throughout the duration of the sampling effort and while being transported to the EPA Region 8 Laboratory for analysis by ESAT. Samples were analyzed for the following: total and dissolved metals (EPA method 200.7 and 200.8), hardness (EPA method 2340B calculated from calcium and magnesium results), DOC (EPA method 415.1), alkalinity (EPA method 160.1), and anions (chloride, fluoride, and sulfate using EPA method 300.0).

Two days prior to the scheduled September sampling event, ESAT contractors collected surface water samples specifically for toxicity testing. It should be noted that the weather included heavy rainfall so results may be reflective of storm event conditions at the site. One station location, Elk-06, was missed during sampling; however, since preliminary results indicated 100% mortality at both upstream and downstream stations, another round of sampling was not required. These samples were collected into multiple 1-gallon HDPE cubitainers, transported on ice to the Region 8 laboratory, and stored at 4°C for use in aquatic toxicity testing. Toxicity testing procedures and results are presented in the Aquatic Toxicity Testing Report for Standard Mine included in Appendix C.

Surface Water Field Measurements

Real-time water quality parameters were measured at each station location using a Hydrolab Multiprobe, results of which were recorded in a site-specific field notebook. The required data included pH, temperature, dissolved oxygen, and conductivity. The June 2007 field water quality parameters are listed in Table 2.2-1 and the September 2007 field water quality parameters are listed in Table 2.2-2.

Stream Flows

Stream flow measurements were conducted at select locations using a Marsh-McBirney flow meter or determined from an existing flume gauge. Flow measurement data was recorded on a Stream Discharge Form. The June and September flow measurements are listed in Tables 2.2-1 and 2.2-2, respectively.

2.3 Sediment Sampling

During the September 2007 sampling event, sediment samples were collected along Coal Creek, Splain's Gulch, and Elk Creek. Samples were taken in order to determine contaminant loading in streambed sediments. At each specific location, samples were collected from a 20-meter stretch in order to form a composite sample. The samples were collected using dedicated Teflon scoops to transfer sediment into a bucket for mixing the composite sample. Then samples were either placed into 8-oz plastic jars for bulk metals analysis or 1-L plastic jars for sediment toxicity testing. All samples were placed on ice throughout the field event and during transport to the EPA Region 8 laboratory. Once at the laboratory, bulk sediment samples were analyzed for total metals using EPA methods 200.7 and 200.8. Toxicity testing procedures and results are presented in the Sediment Toxicity Testing Report for Standard Mine included in Appendix D.

2.4 Macroinvertebrate Assemblage Sampling

Semi-quantitative benthic macroinvertebrate (BMI) assemblage sampling was performed during the September sampling event at locations along Coal Creek, Splain's Gulch, and Elk Creek. The sampling procedure involved 1-minute timed kicking of a 1-foot squared area in front of a D-frame dip net at the following three habitat locations per station: riffle, run, and pool. Macroinvertebrates and any collected debris were then containerized in wide-mouth Nalgene containers. In order to maintain sample integrity, macroinvertebrates were preserved with 70% ethanol in the field. Samples were then placed in a cooler and sent through SRC to a subcontractor, GEI Consultants, Inc., for sorting, counting, and identification in accordance with EPA Rapid Bioassessment Protocol (RBP) Methods.

2.5 Sample Documentation

During sampling activities (surface water, sediment, macroinvertebrate assemblage sampling, and toxicity testing) logbooks were maintained by individuals in the field. At each sampling location, the logbook was filled out with information such as sampling date, time, location, weather conditions, personnel, real-time stream data (pH, dissolved oxygen, specific conductivity, and temperature), and/or other pertinent observations. Where applicable, a Stream Discharge Form was filled out by individuals conducting stream flow measurements. Documentation from the fish population survey conducted by CDOW is available as part of the report in Appendix B. Surface water, sediment,

macroinvertebrate assemblage, and toxicity testing samples (water and sediment) were submitted for laboratory analysis with a chain of custody form. Chain of custody forms were completed using Scribe.

3.0 SAMPLE QUALITY CONTROL

This section details the quality control (QC) methods used in the field for activities performed during the sampling effort. These include decontamination methods, field instrument calibration, and duplicate sample collection.

3.1 Decontamination Methods

In general, all non-dedicated disposable equipment involved in field sampling activities was decontaminated prior to sampling. For stream sampling, disposable items were used when possible to minimize cross contamination. Water quality meters were rinsed between sampling locations with deionized water.

3.2 Field Instrument Calibration

In accordance with field sampling protocols, the water quality meter, a field instrument consisting of a pH probe, dissolved oxygen meter, conductivity meter, thermometer, and barometer, was calibrated daily and compared to established pH and conductivity standards. Dissolved oxygen was calibrated using the saturated air approach on a daily basis and as needed in the field due to substantial changes in barometric pressure. The water quality meter thermometer and barometer are calibrated on an annual basis in accordance with manufacturer recommendations. Instrument calibration logs are maintained at the Region 8 laboratory.

3.3 Duplicate Sample Collection

Duplicate samples were collected during these events in order to determine sampling precision and correlation between samples. During the June 2007 event, surface water duplicate samples were collected at sample locations Coal-25 and Elk-10. For the September 2007 event, surface water duplicate samples were collected at sample locations Coal-15 and Elk-08, in addition to one sediment duplicate sample collected at sample location Coal-15. All of the duplicate samples from both June and September were submitted for the appropriate TAL metals (total recoverable and dissolved), DOC, and anions/alkalinity analysis, as described previously.

Per the USEPA SW-846 guidance, the relative percent difference (RPD) for split samples should generally be calculated below 50% for low level constituents and below 30% for high level constituents. These are laboratory guidelines and may not apply to all field situations. However, for this evaluation an RPD value less than 35% is considered indicative of a good correlation between samples based on methods 6010 and methods 6020, although each analyte will have its own specific criteria for RPD. RPD was evaluated for total and dissolved metals (arsenic, cadmium, copper, lead, and zinc), alkalinity, anions, and DOC for surface water

samples for each event. RPD was also calculated for total recoverable metals (arsenic, cadmium, copper, lead, and zinc) for sediment samples. Results of the RPD evaluation are reported in Tables 3.3-1 (June surface water), 3.3-2 (September surface water), and 3.3-3 (September sediment). RPD values were calculated using the following equation:

RPD = [ABS (Sample Result – Duplicate Result)]/[(0.5 * (Sample Result + Duplicate Result)]

Average RPD values for total and dissolved metals in water samples were consistently low (less than 10%), indicating acceptable reproducibility. The same was true for alkalinity, anions, and DOC average RPD values, which were all below 3%. The only exception was the RPD result for fluoride during the June sampling event, which exceeded 35%; however, because the result was close to the Practical Quantitation Limit and all other analyte RPDs were below 35%, this should not pose a concern. Average RPD values for sediment duplicates (total metals) collected during the September event were all below 11%, indicating acceptable reproducibility.

3.4 Blanks

In order to evaluate the potential of sample contamination during collection and/or transport to the laboratory, as well as contaminants introduced at the laboratory, two aqueous blanks were collected in the field during the June sampling event. Blank samples were analyzed for total recoverable metals, dissolved metals, alkalinity, anions, and DOC. All blank results were either below, or just above the method detection limit for each analyte indicating no substantial contamination issue associated with the collection and/or laboratory analysis process.

4.0 FIELD CHANGES AND/OR CORRECTIVE ACTIONS

The following deviations from the SAP/QAPP (ESAT, 2007) were made in the field based on recommendations by the site team and Standard Mine Remedial Project Manager (RPM):

- The surface water toxicity testing samples were collected on Sunday, September 16, 2007 by ESAT prior to the scheduled start of the September sampling event. These samples were collected during a storm event and will provide condition-specific information of toxicity. One station location, Elk-06, was missed during the sampling event. Preliminary results from toxicity testing of the storm event samples indicated 100% mortality at the stations above (Elk-08) and below (Elk-05), which suggests there would have been 100% mortality at Elk-06. Therefore, ESAT was not directed to sample again or perform a secondary toxicity test.
- On Monday, September 17, 2007, it rained most of the day with precipitation having fallen throughout the previous weekend. These

weather conditions resulted in slightly higher flows and murky water in Coal Creek; therefore, surface water samples should be considered representative of storm event conditions, particularly the water collected for toxicity testing.

- In coordination with the RPM, the sampling team determined in the field the exact sampling locations for the surface water samples collected from the upper wetland systems at Levels 98 and 5 of the Standard Mine site. Detailed descriptions of these locations are provided in Table 2.1-1 and Figure 2.1-2, which provides an aerial depiction of the stations.
- Due to a delay in the subcontracting mechanism, macroinvertebrate samples from the September event were not transferred to the necessary lab until Tuesday, October 16, 2007. In order to maintain sample integrity, samples were preserved with ethanol in the field, kept in a cooler at the EPA Region 8 laboratory, and shipped to GEI Consultants, Inc. in coolers with ice.

5.0 ANALYTICAL RESULTS

Analytical results are presented in Tables 5.0-1 through 5.0-3 and include analytical data from the EPA Region 8 laboratory, as well as data provided by contract laboratories. In addition, macroinvertebrate assemblage results and results of the CDOW fish survey are included in Appendices A and B, respectively. The following sections give a general breakdown of analytical results.

5.1 Surface Water

Results for dissolved metals and hardness, total recoverable metals, and DOC, anions and alkalinity for June surface water are included in Table 5.0-1. Results for dissolved metals and hardness, total recoverable metals, and DOC, anions and alkalinity for September surface water are included in Tables 5.0-2.

5.2 Sediment

Sediment samples collected during the September event were analyzed for total recoverable metals (EPA methods 200.7 and 200.8). Results are included in Table 5.0-3.

5.3 Macroinvertebrate Assemblage Sampling

Macroinvertebrate samples collected during the September event were submitted through SRC to a subcontract laboratory, GEI Consultants, Inc., located in Littleton, Colorado, in order to assess the assemblage makeup. Macroinvertebrate identification results are included in Appendix A and were performed to the species level where possible. In addition, results also include summary statistics and indices evaluations for each sample.

6.0 REFERENCES

Environmental Services Assistance Team. (2007). *Data Quality Objectives Summary Report – 2007 Sampling Events.* Standard Mine, Gunnison County, Colorado.

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Tables

TABLE 2.1-1
Standard Mine
2007 Sample Location Descriptions

Sample Station	Location Description
Coal-10	Coal Creek approximately 50 yards upstream of Keystone Mine WWTP outfall
Coal-Opp 1	Coal Creek upstream of iron fen outfall
Coal-15	Coal Creek 100+ meters downstream of Elk Creek confluence
Coal-20	Coal Creek approximately 50 yards upstream of Elk Creek confluence
Coal-25	Coal Creek downstream from Independence and Anthracite/Ruby confluence
SP-00	Splain's Gulch immediately above confluence with Coal Creek
SP-01	Upper Splain's Gulch above road crossing - reference location
Elk-00	Elk Creek at CO-12 crossing approximately 100 yards upstream of confluence with Coal Creek
Elk-01	CDOW station for fish shocking located .1 meters above CR 12 and upstream from Elk-00
Elk-05	Elk Creek approximately 130 feet downstream of confluence of several seeps that feed Elk Creek from the eastern bank
Elk-06	Elk Creek upstream of sampling location Seep-01
Elk-08	Elk Creek downstream of Copley Lake outfall
Elk-10	Elk Creek approximately 30 meters below historic tailings impoundment
Elk-29	Elk Creek upstream of the primary mine site and downstream of confluence of individual Elk Creek flows (tributaries near headwaters)
Cop-01	Copley Lake outfall
SM-00	Standard Mine adit as it passes through the flume
Three opportunity stations sampled during the June 2007 event	
Elk-12	Elk Creek upstream from Elk-10 located within engineered channel and formerly underneath the support beams for old railroad trestle, which have since been removed
SM-SEEP-01	Seep located below the Standard Mine portal and immediately above the north end of the tailings impoundment south of the mill foundation
SM-SEEP-02	Seep emanating from east hillside near Level 1 adit portal - sample taken approximately 100 yards uphill from 1st of debris piles near the adit
Ten new stations sampled during the September 2007 event in order to characterize the upper wetland areas at Levels 5 and 98 of the mine site	
Level 98 WL-1	In Elk Creek channel below wetland seep influences flowing through waste rock at Level 98
Level 98 WL-2	Facing downstream, farthest left seep from wetland below Level 98 adit; sampled amongst trees ~20 meters upstream of Elk Creek confluence
Level 98 WL-3	Facing downstream, farthest right seep from wetland below Level 98 adit; sampled ~25 meters downstream of berm near Level 98 WL-4
Level 98 WL-4	Downstream of vegetation test plots and approximately 50 meters downstream of Level 98 adit discharge in waste rock piles
Level 98 Adit	Approximately 15 meters downstream of the Level 98 adit opening above the seep flowing down the hillside
Level 98 WL-5	Above adit indraw coming down the slope - runs into wetland system east of adit drainage
Level 5 WL-1	Flowing seep approximately 75 meters downstream of waste rock piles at Level 5
Level 5 WL-2	Immediately below road between waste rock and wetlands
Level 5 WL-3	At the toe of waste rock pile on the right
Level 5 Adit	Directly in pool at the mouth of the Level 5 adit

Table 2.2-1
Standard Mine
June 2007 Field Water Quality Parameters
Surface Water

Station Locations	Date	Time	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Flow (cfs)
Coal-10	6/11/2007	14:53	7.57	9.51	8.20	59.00	44.78
Coal-Opp 1	6/11/2007	15:53	7.55	9.22	7.97	58.00	39.06
Coal-15	6/11/2007	16:50	7.75	8.40	7.95	53.00	40.98
Coal-20	6/11/2007	17:10	7.98	8.43	7.91	41.00	31.19
Coal-25	6/11/2007	18:28	7.72	9.24	7.62	45.00	12.28
SP-00[A]	6/12/2007	11:15	7.24	4.58	8.89	36.00	19.22
SP-01	6/12/2007	12:18	7.47	5.28	8.51	31.00	10.20
Elk-00[B]	6/12/2007	17:58	7.85	7.42	8.09	96.00	-----
Elk-05	6/12/2007	14:30	7.64	5.94	8.38	81.00	10.30
Elk-06	6/12/2007	14:46	7.34	7.32	8.10	75.00	6.46
Elk-08	6/12/2007	15:57	7.34	7.32	8.10	75.00	6.46
Elk-10[A]	6/13/2007	9:35	6.40	4.74	8.70	76.00	1.94
Elk-29	6/13/2007	11:45	7.04	6.69	9.02	37.00	1.39
Cop-01	6/12/2007	16:10	7.65	11.06	7.49	22.00	1.44
SM-00	6/13/2007	10:35	4.19	3.75	9.21	397.00	0.13
Three opportunity samples collected during spring high flows							
Elk-12	6/13/2007	12:25	6.65	7.13	9.63	68.00	2.04
SM-SEEP-01[C]	6/13/2007	17:23	4.53	6.46	9.21	222.00	0.02
SM-SEEP-02[C]	6/13/2007	11:40	7.07	5.33	9.72	61.00	-----

Notes: [A] Duplicate (QC) location

[B] A height of 1.5 was read on the EPA flume gauge at this location. It was later discovered that the flume data transmitter was no working and an accurate flow was not obtained. Refer to sample location ELK-05 for the Elk Creek flow.

[C] These two seeps were sampled for the first time during this sampling event. SM-SEEP-01 is located below the Standard Mine portal and immediately above the north end of the tailings impoundment south of the mill foundation. SM-SEEP-02 is a seep emanating from the east hillside near Level 1 adit portal with the sample taken approximately 100 yards uphill from the 1st of the debris piles near the adit.

Table 2.2-2
Standard Mine
September 2007 Field Water Quality Parameters
Surface Water

Station Locations	Date	Time	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Flow (cfs)
Coal-10	9/17/2007	14:50	6.52	8.90	8.17	136.50	21.29
Coal-Opp 1	9/17/2007	16:00	7.11	9.19	7.56	121.30	14.48
Coal-15[A]	9/17/2007	17:05	7.30	8.15	7.56	115.40	10.49
Coal-20	9/17/2007	17:40	7.45	8.53	7.47	89.80	6.89
Elk-00	9/17/2007	18:39	7.15	6.62	8.28	181.60	2.53
Coal-25	9/18/2007	9:06	6.50	5.22	7.20	91.10	0.82
SP-00	9/18/2007	10:00	6.82	4.55	8.27	55.60	0.65
SP-01	9/18/2007	11:08	7.19	5.53	8.79	47.30	0.43
Elk-05	9/18/2007	15:09	6.93	7.57	8.41	160.20	1.20
Elk-06	9/18/2007	15:27	6.74	8.65	7.61	180.20	0.62
Elk-08[A]	9/18/2007	16:25	6.80	9.41	7.69	165.20	0.63
Cop-01	9/18/2007	17:09	7.01	6.88	7.99	32.80	0.01
Elk-10	9/19/2007	9:57	6.41	6.32	7.84	177.90	0.27
Elk-29	9/19/2007	11:08	6.76	6.37	7.94	53.10	0.16
SM-00	9/19/2007	11:20	5.76	4.33	7.86	530.60	0.29
Ten new stations to characterize upper wetland areas at Level 98 and 5							
Level 98 WL-1	9/19/2007	13:35	6.57	11.50	7.08	59.40	Not collected
Level 98 WL-2	9/19/2007	13:41	6.57	14.61	5.10	72.50	Not collected
Level 98 WL-4	9/19/2007	13:59	6.59	17.29	5.72	72.60	Not collected
Level 98 WL-3	9/19/2007	14:04	6.64	19.58	5.25	80.50	Not collected
Level 98 Adit	9/19/2007	14:28	4.44	11.94	4.12	197.80	Not collected
Level 98 WL-5	9/19/2007	14:45	5.91	13.11	5.57	42.30	Not collected
Level 5 WL-1	9/19/2007	15:23	3.43	14.94	5.13	468.10	Not collected
Level 5 WL-2	9/19/2007	15:55	3.09	11.42	5.95	809.00	Not collected
Level 5 WL-3	9/19/2007	15:35	4.11	10.86	7.86	345.50	Not collected
Level 5 Adit	9/19/2007	15:23	5.72	5.22	6.77	214.00	Not collected

Notes: [A] Duplicate (QC) location

Table 3.3-1 Relative Percent Difference Evaluation for June 2007 Duplicates - Surface Water

Surface Water

Location	Dissolved Arsenic	Dissolved Cadmium	Dissolved Copper	Dissolved Lead	Dissolved Zinc	Hardness (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate as SO4 (mg/L)	Total Alkalinity (mg CaCO3 / L)	Dissolved Organic Carbon (mg/L)
Coal-25	4.65	<0.0200U	<2.00U	<0.0400U	<5.00U	21	<0.05U	<0.02U	<0.1U	19.1	5.3
Coal-25 DUP	4.56	<0.0200U	<2.00U	<0.0400U	<5.00U	21	<0.05U	<0.02U	<0.1U	19.0	5.3
RPD	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%
Elk-10	<0.100U	14.3	39.2	53.0	2520	31	<0.05U	<0.02U	28.7	7.14	1.1
Elk-10 DUP	<0.100U	14.3	39.8	55.0	2520	31	<0.05U	0.3	28.2	7.50	1.1
RPD	0.0%	0.0%	1.5%	3.7%	0.0%	0.0%	0.0%	*175%	1.8%	4.9%	0.0%
Average RPD:	1.0%	0.0%	0.8%	1.9%	0.0%	0.0%	0.0%	*87.5%	0.9%	2.7%	0.0%

Surface Water

Location	Total Arsenic	Total Cadmium	Total Copper	Total Lead	Total Zinc
Coal-25	<1.50UD	<0.100UD	<2.00U	<0.100UD	<5.00U
Coal-25 DUP	<1.50UD	<0.100UD	<2.00U	<0.100UD	<5.00U
RPD	0.0%	0.0%	0.0%	0.0%	0.0%
Elk-10	<1.50UD	14.2	53.1	113	2380
Elk-10 DUP	<1.50UD	13.9	51.4	107	2350
RPD	0.0%	2.1%	3.3%	5.5%	1.3%
Average RPD:	0.0%	1.1%	1.6%	2.7%	0.6%

Notes:

For comparative purposes, flags were removed from analytical results except in instances where both samples were non-detect with the same detection limit.

* RPD is in excess of 35%; however, because the results were close to the Practical Quantitation Limit and all other analyte RPDs were below 35%, this should not pose a concern.

Table 3.3-2 Relative Percent Difference Evaluation for September 2007 Duplicates - Surface Water

Surface Water

Location	Dissolved Arsenic	Dissolved Cadmium	Dissolved Copper	Dissolved Lead	Dissolved Zinc	Hardness (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate as SO4 (mg/L)	Total Alkalinity (mg CaCO3 / L)	Dissolved Organic Carbon (mg/L)
Coal-15	6.43	2.37	<2.00U	0.976	457	53	7.3	<0.02U	17.7	25.0	6.7
Coal-15 DUP	6.37	2.44	<2.00U	0.948	453	52	7.2	<0.02U	17.7	24.5	6.7
RPD	0.9%	2.9%	0.0%	2.9%	0.9%	1.9%	1.4%	0.0%	0.0%	2.0%	0.0%
Elk-08	0.877	15.8	8.52	4.47	2670	77	<0.05U	<0.02U	58.5	19.5	2.4
Elk-08 DUP	0.913	15.8	8.68	4.53	2750	78	<0.05U	<0.02U	57.8	19.5	2.3
RPD	4.0%	0.0%	1.9%	1.3%	3.0%	1.3%	0.0%	0.0%	1.2%	0.0%	4.3%
Average RPD:	2.5%	1.5%	0.9%	2.1%	1.9%	1.6%	0.7%	0.0%	0.6%	1.0%	2.1%

Surface Water

Location	Total Arsenic	Total Cadmium	Total Copper	Total Lead	Total Zinc
Coal-15	11.4	2.42	6.78	13.6	472
Coal-15 DUP	12.1	2.53	7.91	14.6	483
RPD	6.0%	4.4%	15.4%	7.1%	2.3%
Elk-08	<1.50UD	15.8	16.1	32.2	2770
Elk-08 DUP	<1.50UD	15.7	16.0	31.5	2700
RPD	0.0%	0.6%	0.6%	2.2%	2.6%
Average RPD:	3.0%	2.5%	8.0%	4.6%	2.4%

Notes:

For comparative purposes, flags were removed from analytical results except in instances where both samples were non-detect with the same detection limit.

Table 3.3-3 Relative Percent Difference Evaluation for September 2007 Duplicates - Sediment

Sediment

Location	Total Arsenic	Total Cadmium	Total Copper	Total Lead	Total Zinc
Coal-15	56500	4000	20.3	74.9	547
Coal-15 DUP	57200	4420	20.5	83.2	566
RPD	1.2%	10.0%	1.0%	10.5%	3.4%

Notes:

For comparative purposes, flags were removed from analytical results except in instances where both samples were non-detect with the same detection limit.

Table 5.0-1 Analytical Results for Surface Water

Dissolved Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc	Hardness (mg/L)
COAL-10	66.4	<0.0500U	2.23	14.3	<2.00U	0.493	8950	<2.00U	<2.00U	<2.00U	<100U	0.717	1110	31.1	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1570	83.2	<0.0100U	<5.00U	<10.0U	115	27
COAL-15	51.0	<0.0500U	2.42	15.3	<2.00U	0.653	8160	<2.00U	<2.00U	<2.00U	<100U	1.52	942	22.3	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1410	76.0	<0.0100U	<5.00U	<10.0U	119	24
COAL-20	52.2	<0.0500U	2.49	15.9	<2.00U	<0.0200U	6200	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	891	6.62	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1370	63.4	<0.0100U	<5.00U	<10.0U	<5.00U	19
COAL-25	56.2	<0.0500U	4.65	17.3	<2.00U	<0.0200U	7170	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	760	16.1	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1220	66.7	<0.0100U	<5.00U	<10.0U	<5.00U	21
COAL-25 DUP	50.7	<0.0500U	4.56	17.1	<2.00U	<0.0200U	7150	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	755	16.1	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1220	67.9	<0.0100U	<5.00U	<10.0U	<5.00U	21
COAL-OPP1	<20.0U	<0.0500U	2.43	14.9	<2.00U	0.435	9040	<2.00U	<2.00U	<2.00U	<100U	0.899	1030	19.0	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1510	84.8	<0.0100U	<5.00U	<10.0U	84.9	27
COP-01	70.1	<0.0500U	1.31	<2.00U	<2.00U	<0.0200U	3580	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	417	10.2	<2.00U	<0.200U	<250U	<0.200U	<0.100U	<250U	24.8	<0.0100U	<5.00U	<10.0U	<5.00U	11
ELK-00	<20.0U	<0.0500U	2.12	11.9	<2.00U	3.21	15600	<2.00U	<2.00U	7.74	<100U	7.01	1100	89.2	<2.00U	1.18	<250U	<0.200U	<0.100U	1510	101	<0.0100U	<5.00U	<10.0U	587	43
ELK-05	75.2	<0.0500U	2.16	10.5	<2.00U	3.77	12300	<2.00U	<2.00U	11.8	<100U	13.5	949	152	<2.00U	1.20	<250U	<0.200U	<0.100U	1290	67.6	<0.0100U	<5.00U	<10.0U	663	35
ELK-06	82.5	<0.0500U	0.853	8.79	<2.00U	4.21	10500	<2.00U	<2.00U	11.7	<100U	6.70	905	185	<2.00U	1.28	<250U	<0.200U	<0.100U	1230	62.9	<0.0100U	<5.00U	<10.0U	717	30
ELK-08	95.1	<0.0500U	1.12	8.54	<2.00U	5.30	10900	<2.00U	<2.00U	15.3	<100U	16.8	944	230	<2.00U	1.22	<250U	<0.200U	<0.100U	1220	64.4	<0.0100U	<5.00U	<10.0U	909	31
ELK-10	103	<0.0500U	<0.100U	9.51	<2.00U	14.3	10600	<2.00U	<2.00U	39.2	<100U	53.0	1120	660	<2.00U	2.16	<250U	<0.200U	<0.100U	<250U	63.1	<0.0100U	<5.00U	<10.0U	2520	31
ELK-10 DUP	105	<0.0500U	<0.100U	9.59	<2.00U	14.3	10500	<2.00U	<2.00U	39.8	<100U	55.0	1110	653	<2.00U	2.30	<250U	<0.200U	<0.100U	<250U	62.6	<0.0100U	<5.00U	<10.0U	2520	31
ELK-12	121	<0.0500U	<0.100U	9.85	<2.00U	12.9	9230	<2.00U	<2.00U	47.4	<100U	91.9	935	520	<2.00U	1.83	<250U	<0.200U	<0.100U	<250U	59.7	<0.0100U	<5.00U	<10.0U	2160	27
ELK-29	<20.0U	<0.0500U	<0.100U	8.41	<2.00U	1.09	5340	<2.00U	<2.00U	<2.00U	<100U	5.12	540	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	<250U	32.5	<0.0100U	<5.00U	<10.0U	214	16
FB-01	<20.0U	<0.0500U	<0.100U	<2.00U	<2.00U	<0.0200U	<100U	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	<100U	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	<250U	<2.00U	<0.0100U	<5.00U	<10.0U	<5.00U	0.4J
FB-02	<20.0U	<0.0500U	<0.100U	<2.00U	<2.00U	<0.0200U	<100U	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	<100U	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	<250U	<2.00U	<0.0100U	<5.00U	<10.0U	<5.00U	<0.3U
SM-00	1030	<0.0500U	0.684	13.8	<2.00U	113	40600	<2.00U	15.2	624	1530	990	4390	5720	<2.00U	11.1	<250U	1.90	0.916	2070	315	<0.0100U	<5.00U	<10.0U	19900	120
SM-SEEP-01	<20.0U	<0.0500U	<0.100U	9.38	<2.00U	15.0	14500	<2.00U	<2.00U	21.8	<100U	70.9	1340	186	<2.00U	2.40	<250U	0.533	<0.100U	<250U	76.8	<0.0100U	<5.00U	<10.0U	2960	42
SM-SEEP-02	<20.0U	<0.0500U	<0.100U	<2.00U	<2.00U	0.200	10200	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	663	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1110	52.8	<0.0100U	<5.00U	<10.0U	55.1	28
SP-00	<20.0U	<0.0500U	<0.100U	9.19	<2.00U	<0.0200U	5050	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	977	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1500	57.7	<0.0100U	<5.00U	<10.0U	<5.00U	17
SP-01	<20.0U	<0.0500U	<0.100U	8.61	<2.00U	<0.0200U	4220	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	871	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1500	47.9	<0.0100U	<5.00U	<10.0U	<5.00U	14

Total Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc
COAL-10	138	<0.150UD	<1.50UD	15.1	<2.00U	<0.100UD	8650	<2.00U	<2.00U	<2.00U	<100U	1.89D	1100	32.7	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1540	86.9	1.41D	<5.00U	<10.0U	115
COAL-15	159	<0.150UD	<1.50UD	16.5	<2.00U	<0.100UD	8140	<2.00U	<2.00U	<2.00U	<100U	3.47D	940	28.4	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1400	79.9	2.37D	<5.00U	<10.0U	114
COAL-20	143	<0.150UD	<1.50UD	17.1	<2.00U	<0.100UD	6130	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	886	13.5	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1340	67.4	<0.100UD	<5.00U	<10.0U	<5.00U
COAL-25	174	<0.150UD	<1.50UD	19.2	<2.00U	<0.100UD	7120	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	764	26.7	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1210	71.8	<0.100UD	<5.00U	<10.0U	<5.00U
COAL-25 DUP	186	<0.150UD	<1.50UD	18.8	<2.00U	<0.100UD	6990	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	758	26.0	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1190	71.2	<0.100UD	<5.00U	<10.0U	<5.00U
COAL-OPP1	107	<0.150UD	<1.50UD	15.7	<2.00U	<0.100UD	8710	<2.00U	<2.00U	<2.00U	<100U	2.39D	1020	27.2	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1480	87.6	<0.100UD	<5.00U	<10.0U	85.7
COP-01	174	<0.150UD	<1.50UD	6.28	<2.00U	<0.100UD	3530	<2.00U	<2.00U	<2.00U	549	<0.100UD	417	46.4	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	24.2	2.45D	<5.00U	<10.0U	<5.00U
ELK-00	77.8	<0.150UD	<1.50UD	12.2	<2.00U	3.38D	15300	<2.00U	<2.00U	10.8	<100U	15.2D	1070	92.2	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1460	108	<0.100UD	<5.00U	<10.0U	561
ELK-05	539	<0.150UD	<1.50UD	14.4	<2.00U	3.92D	12300	<2.00U	<2.00U	16.4	543	31.3D	1000	185	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1290	71.0	<0.100UD	<5.00U	<10.0U	665
ELK-06	4100	<0.150UD	<1.50UD	45.2	<2.00U	6.03D	10300	<2.00U	<2.00U	35.5	4520	152D	1430	514	<2.00U	<1.00UD	1410	<1.50UD	<0.500UD	1160	60.3	1.58D	48.5	<10.0U	1030
ELK-08	759	<0.150UD	<1.50UD	14.8	<2.00U	5.77D	10500	<2.00U	<2.00U	22.2	902	55.2D	993	296	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1160	57.5	<0.100UD	<5.00U	<10.0U	907
ELK-10	244	<0.150UD	<1.50UD	9.91	<2.00U	14.2D	10100	<2.00U	<2.00U	53.1	495	113D	1070	683	<2.00U	6.04D	<250U	<1.50UD	<0.500UD	<250U	57.7	<0.100UD	<5.00U	<10.0U	2380
ELK-10 DUP	232	<0.150UD	<1.50UD	9.69	<2.00U	13.9D	10100	<2.00U	<2.00U	51.4	356	107D	1070	675	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	56.7	<0.100UD	<5.00U	<10.0U	2350
ELK-12	263	<0.150UD	<1.50UD	10.9	<2.00U	12.8D	8740	<2.00U	<2.00U	53.3	351	145D	908	545	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	54.1	<0.100UD	<5.00U	<10.0U	2010
ELK-29	<20.0U	<0.150UD	<1.50UD	8.89	<2.00U	<0.100UD	4990	<2.00U	<2.00U	<2.00U	<100U	9.06D	517	6.02	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	28.8	<0.100UD	<5.00U	<10.0U	199
FB-01	<20.0U	<0.150UD	<1.50UD	<2.00U	<2.00U	<0.100UD	<100U	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	<100U	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	<2.00U	<0.100UD	<5.00U	<10.0U	<5.00U
FB-02	<20.0U	<0.150UD	<1.50UD	<2.00U	<2.00U	<0.100UD	<100U	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	<100U	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	<2.00U	<0.100UD	<5.00U	<10.0U	<5.00U
SM-00	1020	<0.150UD	<1.50UD	15.8	<2.00U	114D	36800	<2.00U	13.2	611	2080	1170D	4040	5780	<2.00U	12.8D	<250U	<1.50UD	<0.500UD	1940	280	<0.100UD	<5.00U	<10.0U	18500
SM-SEEP-01	90.7	<0.150UD	<1.50UD	9.74	<2.00U	14.8D	13800	<2.00U	<2.00U	22.1	<100U	92.1D	1280	196	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	<250U	67.3	<0.100UD	<5.00U	<10.0U	2780
SM-SEEP-02	88.9	<0.150UD	<1.50UD	<2.00U	<2.00U	<0.100UD	9780	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	641	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1040	47.2	<0.100UD	<5.00U	<10.0U	52.9
SP-00	92.2	<0.150UD	<1.50UD	9.91	<2.00U	<0.100UD	5050	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	970	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1480	61.6	<0.100UD	<5.00U	<10.0U	<5.00U
SP-01	104	<0.150UD	<1.50UD	9.49	<2.00U	<0.100UD	4240	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	874	5.11	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1490	51.4	<0.100UD	<5.00U	<10.0U	<5.00U

Dissolved Organic Carbon (mg/L)

Location	DOC
COAL-10	4.1
COAL-15	4.4
COAL-20	5.3
COAL-25	5.3
COAL-25 DUP	5.3
COAL-OPP1	4.4
COP-01	6.9
ELK-00	2.1
ELK-05	3.1
ELK-06	4.0
ELK-08	3.0
ELK-10	1.1
ELK-10 DUP	1.1
ELK-12	1.4
ELK-29	1.7
FB-01	<0.2U
FB-02	<0.2U
SM-00	<0.2U
SM-SEEP-02	2.6
SP-00	6.1
SP-01	6.5

Wet Chem **(mg CaCO3/L)** **(mg/L)**

Location	Total Alkalinity	Chloride	Fluoride	Sulfate as SO4
COAL-10	21.2	<0.05U	<0.02U	8.4
COAL-15	19.8	<0.05U	<0.02U	7.1
COAL-20	18.7	<0.05U	<0.02U	<0.1U
COAL-25	19.1	<0.05U	<0.02U	<0.1U
COAL-25 DUP	19.0	<0.05U	<0.02U	<0.1U
COAL-OPP1	20.8	<0.05U	<0.02U	7.9
COP-01	9.71	<0.05U	<0.02U	<0.1U
ELK-00	24.6	<0.05U	<0.02U	9.3
ELK-05	18.9	<0.05U	<0.02U	7.8
ELK-06	13.4	<0.05U	<0.02U	17.4
ELK-08	13.3	<0.05U	<0.02U	19.2
ELK-10	7.14	<0.05U	<0.02U	28.7
ELK-10 DUP	7.50	<0.05U	0.3	28.2
ELK-12	7.43	<0.05U	<0.02U	23.7
ELK-29	8.48	<0.05U	<0.02U	8.6
FB-01	2.06J	<0.05U	<0.02U	<0.1U
FB-02	<2.00U	<0.05U	<0.02U	<0.1U
SM-00	<2.00U	3.0	0.3	154
SM-SEEP-01	7.46	<0.05U	<0.02U	35.8
SM-SEEP-02	16.6	<0.05U	<0.02U	12.2
SP-00	17.7	<0.05U	<0.02U	<0.1U
SP-01	15.2	<0.05U	<0.02U	<0.1U

< - Less than
U - Indicates analyte not detected (result is reported as less than the reporting limit)
J - Indicates result is an estimated value (refer to analytical data package narrative for discussion)
D - Indicates sample was diluted

mg/L - milligrams per liter
ug/L - micrograms per liter

Table 5.0-2 Analytical Results for Surface Water

Dissolved Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc	Hardness (mg/L)
COAL-10	96.1	<0.0500U	3.60	26.7	<2.00U	0.666	17900	<2.00U	<2.00U	<2.00U	<100U	0.465	4100	157	<2.00U	1.23	1220	0.661	<0.100U	2700	177	<0.0100U	<5.00U	<10.0U	179	62
COAL-15	<20.0U	<0.0500U	6.43	30.7	<2.00U	2.37	16500	<2.00U	<2.00U	<2.00U	<100U	0.976	2760	228	<2.00U	1.02	1190	0.684	<0.100U	2290	162	<0.0100U	<5.00U	<10.0U	457	53
COAL-15 DUP	<20.0U	<0.0500U	6.37	30.8	<2.00U	2.44	16400	<2.00U	<2.00U	<2.00U	<100U	0.948	2750	228	<2.00U	1.06	1180	<0.200U	<0.100U	2330	165	<0.0100U	<5.00U	<10.0U	453	52
COAL-20	<20.0U	<0.0500U	8.41	32.6	<2.00U	<0.0200U	11800	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	2800	39.7	<2.00U	<0.200U	1220	<0.200U	<0.100U	2410	145	<0.0100U	<5.00U	<10.0U	<5.00U	41
COAL-25	<20.0U	<0.0500U	20.7	32.7	<2.00U	<0.0200U	13700	<2.00U	<2.00U	<2.00U	321	0.231	2250	108	<2.00U	<0.200U	1120	<0.200U	<0.100U	2310	157	<0.0100U	<5.00U	<10.0U	<5.00U	44
COAL-OPP1	<20.0U	<0.0500U	5.33	26.6	<2.00U	0.889	16700	<2.00U	<2.00U	<2.00U	<100U	0.916	3290	152	<2.00U	<0.200U	1160	0.634	<0.100U	2450	167	<0.0100U	<5.00U	<10.0U	200	55
COP-90	<20.0U	<0.0500U	1.64	<2.00U	<2.00U	<0.0200U	5540	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	629	26.5	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1250	37.9	<0.0100U	<5.00U	<10.0U	<5.00U	16
ELK-00	<20.0U	<0.0500U	1.03	23.6	<2.00U	10.3	29500	<2.00U	<2.00U	7.32	<100U	1.87	2360	792	<2.00U	2.55	1100	0.550	<0.100U	2080	216	<0.0100U	<5.00U	<10.0U	1830	83
ELK-05	<20.0U	<0.0500U	3.25	20.7	<2.00U	9.38	26500	<2.00U	<2.00U	5.69	<100U	2.59	2150	621	<2.00U	2.36	<250U	0.573	<0.100U	2100	159	<0.0100U	<5.00U	<10.0U	1670	75
ELK-06	<20.0U	<0.0500U	0.830	18.4	<2.00U	15.3	28200	<2.00U	<2.00U	8.56	<100U	3.65	2550	1000	<2.00U	3.45	<250U	0.630	<0.100U	2000	174	<0.0100U	<5.00U	<10.0U	2670	81
ELK-08	<20.0U	<0.0500U	0.877	16.5	<2.00U	15.8	26600	<2.00U	<2.00U	8.52	<100U	4.47	2460	1200	<2.00U	3.36	<250U	0.598	<0.100U	1900	165	<0.0100U	<5.00U	<10.0U	2670	77
ELK-08 DUP	<20.0U	<0.0500U	0.913	16.8	<2.00U	15.8	27100	<2.00U	<2.00U	8.68	<100U	4.53	2510	1230	<2.00U	3.46	1010	0.583	<0.100U	1930	168	<0.0100U	<5.00U	<10.0U	2750	78
ELK-10	<20.0U	<0.0500U	<0.100U	16.4	<2.00U	25.9	25200	<2.00U	<2.00U	10.6	<100U	5.20	2570	1950	<2.00U	4.61	<250U	0.676	<0.100U	1650	161	<0.0100U	<5.00U	<10.0U	4820	74
ELK-29	<20.0U	<0.0500U	<0.100U	12.3	<2.00U	0.971	8810	<2.00U	<2.00U	<2.00U	<100U	1.42	749	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1200	58.5	<0.0100U	<5.00U	<10.0U	208	25
Level 5 Adit	<20.0U	<0.0500U	<0.100U	16.5	<2.00U	26.9	27300	<2.00U	<2.00U	<2.00U	353	17.6	3860	2810	<2.00U	3.69	<250U	<0.200U	<0.100U	3000	175	<0.0100U	<5.00U	<10.0U	3510	84
Level 5 WL-1	4550	<0.0500U	<0.100U	25.5	5.76	68.9	29900	<2.00U	16.8	68.3	808	226	7020	12300	<2.00U	11.2	<250U	1.53	<0.100U	2470	173	<0.0100U	<5.00U	<10.0U	9620	104
Level 5 WL-2	5210	<0.0500U	0.645	24.6	5.87	88.2	39200	<2.00U	14.9	217	438	675	8140	10900	<2.00U	11.9	1640	2.37	<0.100U	3100	232	<0.0100U	<5.00U	<10.0U	12800	131
Level 5 WL-3	1750	<0.0500U	<0.100U	20.8	<2.00U	56.2	38600	<2.00U	<2.00U	74.9	<100U	50.9	7190	5330	<2.00U	8.19	1040	1.66	<0.100U	2870	213	<0.0100U	<5.00U	<10.0U	8330	126
Level 98 Adit	258	<0.0500U	<0.100U	21.8	<2.00U	34.0	15300	<2.00U	<2.00U	210	1820	1340	1490	1660	<2.00U	2.48	<250U	0.950	<0.100U	1260	96.1	<0.0100U	<5.00U	<10.0U	6860	44
Level 98 WL-1	<20.0U	<0.0500U	<0.100U	12.1	<2.00U	0.925	8530	<2.00U	<2.00U	<2.00U	<100U	7.14	890	38.8	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1340	54.7	<0.0100U	<5.00U	<10.0U	202	25
Level 98 WL-2	<20.0U	<0.0500U	<0.100U	16.3	<2.00U	5.65	10200	<2.00U	<2.00U	10.3	<100U	23.9	869	78.4	<2.00U	1.00	<250U	<0.200U	<0.100U	1090	53.5	<0.0100U	<5.00U	<10.0U	1000	29
Level 98 WL-3	<20.0U	<0.0500U	<0.100U	16.7	<2.00U	6.21	10700	<2.00U	<2.00U	15.8	<100U	11.5	1110	8.30	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1030	54.8	<0.0100U	<5.00U	<10.0U	1040	31
Level 98 WL-4	<20.0U	<0.0500U	<0.100U	10.7	<2.00U	5.18	10000	<2.00U	<2.00U	17.2	<100U	60.3	930	278	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1090	50.4	<0.0100U	<5.00U	<10.0U	945	29
Level 98 WL-5	<20.0U	<0.0500U	<0.100U	8.85	<2.00U	<0.0200U	6430	<2.00U	<2.00U	<2.00U	<100U	0.724	636	153	<2.00U	<0.200U	<250U	<0.200U	<0.100U	1010	38.5	<0.0100U	<5.00U	<10.0U	31.5	19
SM-00	162	<0.0500U	0.588	12.7	<2.00U	147	72900	<2.00U	17.3	228	360	716	8010	10500	<2.00U	18.9	1080	1.93	0.591	3140	549	<0.0100U	<5.00U	<10.0U	25400	215
SP-00	<20.0U	<0.0500U	<0.100U	15.1	<2.00U	<0.0200U	8410	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	1610	7.85	<2.00U	<0.200U	<250U	<0.200U	<0.100U	2360	101	<0.0100U	<5.00U	<10.0U	<5.00U	28
SP-01	<20.0U	<0.0500U	<0.100U	13.5	<2.00U	<0.0200U	6760	<2.00U	<2.00U	<2.00U	<100U	<0.0400U	1420	<2.00U	<2.00U	<0.200U	<250U	<0.200U	<0.100U	2200	83.3	<0.0100U	<5.00U	<10.0U	<5.00U	23

Total Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc
COAL-10	1130	<0.150UD	10.9D	38.0	<2.00U	1.25D	18300	<2.00U	<2.00U	6.26	1490	12.0D	4110	314	<2.00U	<1.00UD	1450	<1.50UD	<0.500UD	2660	179	<0.100UD	<5.00U	<10.0U	326
COAL-15	633	<0.150UD	11.4D	37.4	<2.00U	2.42D	16200	<2.00U	<2.00U	6.78	926	13.6D	2760	268	<2.00U	<1.00UD	1300	<1.50UD	<0.500UD	2190	156	1.02D	<5.00U	<10.0U	472
COAL-15 DUP	684	<0.150UD	12.1D	37.9	<2.00U	2.53D	16400	<2.00U	<2.00U	7.91	981	14.6D	2790	279	<2.00U	<1.00UD	1340	<1.50UD	<0.500UD	2280	164	<0.100UD	<5.00U	<10.0U	483
COAL-20	650	<0.150UD	15.1D	40.8	<2.00U	<0.100UD	11900	<2.00U	<2.00U	<2.00U	883	1.49D	2800	85.1	<2.00U	<1.00UD	1350	<1.50UD	<0.500UD	2200	136	<0.100UD	<5.00U	<10.0U	<5.00U
COAL-25	442	<0.150UD	28.4D	36.7	<2.00U	<0.100UD	13900	<2.00U	<2.00U	<2.00U	927	1.48D	2220	125	<2.00U	<1.00UD	1160	<1.50UD	<0.500UD	2230	158	<0.100UD	<5.00U	<10.0U	<5.00U
COAL-OPP1	731	<0.150UD	13.5D	36.1	<2.00U	1.23D	17200	<2.00U	<2.00U	6.94	1230	14.2D	3310	250	<2.00U	<1.00UD	1320	<1.50UD	<0.500UD	2420	171	<0.100UD	<5.00U	<10.0U	277
COP-00	60.4	<0.150UD	<1.50UD	5.16	<2.00U	<0.100UD	5490	<2.00U	<2.00U	<2.00U	374	<0.100UD	618	41.2	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1150	36.5	<0.100UD	<5.00U	<10.0U	<5.00U
ELK-00	619	<0.150UD	<1.50UD	28.9	<2.00U	11.1D	30100	<2.00U	<2.00U	18.7	842	52.9D	2350	863	<2.00U	<1.00UD	1250	<1.50UD	<0.500UD	2010	214	<0.100UD	<5.00U	<10.0U	2000
ELK-05	70.9	<0.150UD	<1.50UD	20.2	<2.00U	9.37D	26400	<2.00U	<2.00U	9.62	<100U	10.1D	2050	625	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	2000	155	<0.100UD	<5.00U	<10.0U	1600
ELK-06	189	<0.150UD	<1.50UD	19.8	<2.00U	14.7D	28000	<2.00U	<2.00U	13.9	253	19.6D	2520	1040	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1870	165	<0.100UD	<5.00U	<10.0U	2710
ELK-08	221	<0.150UD	<1.50UD	18.1	<2.00U	15.8D	26800	<2.00U	<2.00U	16.1	355	32.2D	2440	1260	<2.00U	<1.00UD	1050	<1.50UD	<0.500UD	1750	155	<0.100UD	<5.00U	<10.0U	2770
ELK-08 DUP	207	<0.150UD	<1.50UD	18.0	<2.00U	15.7D	26800	<2.00U	<2.00U	16.0	335	31.5D	2410	1240	<2.00U	<1.00UD	1030	<1.50UD	<0.500UD	1730	154	<0.100UD	<5.00U	<10.0U	2700
ELK-10	1290	<0.150UD	11.4D	33.9	<2.00U	27.9D	27100	<2.00U	<2.00U	69.4	3910	533D	2730	2530	<2.00U	6.07D	1490	<1.50UD	<0.500UD	1590	156	<0.100UD	<5.00U	<10.0U	5050
ELK-29	<20.0U	<0.150UD	<1.50UD	12.7	<2.00U	<0.100UD	8810	<2.00U	<2.00U	<2.00U	<100U	6.95D	739	7.91	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1130	54.8	<0.100UD	<5.00U	<10.0U	205
Level 5 Adit	329	<0.150UD	<1.50UD	17.6	<2.00U	26.0D	27700	<2.00U	<2.00U	11.3	1420	429D	3900	2850	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	3070	179	<0.100UD	<5.00U	<10.0U	3430
Level 5 WL-1	4740	<0.150UD	<1.50UD	26.4	5.54	64.9D	31400	<2.00U	15.8	70.4	1050	223D	7200	12400	<2.00U	12.2D	<250U	<1.50UD	<0.500UD	2520	182	<0.100UD	<5.00U	<10.0U	9370
Level 5 WL-2	15200	<0.150UD	<1.50UD	35.8	12.4	186D	47600	<2.00U	39.4	606	2300	1060D	12200	24900	<2.00U	27.4D	1090	5.45D	<0.500UD	2330	253	<0.100UD	<5.00U	<10.0U	27500
Level 5 WL-3	1830	<0.150UD	<1.50UD	21.6	<2.00U	54.3D	39200	<2.00U	<2.00U	77.8	272	66.8D	7290	5370	<2.00U	8.64D	1080	<1.50UD	<0.500UD	2960	219	<0.100UD	<5.00U	<10.0U	8050
Level 98 Adit	285	<0.150UD	<1.50UD	21.0	<2.00U	32.3D	15400	<2.00U	<2.00U	205	3110	1340D	1480	1600	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1350	105	<0.100UD	<5.00U	<10.0U	6250
Level 98 WL-1	<20.0U	<0.150UD	<1.50UD	12.2	<2.00U	<0.100UD	8700	<2.00U	<2.00U	<2.00U	<100U	16.4D	899	45.1	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1370	57.1	<0.100UD	<5.00U	<10.0U	191
Level 98 WL-2	<20.0U	<0.150UD	<1.50UD	15.5	<2.00U	5.47D	10400	<2.00U	<2.00U	14.1	<100U	49.6D	852	78.7	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1150	58.1	<0.100UD	<5.00U	<10.0U	905
Level 98 WL-3	<20.0U	<0.150UD	<1.50UD	16.4	<2.00U	6.04D	11200	<2.00U	<2.00U	18.0	<100U	13.3D	1130	5.39	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1130	60.9	<0.100UD	<5.00U	<10.0U	982
Level 98 WL-4	353	<0.150UD	<1.50UD	12.8	<2.00U	6.48D	10400	<2.00U	<2.00U	68.7	3580	664D	1070	309	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1180	56.5	<0.100UD	<5.00U	<10.0U	1150
Level 98 WL-5	<20.0U	<0.150UD	<1.50UD	8.76	<2.00U	<0.100UD	6590	<2.00U	<2.00U	<2.00U	<100U	2.70D	629	159	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	1070	41.5	<0.100UD	<5.00U	<10.0U	31.2
SM-00	883	<0.150UD	<1.50UD	13.1	<2.00U	139D	75900	<2.00U	16.6	287	1250	1060D	8170	10700	<2.00U	20.7D	1100	<1.50UD	<0.500UD	3230	571	<0.100UD	<5.00U	<10.0U	24800
SP-00	<20.0U	<0.150UD	<1.50UD	14.9	<2.00U	<0.100UD	8660	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	1610	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	2580	113	<0.100UD	<5.00U	<10.0U	<5.00U
SP-01	<20.0U	<0.150UD	<1.50UD	13.5	<2.00U	<0.100UD	6890	<2.00U	<2.00U	<2.00U	<100U	<0.100UD	1420	<2.00U	<2.00U	<1.00UD	<250U	<1.50UD	<0.500UD	2410	93.0	<0.100UD	<5.00U	<10.0U	<5.00U

Dissolved Organic Carbon (mg/L)

Location	DOC
COAL-10	4.2
COAL-15	6.7
COAL-15 DUP	6.7
COAL-20	8.1
COAL-25	8.5
COAL-OPP1	5.7
COP-00	6.3
ELK-00	3.0
ELK-05	1.5
ELK-06	2.2
ELK-08	2.4
ELK-08 DUP	2.3
ELK-10	1.7
ELK-29	1.6
Level 5 Adit	<0.2U
Level 5 WL-1	1.5
Level 5 WL-2	1.0
Level 5 WL-3	<0.2U
Level 98 Adit	<0.2U
Level 98 WL-1	2.2
Level 98 WL-2	1.7
Level 98 WL-3	2.1
Level 98 WL-4	1.7
Level 98 WL-5	3.4
SM-00	<0.2U
SP-00	4.6
SP-01	6.7

Wet Chem **(mg CaCO3/L)** **(mg/L)**

Location	Total Alkalinity	Chloride	Fluoride	Sulfate as SO4
COAL-10	27.4	11.2	0.2	18.5
COAL-15	25.0	7.3	<0.02U	17.7
COAL-15 DUP	24.5	7.2	<0.02U	17.7
COAL-20	25.0	8.9	<0.02U	5.8
COAL-25	26.1	6.9	<0.02U	8.6
COAL-OPP1	27.1	8.5	<0.02U	16.2
COP-00	13.7	<0.05U	<0.02U	<0.1U
ELK-00	25.8	<0.05U	<0.02U	54.6
ELK-05	28.7	<0.05U	<0.02U	45.4
ELK-06	19.2	<0.05U	<0.02U	60.7
ELK-08	19.5	<0.05U	<0.02U	58.5
ELK-08 DUP	19.5	<0.05U	<0.02U	57.8
ELK-10	14.6	<0.05U	<0.02U	71.7
ELK-29	14.9	<0.05U	<0.02U	10.1
Level 5 Adit	10.7	<0.05U	0.4	80.3
Level 5 WL-1	<2.00U	<0.05U	0.8	173
Level 5 WL-2	<2.00U	<0.05U	1.3	325
Level 5 WL-3	<2.00U	<0.05U	0.8	148
Level 98 Adit	<2.00U	<0.05U	<0.02U	57.8
Level 98 WL-1	11.3	<0.05U	<0.02U	13.2
Level 98 WL-2	7.70	<0.05U	<0.02U	21.6
Level 98 WL-3	5.10	<0.05U	<0.02U	26.2
Level 98 WL-4	10.4	<0.05U	<0.02U	20.0
Level 98 WL-5	12.0	<0.05U	<0.02U	7.0
SM-00	13.7	<0.05U	0.4	246
SP-00	28.0	<0.05U	<0.02U	<0.1U
SP-01	23.5	<0.05U	<0.02U	<0.1U

< - Less than
U - Indicates analyte not detected (result is reported as less than the reporting limit)
J - Indicates result is an estimated value (refer to analytical data package narrative for discussion)
D - Indicates sample was diluted

mg/L - milligrams per liter
ug/L - micrograms per liter

Table 5.0-3 Analytical Results for Sediment

Total Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc
SP-01	4720D	<469UD	726D	91.7D	<2.34UD	195D	2720D	<2.34UD	3.99D	6.91D	11500D	6550D	1820D	487D	0.021D	<4.69UD	1670D	768D	323D	<234UD	<469UD	38.6D	<93.7UD	144D	<23.4UD	38.3D
COAL-10	8730D	<980UD	81100D	104D	<2.45UD	13200D	2890D	<2.45UD	18.4D	34.0D	16500D	93.2D	2290D	2900D	0.048D	<4.90UD	7810D	638D	789D	1870D	<490UD	29.2D	238D	63.5D	<24.5UD	2470D
COAL-15	5910D	<492UD	56500D	77.2D	<2.46UD	4000D	2600D	<2.46UD	5.50D	20.3D	13300D	74.9D	2230D	685D	0.048D	<4.92UD	2300D	605D	359D	1480D	<492UD	24.8D	<98.5UD	55.1D	<24.6UD	547D
COAL-15 DUP	5760D	<481UD	57200D	85.5D	<2.41UD	4420D	2990D	<2.41UD	5.14D	20.5D	12600D	83.2D	2200D	745D	0.052D	<4.81UD	2260D	649D	370D	1590D	<481UD	27.9D	<96.2UD	60.3D	<24.1UD	566D
COAL-20	5080D	<467UD	66800D	91.7D	<2.33UD	241D	2450D	<2.33UD	3.93D	4.51D	11200D	24600D	2050D	601D	0.036D	<4.67UD	1680D	625D	291D	2370D	<467UD	26.2D	<93.3UD	51.3D	<23.3UD	80.4D
COAL-OPP1	7600D	<495UD	84600D	121D	<2.48UD	10800D	4190D	<2.48UD	8.25D	44.1D	16300D	144D	2370D	1260D	0.075D	<4.95UD	4020D	640D	954D	3280D	<495UD	43.2D	142D	37.8D	<24.8UD	1280D
ELK-00	7890D	<1950UD	55200D	154D	<2.44UD	31700D	3290D	<2.44UD	24.3D	182D	19100D	1230D	2420D	6610D	0.018D	<4.88UD	8010D	754D	1170D	<975UD	<488UD	28.3D	<390UD	30.9D	<24.4UD	4650D
ELK-05	9020D	<2000UD	66700D	133D	<2.49UD	38700D	4210D	<2.49UD	29.0D	298D	22500D	1050D	3340D	6900D	0.021D	<4.99UD	9790D	915D	1520D	1500D	<499UD	27.4D	<399UD	32.6D	<24.9UD	5990D
ELK-06	9690D	<987UD	63300D	126D	<2.47UD	29500D	3700D	<2.47UD	18.7D	233D	24400D	903D	3770D	5020D	0.027D	<4.93UD	8850D	1020D	1600D	1800D	<493UD	24.5D	<197UD	39.0D	<24.7UD	4780D
ELK-08	8560D	<1900UD	52500D	96.3D	<2.37UD	41300D	2490D	<2.37UD	28.0D	421D	26600D	1540D	2420D	8170D	0.026D	<4.74UD	8770D	699D	1740D	3010D	<474UD	18.4D	<379UD	30.7D	<23.7UD	5160D
ELK-10	7700D	<970UD	109000D	112D	<2.42UD	25600D	2190D	2.96D	16.7D	344D	57800D	1720D	1720D	3720D	0.034D	<4.85UD	6220D	1080D	3620D	6290D	<485UD	13.8D	425D	16.1D	<24.2UD	4480D
ELK-29	4610D	<486UD	16100D	66.4D	<2.43UD	9350D	2200D	<2.43UD	7.16D	36.7D	11300D	1370D	943D	2350D	0.023D	<4.86UD	4960D	551D	913D	775D	<486UD	15.7D	127D	23.0D	<24.3UD	1350D
SP-00	6190D	<458UD	1810D	116D	<2.29UD	214D	3570D	<2.29UD	4.45D	5.49D	12100D	10200D	2460D	533D	0.016D	<4.58UD	1660D	928D	448D	<229UD	<458UD	47.3D	<91.7UD	93.9D	<22.9UD	41.5D

< - Less than
U - Indicates analyte not detected (result is reported as less than the reporting limit)
J - Indicates result is an estimated value (refer to analytical data package narrative for discussion)
D - Indicates sample was diluted

mg/L - milligrams per liter
ug/L - micrograms per liter

Figures

Figure 2.1-1 Standard Mine 2007 Surface Water Sampling Locations

Surface Water Sampling Location

Miles

0 0.25 0.5

EPA TechLaw

Date: December 4, 2007

References:
Imagery - One-foot aerial photography from Spectrum Mapping (July 13, 2006)
Surface Water Sampling Locations - US-EPA Region 8 (2007)

Map Projection/Coordinate System:
UTM, Meters, Zone 13 North, NAD 83

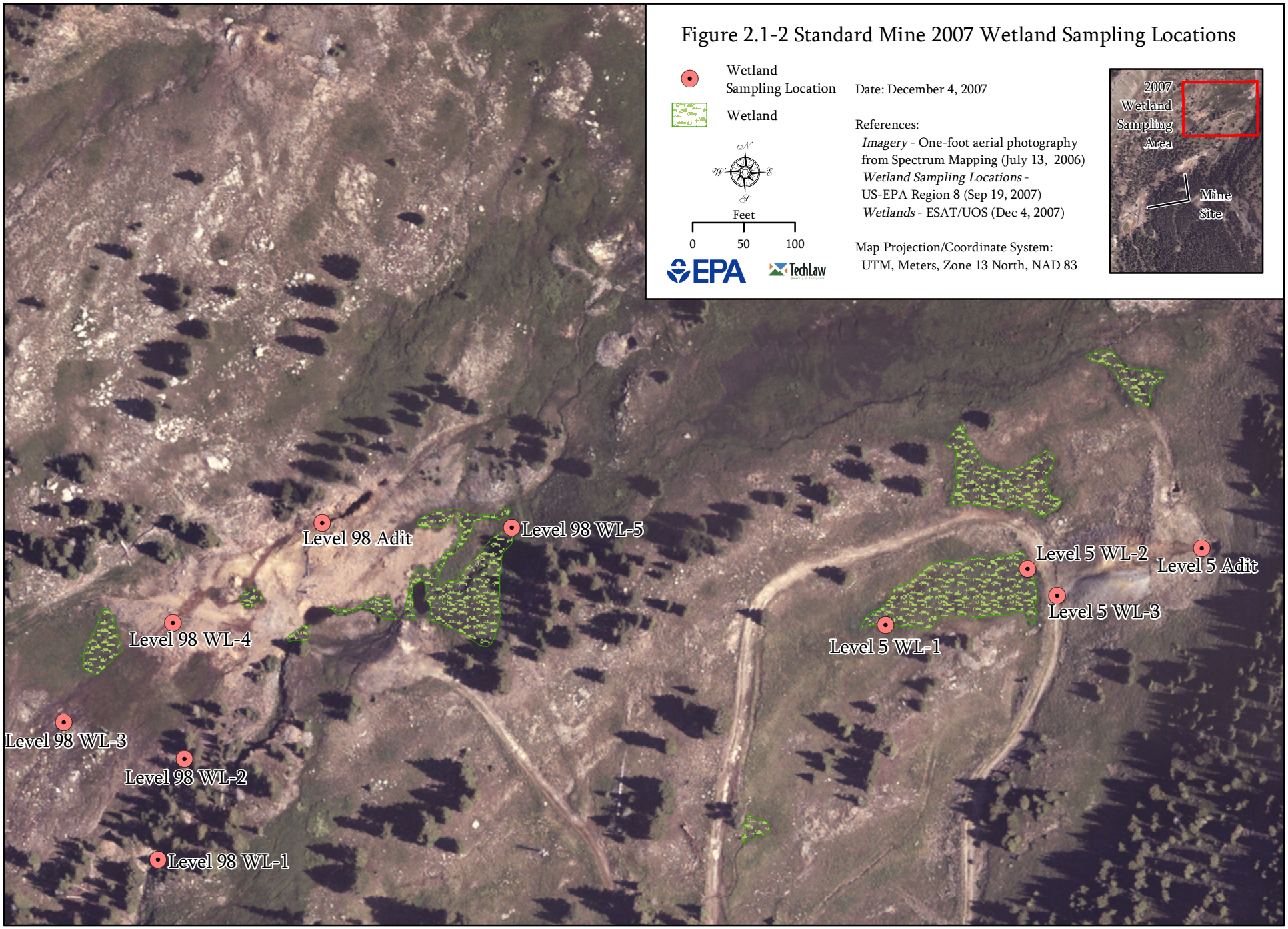


Figure 2.1-2 Standard Mine 2007 Wetland Sampling Locations
Wetland Sampling Location
Wetland
Feet
0
50
100
EPA
TechLaw
Date: December 4, 2007
References:
Imagery - One-foot aerial photography from Spectrum Mapping (July 13, 2006)
Wetland Sampling Locations - US-EPA Region 8 (Sep 19, 2007)
Wetlands - ESAT/UOS (Dec 4, 2007)
Map Projection/Coordinate System:
UTM, Meters, Zone 13 North, NAD 83
2007 Wetland Sampling Area
Mine Site
Level 98 Adit
Level 98 WL-5
Level 98 WL-4
Level 98 WL-3
Level 98 WL-2
Level 98 WL-1
Level 5 WL-2
Level 5 Adit
Level 5 WL-3
Level 5 WL-1

Appendix A

Macroinvertebrate Assemblage Results

GEI Consultants
Chadwick Ecological Division

Geotechnical
Water Resources
Environmental and
Ecological Services

January 11, 2008

Ms. Janet Burris
Syracuse Research Corporation
Environmental Science Center
999 18th Street, Suite 1975, North Tower
Denver, CO 80202

Dear Ms. Burris:

Enclosed are the results of the analyses of the 11 benthic macroinvertebrate samples collected September 17-19, 2007 from Colorado for the Standard Mine project. Data are reported as number of organisms per sample. The invertebrates were identified to species level where possible. In addition, we have sorted organisms by family as requested.

If you have any questions regarding these data, please do not hesitate to call.

Sincerely,

GEI Consultants Inc. / Chadwick Ecological Division

Steven P. Canton
President

Enclosures

www.geiconsultants.com

GEI Consultants, Inc./Chadwick Ecological Division
5575 South Sycamore Street, Suite 101, Littleton, CO 80120
303.794.5530 fax: 303.794.5041

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-15
SAMPLED: 9/17/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**139**
Ameletidae	Ameletus sp.	10
Baetidae	Baetis flavistriga	13
Ephemerellidae	Drunella doddsi	88
Heptageniidae	Rhithrogena robusta	28
PLECOPTERA		**35**
Capniidae	Capniidae	3
Chloroperlidae	Sweltsa sp.	15
Nemouridae	Zapada oregonensis gr.	5
Perlidae	Hesperoperla pacifica	6
Perlidae	Perlidae	3
Perlodidae	Perlodidae	3
COLEOPTERA		**151**
Elmidae	Heterlimnius corpulentus	145
Elmidae	Narpus concolor	3
Elmidae	Zaitzevia parvula	3
TRICHOPTERA		**103**
Brachycentridae	Brachycentrus americanus	3
Brachycentridae	Micrasema bactro	38
Hydropsychidae	Arctopsyche grandis	24
Hydropsychidae	Cheumatopsyche sp.	3
Hydropsychidae	Parapsyche elsis	1
Rhyacophilidae	Rhyacophila brunnea gr.	18
Rhyacophilidae	Rhyacophila hyalinata gr.	8
Uenoidae	Oligophlebodes minutus	8
DIPTERA		**416**
Ceratopogonidae	Ceratopogoninae	68
Chironomidae	Chironomidae	311
Muscidae	Limnophora sp.	3
Psychodidae	Pericoma sp.	25
Tipulidae	Hexatoma sp.	3
Tipulidae	Tipula sp.	6
ANNELIDA		
OLIGOCHAETA		**95**
Enchytraeidae	Enchytraeidae	95

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-15
SAMPLED: 9/17/07

TAXA	REP 1
TOTAL NUMBER (#/sample)	939
NUMBER OF TAXA	28
SHANNON-WEAVER (H')	3.35
TOTAL EPT TAXA	18
EPT INDEX (% of Total Number of Taxa)	64
EPHEMEROPTERA ABUNDANCE (% of Total Number)	14.8
# EPHEMEROPTERA TAXA	4
# PLECOPTERA TAXA	6
# TRICHOPTERA TAXA	8
% EPT (% of Total Number)	29.5
# INTOLERANT TAXA	23
TOLERANT ORGANISMS (% of Total Number)	10.1
DOMINANT TAXON (% of Total Number)	33.1
FILTERERS (% of Total Number)	3.2
SCRAPERS (% of Total Number)	10.2
# CLINGER TAXA	18
CLINGERS (% of Total Number)	42.8

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-20
SAMPLED: 9/17/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**26**
Ameletidae	Ameletus sp.	23
Heptageniidae	Heptageniidae	3
PLECOPTERA		**53**
Chloroperlidae	Chloroperlidae	13
Chloroperlidae	Sweltsa sp.	27
Nemouridae	Zapada cinctipes	3
Perlodidae	Cultus aestivalis	7
Perlodidae	Isoperla sp.	3
COLEOPTERA		**240**
Elmidae	Heterlimnius corpulentus	240
TRICHOPTERA		**57**
Brachycentridae	Micrasema bactro	13
Hydroptilidae	Hydroptila sp.	7
Lepidostomatidae	Lepidostoma sp.	7
Limnephilidae	Limnephilidae	7
Uenoidae	Oligophlebodes minutus	23
DIPTERA		**719**
Ceratopogonidae	Ceratopogoninae	10
Chironomidae	Chironomidae	693
Empididae	Wiedemannia sp.	3
Psychodidae	Pericoma sp.	7
Simuliidae	Simulium sp.	3
Tipulidae	Hexatoma sp.	3
HYDRACARINA		**9**
Sperchontidae	Sperchon sp.	3
Sperchontidae	Sperchonopsis sp.	3
Torrenticolidae	Torrenticola sp.	3
ANNELIDA		
OLIGOCHAETA		**186**
Enchytraeidae	Enchytraeidae	173
Tubificidae	Unid. Immature Tubificidae w/ Capilliform Chaetae	10
Tubificidae	Unid. Immature Tubificidae w/o Capilliform Chaetae	3

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-20
SAMPLED: 9/17/07

TAXA	REP 1
TOTAL NUMBER (#/sample)	1290
NUMBER OF TAXA	25
SHANNON-WEAVER (H')	2.30
TOTAL EPT TAXA	12
EPT INDEX (% of Total Number of Taxa)	48
EPHEMEROPTERA ABUNDANCE (% of Total Number)	2.0
# EPHEMEROPTERA TAXA	2
# PLECOPTERA TAXA	5
# TRICHOPTERA TAXA	5
% EPT (% of Total Number)	10.5
# INTOLERANT TAXA	14
TOLERANT ORGANISMS (% of Total Number)	15.1
DOMINANT TAXON (% of Total Number)	53.7
FILTERERS (% of Total Number)	0.2
SCRAPERS (% of Total Number)	2.0
# CLINGER TAXA	11
CLINGERS (% of Total Number)	26.5

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-OPP1
SAMPLED: 9/17/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**67**
Ameletidae	Ameletus sp.	4
Ephemerellidae	Drunella doddsi	30
Heptageniidae	Rhithrogena robusta	33
PLECOPTERA		**315**
Capniidae	Capniidae	17
Chloroperlidae	Chloroperlidae	53
Chloroperlidae	Sweltsa sp.	173
Nemouridae	Zapada cinctipes	33
Nemouridae	Zapada oregonensis gr.	30
Perlodidae	Megarcys signata	3
Perlodidae	Perlodidae	3
Perlodidae	Skwala americana	3
COLEOPTERA		**413**
Elmidae	Heterlimnius corpulentus	410
Elmidae	Narpus concolor	3
TRICHOPTERA		**76**
Glossosomatidae	Glossosoma sp.	3
Hydropsychidae	Arctopsyche grandis	7
Rhyacophilidae	Rhyacophila brunnea gr.	3
Rhyacophilidae	Rhyacophila sibirica gr.	3
Uenoidae	Oligophlebodes minutus	60
DIPTERA		**736**
Ceratopogonidae	Ceratopogoninae	57
Chironomidae	Chironomidae	583
Empididae	Oreogeton sp.	3
Psychodidae	Pericoma sp.	53
Tipulidae	Dicranota sp.	10
Tipulidae	Hexatoma sp.	30
HYDRACARINA		**17**
Lebertiidae	Lebertia sp.	7
Sperchontidae	Sperchon sp.	7
Sperchontidae	Sperchonopsis sp.	3
NEMATODA		**3**
Nematoda	Unid. Nematoda	3

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: COAL-OPP1
SAMPLED: 9/17/07

TAXA		REP 1
ANNELIDA		
OLIGOCHAETA		**17**
Enchytraeidae	Enchytraeidae	10
Tubificidae	Unid. Immature Tubificidae w/o Capilliform Chaetae	7
HIRUDINEA		**3**
Glossiphoniidae	Glossiphonia complanata	3
TOTAL NUMBER (#/sample)		1647
NUMBER OF TAXA		31
SHANNON-WEAVER (H')		3.07
TOTAL EPT TAXA		16
EPT INDEX (% of Total Number of Taxa)		52
EPHEMEROPTERA ABUNDANCE (% of Total Number)		4.1
# EPHEMEROPTERA TAXA		3
# PLECOPTERA TAXA		8
# TRICHOPTERA TAXA		5
% EPT (% of Total Number)		27.8
# INTOLERANT TAXA		21
TOLERANT ORGANISMS (% of Total Number)		2.2
DOMINANT TAXON (% of Total Number)		35.4
FILTERERS (% of Total Number)		0.4
SCRAPERS (% of Total Number)		5.6
# CLINGER TAXA		15
CLINGERS (% of Total Number)		49.6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-00
SAMPLED: 9/17/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**168**
Baetidae	Baetis tricaudatus	33
Ephemerellidae	Drunella doddsi	100
Heptageniidae	Rhithrogena robusta	35
PLECOPTERA		**61**
Chloroperlidae	Chloroperlidae	33
Chloroperlidae	Sweltsa sp.	5
Nemouridae	Zapada oregonensis	20
Perlodidae	Perlodidae	3
COLEOPTERA		**3**
Elmidae	Heterlimnius corpulentus	3
TRICHOPTERA		**121**
Hydropsychidae	Arctopsyche grandis	48
Hydropsychidae	Parapsyche elsis	32
Limnephilidae	Limnephilidae	3
Rhyacophilidae	Rhyacophila brunnea gr.	10
Rhyacophilidae	Rhyacophila hyalinata gr.	5
Rhyacophilidae	Rhyacophila sp.	5
Rhyacophilidae	Rhyacophila vofixa gr.	15
Uenoidae	Neothremma alicia	3
DIPTERA		**239**
Ceratopogonidae	Ceratopogoninae	5
Chironomidae	Chironomidae	209
Empididae	Neoplasta sp.	10
Empididae	Wiedemannia sp.	10
Simuliidae	Simulium sp.	5
TURBELLARIA		**120**
Planariidae	Polycelis coronata	120

TOTAL NUMBER (#/sample)	712
NUMBER OF TAXA	22
SHANNON-WEAVER (H')	3.34
TOTAL EPT TAXA	15
EPT INDEX (% of Total Number of Taxa)	68
EPHEMEROPTERA ABUNDANCE (% of Total Number)	23.6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-00
SAMPLED: 9/17/07

TAXA	REP 1
# EPHEMEROPTERA TAXA	3
# PLECOPTERA TAXA	4
# TRICHOPTERA TAXA	8
% EPT (% of Total Number)	49.2
# INTOLERANT TAXA	16
TOLERANT ORGANISMS (% of Total Number)	0.0
DOMINANT TAXON (% of Total Number)	29.4
FILTERERS (% of Total Number)	7.4
SCRAPERS (% of Total Number)	14.5
# CLINGER TAXA	15
CLINGERS (% of Total Number)	46.2

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-05
SAMPLED: 9/18/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**25**
Baetidae	Baetis bicaudatus	23
Ephemerellidae	Drunella doddsi	2
PLECOPTERA		**67**
Capniidae	Capniidae	2
Chloroperlidae	Sweltsa sp.	7
Nemouridae	Zapada oregonensis gr.	53
Perlodidae	Cultus aestivalis	5
COLEOPTERA		**3**
Dytiscidae	Liodessus obscurellus	3
TRICHOPTERA		**87**
Hydropsychidae	Arctopsyche grandis	17
Hydropsychidae	Parapsyche elsis	7
Limnephilidae	Ecclisomyia sp.	3
Limnephilidae	Hesperophylax sp.	2
Rhyacophilidae	Rhyacophila hyalinata gr.	28
Rhyacophilidae	Rhyacophila vofixa gr.	30
DIPTERA		**216**
Chironomidae	Chironomidae	209
Empididae	Neoplasta sp.	7
HYDRACARINA		**3**
Sperchontidae	Sperchonopsis sp.	3
TURBELLARIA		**165**
Planariidae	Polycelis coronata	165
ANNELIDA		
OLIGOCHAETA		**6**
Enchytraeidae	Enchytraeidae	6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-05
SAMPLED: 9/18/07

TAXA	REP 1
TOTAL NUMBER (#/sample)	572
NUMBER OF TAXA	18
SHANNON-WEAVER (H')	2.71
TOTAL EPT TAXA	12
EPT INDEX (% of Total Number of Taxa)	67
EPHEMEROPTERA ABUNDANCE (% of Total Number)	4.4
# EPHEMEROPTERA TAXA	2
# PLECOPTERA TAXA	4
# TRICHOPTERA TAXA	6
% EPT (% of Total Number)	31.3
# INTOLERANT TAXA	11
TOLERANT ORGANISMS (% of Total Number)	1.6
DOMINANT TAXON (% of Total Number)	36.5
FILTERERS (% of Total Number)	3.0
SCRAPERS (% of Total Number)	0.3
# CLINGER TAXA	9
CLINGERS (% of Total Number)	26.6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-06
SAMPLED: 9/18/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**3**
Baetidae	Baetidae	3
PLECOPTERA		**1**
Perlodidae	Skwala americana	1
TRICHOPTERA		**7**
Hydropsychidae	Arctopsyche grandis	3
Hydropsychidae	Parapsyche elsis	2
Rhyacophilidae	Rhyacophila hyalinata gr.	2
HYDRACARINA		**2**
Sperchontidae	Sperchonopsis sp.	2
TURBELLARIA		**121**
Planariidae	Polycelis coronata	121
NEMATODA		**1**
Nematoda	Unid. Nematoda	1

TOTAL NUMBER (#/sample)	135
NUMBER OF TAXA	8
SHANNON-WEAVER (H')	0.76
TOTAL EPT TAXA	8
EPT INDEX (% of Total Number of Taxa)	100
EPHEMEROPTERA ABUNDANCE (% of Total Number)	2.2

# EPHEMEROPTERA TAXA	1
# PLECOPTERA TAXA	1
# TRICHOPTERA TAXA	3
% EPT (% of Total Number)	100.0
# INTOLERANT TAXA	6
TOLERANT ORGANISMS (% of Total Number)	1.5
DOMINANT TAXON (% of Total Number)	89.6
FILTERERS (% of Total Number)	2.2
SCRAPERS (% of Total Number)	0.0
# CLINGER TAXA	4
CLINGERS (% of Total Number)	5.9

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-08
SAMPLED: 9/18/07

TAXA		REP 1
INSECTA		
PLECOPTERA		**10**
Capniidae	Capniidae	5
Chloroperlidae	Sweltsa sp.	2
Perlodidae	Skwala americana	3
TRICHOPTERA		**8**
Hydropsychidae	Parapsyche elsis	2
Limnephilidae	Psychoglypha sp.	1
Rhyacophilidae	Rhyacophila brunnea gr.	2
Rhyacophilidae	Rhyacophila sp.	1
Uenoidae	Neothremma alicia	2
DIPTERA		**16**
Ceratopogonidae	Ceratopogoninae	2
Chironomidae	Chironomidae	9
Empididae	Neoplasta sp.	4
Empididae	Oreogeton sp.	1
TURBELLARIA		**52**
Planariidae	Polycelis coronata	52

TOTAL NUMBER (#/sample)	86
NUMBER OF TAXA	13
SHANNON-WEAVER (H')	2.25
TOTAL EPT TAXA	8
EPT INDEX (% of Total Number of Taxa)	62
EPHEMEROPTERA ABUNDANCE (% of Total Number)	0.0

# EPHEMEROPTERA TAXA	0
# PLECOPTERA TAXA	3
# TRICHOPTERA TAXA	5
% EPT (% of Total Number)	20.9
# INTOLERANT TAXA	9
TOLERANT ORGANISMS (% of Total Number)	0.0
DOMINANT TAXON (% of Total Number)	60.5
FILTERERS (% of Total Number)	0.0
SCRAPERS (% of Total Number)	2.3
# CLINGER TAXA	5
CLINGERS (% of Total Number)	11.6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-10
SAMPLED: 9/19/07

TAXA		REP 1
INSECTA		
DIPTERA		**2**
Ceratopogonidae	Dasyheleinae	1
Tipulidae	Ormosia sp.	1
TOTAL NUMBER (#/sample)		2
NUMBER OF TAXA		2
SHANNON-WEAVER (H')		1.00
TOTAL EPT TAXA		0
EPT INDEX (% of Total Number of Taxa)		0
EPHEMEROPTERA ABUNDANCE (% of Total Number)		0.0
# EPHEMEROPTERA TAXA		0
# PLECOPTERA TAXA		0
# TRICHOPTERA TAXA		0
% EPT (% of Total Number)		0.0
# INTOLERANT TAXA		1
TOLERANT ORGANISMS (% of Total Number)		0.0
DOMINANT TAXON (% of Total Number)		50.0
FILTERERS (% of Total Number)		0.0
SCRAPERS (% of Total Number)		0.0
# CLINGER TAXA		0
CLINGERS (% of Total Number)		0.0

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-29
SAMPLED: 9/19/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**80**
Ameletidae	Ameletus sp.	5
Baetidae	Baetis tricaudatus	5
Heptageniidae	Heptageniidae	70
PLECOPTERA		**341**
Capniidae	Capniidae	30
Chloroperlidae	Chloroperlidae	105
Chloroperlidae	Sweltsa sp.	90
Nemouridae	Zapada cinctipes	85
Nemouridae	Zapada oregonensis gr.	15
Nemouridae	Zapada sp.	10
Perlidae	Hesperoperla pacifica	6
TRICHOPTERA		**115**
Limnephilidae	Limnephilidae	15
Rhyacophilidae	Rhyacophila vofixa gr.	5
Uenoidae	Neothremma alicia	95
DIPTERA		**525**
Ceratopogonidae	Ceratopogoninae	15
Chironomidae	Chironomidae	440
Empididae	Neoplasta sp.	15
Empididae	Oreogeton sp.	45
Tipulidae	Dicranota sp.	5
Tipulidae	Tipula sp.	5
HYDRACARINA		**1**
Sperchontidae	Sperchonopsis sp.	1
TURBELLARIA		**55**
Planariidae	Polycelis coronata	55
ANNELIDA		
OLIGOCHAETA		**170**
Enchytraeidae	Enchytraeidae	170

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: ELK-29
SAMPLED: 9/19/07

TAXA	REP 1
TOTAL NUMBER (#/sample)	1287
NUMBER OF TAXA	22
SHANNON-WEAVER (H')	3.29
TOTAL EPT TAXA	13
EPT INDEX (% of Total Number of Taxa)	59
EPHEMEROPTERA ABUNDANCE (% of Total Number)	6.2
# EPHEMEROPTERA TAXA	3
# PLECOPTERA TAXA	7
# TRICHOPTERA TAXA	3
% EPT (% of Total Number)	41.6
# INTOLERANT TAXA	15
TOLERANT ORGANISMS (% of Total Number)	13.3
DOMINANT TAXON (% of Total Number)	34.2
FILTERERS (% of Total Number)	0.0
SCRAPERS (% of Total Number)	12.8
# CLINGER TAXA	6
CLINGERS (% of Total Number)	22.6

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: SP-00
SAMPLED: 9/18/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**285**
Ameletidae	Ameletus sp.	50
Baetidae	Baetis tricaudatus	40
Ephemerellidae	Drunella doddsi	25
Heptageniidae	Rhithrogena robusta	170
PLECOPTERA		**250**
Capniidae	Capniidae	5
Chloroperlidae	Chloroperlidae	20
Chloroperlidae	Plumiperla diversa	55
Chloroperlidae	Sweltsa sp.	80
Nemouridae	Zapada cinctipes	25
Nemouridae	Zapada oregonensis	10
Perlidae	Hesperoperla pacifica	15
Perlodidae	Megarcys signata	5
Perlidae	Perlidae	20
Taeniopterygidae	Taeniopterygidae	15
COLEOPTERA		**65**
Elmidae	Heterlimnius corpulentus	65
TRICHOPTERA		**95**
Brachycentridae	Brachycentridae	20
Hydropsychidae	Parapsyche elsis	5
Limnephilidae	Ecclisomyia sp.	15
Rhyacophilidae	Rhyacophila brunnea gr.	10
Rhyacophilidae	Rhyacophila sibirica gr.	35
Uenoidae	Neothremma alicia	10
DIPTERA		**1481**
Ceratopogonidae	Ceratopogoninae	10
Chironomidae	Chironomidae	1455
Empididae	Oreogeton sp.	10
Tipulidae	Dicranota sp.	5
Tipulidae	Hexatoma sp.	1
HYDRACARINA		**25**
Sperchontidae	Sperchon sp.	5
Sperchontidae	Sperchonopsis sp.	15
Torrenticolidae	Torrenticola sp.	5
TURBELLARIA		**20**
Planariidae	Polycelis coronata	20

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: SP-00
SAMPLED: 9/18/07

TAXA		REP 1
ANNELIDA		
OLIGOCHAETA		**47**
Enchytraeidae	Enchytraeidae	35
Lumbricidae	Eiseniella tetraedra	2
Tubificidae	Unid. Immature Tubificidae w/o Capilliform Chaetae	10
TOTAL NUMBER (#/sample)		2268
NUMBER OF TAXA		33
SHANNON-WEAVER (H')		2.46
TOTAL EPT TAXA		20
EPT INDEX (% of Total Number of Taxa)		61
EPHEMEROPTERA ABUNDANCE (% of Total Number)		12.6
# EPHEMEROPTERA TAXA		4
# PLECOPTERA TAXA		10
# TRICHOPTERA TAXA		6
% EPT (% of Total Number)		27.8
# INTOLERANT TAXA		23
TOLERANT ORGANISMS (% of Total Number)		3.1
DOMINANT TAXON (% of Total Number)		64.2
FILTERERS (% of Total Number)		0.9
SCRAPERS (% of Total Number)		1.5
# CLINGER TAXA		15
CLINGERS (% of Total Number)		24.3

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: SP-01
SAMPLED: 9/18/07

TAXA		REP 1
INSECTA		
EPHEMEROPTERA		**275**
Ameletidae	Ameletus sp.	80
Ephemerellidae	Drunella doddsi	30
Ephemerellidae	Ephemerella dorothea/excrucians	50
Heptageniidae	Rhithrogena robusta	115
PLECOPTERA		**186**
Capniidae	Capniidae	20
Chloroperlidae	Chloroperlidae	5
Chloroperlidae	Sweltsa sp.	50
Nemouridae	Zapada cinctipes	20
Nemouridae	Zapada oregonensis gr.	70
Perlidae	Hesperoperla pacifica	6
Perlidae	Perlidae	5
Taeniopterygidae	Taenionema sp.	10
COLEOPTERA		**170**
Elmidae	Heterlimnius corpulentus	170
TRICHOPTERA		**35**
Hydropsychidae	Hydropsychidae	5
Philopotamidae	Dolophilodes aequalis	5
Rhyacophilidae	Rhyacophila brunnea gr.	20
Uenoidae	Neothremma alicia	5
DIPTERA		**740**
Chironomidae	Chironomidae	715
Psychodidae	Pericoma sp.	5
Simuliidae	Simulium sp.	20
HYDRACARINA		**5**
Lebertiidae	Lebertia sp.	5
ANNELIDA		
OLIGOCHAETA		**170**
Enchytraeidae	Enchytraeidae	170

MACROINVERTEBRATE DENSITY
CLIENT: SYRACUSE RESEARCH
STANDARD MINE
SITE: SP-01
SAMPLED: 9/18/07

TAXA	REP 1
TOTAL NUMBER (#/sample)	1581
NUMBER OF TAXA	22
SHANNON-WEAVER (H')	2.90
TOTAL EPT TAXA	16
EPT INDEX (% of Total Number of Taxa)	73
EPHEMEROPTERA ABUNDANCE (% of Total Number)	17.4
# EPHEMEROPTERA TAXA	4
# PLECOPTERA TAXA	8
# TRICHOPTERA TAXA	4
% EPT (% of Total Number)	31.4
# INTOLERANT TAXA	18
TOLERANT ORGANISMS (% of Total Number)	11.1
DOMINANT TAXON (% of Total Number)	45.2
FILTERERS (% of Total Number)	1.6
SCRAPERS (% of Total Number)	2.8
# CLINGER TAXA	13
CLINGERS (% of Total Number)	34.9

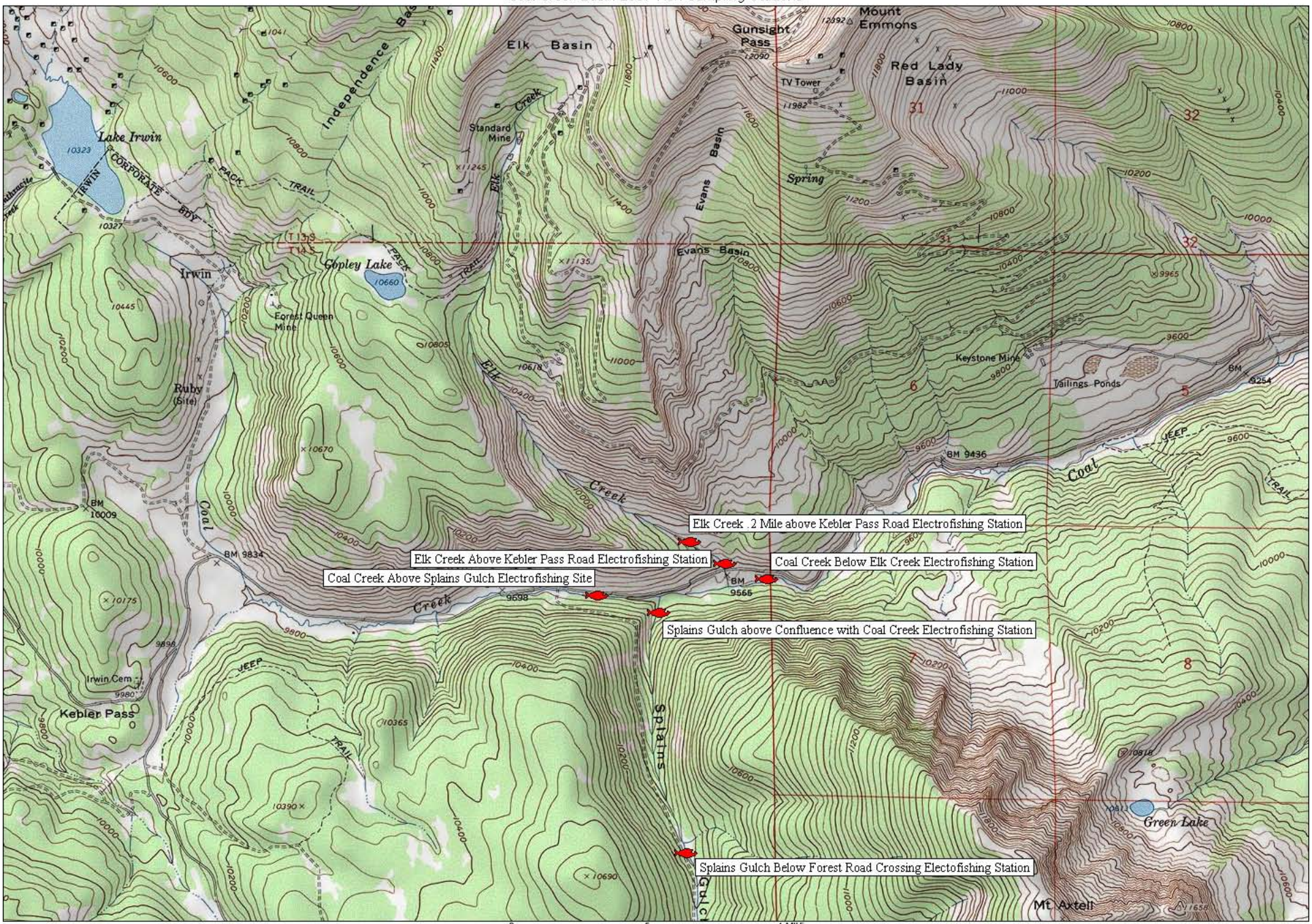
Appendix B

Colorado Division of Wildlife Fisheries Inventory

Coal Creek Basin
2007 Fish Inventory Results

Daniel Brauch
Colorado Division of Wildlife
Aquatic Section
Gunnison, Colorado
February 2008

Coal Creek Basin 2007 Fish Sampling Stations



LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Coal Creek**
Location: Below Elk Creek
Drainage: Gunnison
Crew: Brauch, Jones et.al.
Date: 9/18/2007
Water Code: 39140
Notes: UTM's in NAD83; Bank Electrofishing with 3 electrodes.
UTM Zone: 13T
UTM X: 321538
UTM Y: 4302840
Station Length (ft): 300
Station Width (ft): 15.6

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	111	100	86	0.83	2007	89	1061	47	81	4

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK			5	14	6	40	22	14	12	12	2	3																			

Sample Location: Coal-15
Coal Creek below Elk Creek

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Coal Creek**
Location: .3 M above conf. with Splains Gulch
Drainage: Gunnison
Crew: Brauch, Jones, Gunn, Lamar"
Notes: UTM's in NAD83; Backpack Electrofishing."

Date: 9/18/2007
Water Code: 39140
UTM Zone: 13T
UTM X: 320472
UTM Y: 4302779
Station Length (ft): 300
Station Width (ft): 10.8

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	31	100	86	0.97	546	7	417	5	43	1

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK			1	9	2	5	11	1	5	5	3	1																			

Sample Location: Coal-25E
Coal Creek .3M above confluence with Splains Gulch

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Elk Creek**
Location: Just above Kebler Pass Road
Drainage: Gunnison
Crew: Brauch, Jones
Date: 9/19/07
Water Code: 38166
Notes: UTM's in NAD83, backpack electrofishing.
UTM Zone: 13T
UTM X: 321278
UTM Y: 4302931
Station Length (ft): 150
Station Width (ft): 6.5

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	32	100	86	0.57	1390	596	1765	757	144	62

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK						4	5	13	5	4	1																				

Sample Location: Elk-00
Elk Creek just above Kebler Pass Road

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water	Elk Creek
Location	0.2 Mile Above Kebler Pass Road
Drainage	Gunnison
Crew	Brauch, Jones, Lamar, Gunn"
Date	9/19/07
Water Code	38166
UTM Zone	13T
UTM X	321053
UTM Y	4303088
Station Length (ft)	900
Station Width (ft)	7.2

Notes

UTM"S in NAD83, No fish sampled or seen, backpack electrofishing.

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60

Sample Location: Elk-01
Elk Creek .2 Mile above Kebler Pass Road

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Splains Gulch**
Date: 9/19/07
Location: Above Confluence with Coal Creek
Drainage: Gunnison
Water Code: 49254
Crew: Brauch, Jones, Gunn , Reese, Bosco"
Notes: UTM's in NAD83; One third of flow going down side channel to east (Dry in 2006), backpack electrofishing
UTM Zone: 13T
UTM X: 320861
UTM Y: 4302655
Station Length (ft): 300
Station Width (ft): 7.6

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	41	100	86	0.83	740	55	803	60	80	6

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK			41	11	3	11	4	10	7	4	2																				

Sample Location: SP-00
Splains Gulch above Confluence with Coal Creek

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Splains Gulch**
Date: 9/19/07
Location: Below Forest Road Crossing
Drainage: Gunnison
Water Code: 49254
Crew: Brauch, Jones, Gunn
Notes: UTM's in NAD83, backpack electrofishing.
UTM Zone: 13T
UTM X: 321011
UTM Y: 4301192
Station Length (ft): 300
Station Width (ft): 8.2

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	15	100	86	0.86	267	29	269	29	28	3

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK			31	19		5	1	2	4	3																					

Sample Location: SP-01
Splains Gulch below Forest Road Crossing

EPA Station ID: Coal-25E
Water: Coal Creek
Date: 9/18/2007
Location: .3 M above conf. with Splains Gulch
Drainage: Gunnison
Water Code: 39140
UTM Zone: 13T
UTM X: 320472 m
UTM Y: 4302779 m
Station Length = 300 ft
Station Width = 10.8 ft
Crew: Brauch, Jones, Gunn, Lamar
Notes: UTM's in NAD83; Backpack Electrofishing.

Species	Count	Length (mm)	Weight (g)	Status	Mark	TagID
BRK	1	80		2		
BRK	1	80		2		
BRK	1	75		2		
BRK	1	73		2		
BRK	1	73		2		
BRK	1	106	11	2		
BRK	1	215	97	1		
BRK	1	185	69	1		
BRK	1	141	33	1		
BRK	1	138	26	1		
BRK	1	184	56	1		
BRK	1	135	30	1		
BRK	1	195	76	1		
BRK	1	115	17	1		
BRK	1	130	24	1		
BRK	1	121	15	1		
BRK	1	120	24	1		
BRK	1	132	21	1		
BRK	1	121	22	1		
BRK	1	181	59	1		
BRK	1	210	166	1		
BRK	1	164	46	1		
BRK	1	234	136	1		
BRK	1	205	99	1		
BRK	1	167	49	1		
BRK	1	168	60	1		
BRK	1	133	24	1		
BRK	1	182	69	1		
BRK	1	163	45	1		
BRK	1	130	30	1		
BRK	1	167	44	1		
BRK	1	121	25	1		
BRK	1	105	12	1		
BRK	1	125	29	1		
BRK	1	108	11	1		
BRK	1	109	14	1		
BRK	1	71		1		

BRK	1	74	1
BRK	1	78	1
BRK	1	70	1
BRK	1	73	1
BRK	1	56	1
BRK	1	65	1

EPA Station ID: Coal-15
Water: Coal Creek
Date: 9/18/2007
Location: Below Elk Creek
Drainage: Gunnison
Water Code: 39140
UTM Zone: 13T
UTM X: 321538 m
UTM Y: 4302840 m
Station Length = 300 ft
Station Width = 15.6 ft
Crew: Brauch, Jones et.al.
Notes: UTM's in NAD83; Bank Electrofishing with 3 electrodes.

Species	Count	Length (mm)	Weight (g)	Status	Mark	TagID
BRK	1	215	95	2		
BRK	1	68		2		
BRK	1	57		2		
BRK	1	57		2		
BRK	1	73		2		
BRK	1	62		2		
BRK	1	185	82	2		
BRK	1	147	38	2		
BRK	1	143	34	2		
BRK	1	123	20	2		
BRK	1	127	25	2		
BRK	1	110	17	2		
BRK	1	108	17	2		
BRK	1	92	11	2		
BRK	1	110	17	2		
BRK	1	108	12	2		
BRK	1	98	13	2		
BRK	1	108	15	2		
BRK	1	103	15	2		
BRK	1	104	14	2		
BRK	1	105	10	2		
BRK	1	60		2		
BRK	1	175	63	1		
BRK	1	162	49	1		
BRK	1	238	121	1		
BRK	1	150	35	1		
BRK	1	151	36	1		
BRK	1	135	42	1		
BRK	1	137	39	1		
BRK	1	153	38	1		
BRK	1	168	69	1		
BRK	1	168	57	1		
BRK	1	159	60	1		
BRK	1	118	20	1		
BRK	1	132	28	1		
BRK	1	190	97	1		
BRK	1	139	28	1		

BRK	1	128	41	1
BRK	1	157	37	1
BRK	1	140	35	1
BRK	1	140	24	1
BRK	1	152	33	1
BRK	1	111	17	1
BRK	1	137	28	1
BRK	1	104	13	1
BRK	1	133	22	1
BRK	1	115	14	1
BRK	1	141	27	1
BRK	1	115	16	1
BRK	1	108	10	1
BRK	1	115	15	1
BRK	1	116	17	1
BRK	1	108	12	1
BRK	1	101	11	1
BRK	1	110	15	1
BRK	1	235	112	1
BRK	1	164	51	1
BRK	1	238	127	1
BRK	1	180	63	1
BRK	1	199	89	1
BRK	1	173	57	1
BRK	1	150	41	1
BRK	1	186	54	1
BRK	1	190	62	1
BRK	1	182	65	1
BRK	1	189	68	1
BRK	1	172	62	1
BRK	1	148	37	1
BRK	1	138	31	1
BRK	1	137	25	1
BRK	1	115	14	1
BRK	1	136	28	1
BRK	1	124	15	1
BRK	1	121	21	1
BRK	1	108	112	1
BRK	1	129	28	1
BRK	1	125	17	1
BRK	1	58		1
BRK	1	174	70	1
BRK	1	165	46	1
BRK	1	182	83	1
BRK	1	180	51	1
BRK	1	185	69	1
BRK	1	138	29	1
BRK	1	171	52	1
BRK	1	207	102	1
BRK	1	114	16	1
BRK	1	165	46	1
BRK	1	162	49	1

BRK	1	185	72	1
BRK	1	120	17	1
BRK	1	127	22	1
BRK	1	63		1
BRK	1	60		1
BRK	1	64		1
BRK	1	73		1
BRK	1	68		1
BRK	1	64		1
BRK	1	66		1
BRK	1	58		1
BRK	1	71		1
BRK	1	58		1
BRK	1	103	10	1
BRK	1	110	16	1
BRK	1	140	23	1
BRK	1	100	16	1
BRK	1	106	14	1
BRK	1	101	13	1
BRK	1	65		1
BRK	1	94	7	1
BRK	1	94	8	1
BRK	1	118	19	1
BRK	1	138	25	1
BRK	1	132	18	1
BRK	1	103	12	1
BRK	1	100	6	1
BRK	1	115	14	1
BRK	1	104	11	1
BRK	1	122	29	1
BRK	1	100	9	1
BRK	1	105	8	1
BRK	1	105	13	1
BRK	1	96	11	1
BRK	1	102	10	1
BRK	1	104	14	1
BRK	1	104	10	1
BRK	1	104	14	1
BRK	1	104	15	1
BRK	1	97	8	1
BRK	1	72		1

EPA Station ID: Elk-05 (not exactly)
Water: Elk Creek
Date:9/19/07
Location: 0.2 Mile Above Kebler Pass Road
Drainage: Gunnison
Water Code:38166
UTM Zone: 13T
UTM X: 321053 m
UTM Y: 4303088 m
Station Length = 900 ft
Station Width = 7.25
Crew: Brauch, Jones, Lamar, Gunn
Notes:UTM"S in NAD83, No fish sampled or seen, backpack electrofishing.

Species	Count	Length (mr	Weight (g)	Status	Mark	TagID

EPA Station ID: Elk-00
Water: Elk Creek
Date:9/19/07
Location: Just above Kebler Pass Road
Drainage: Gunnison
Water Code:38166
UTM Zone: 13T
UTM X: 321278 m
UTM Y: 4302931 m
Station Length = 150 ft
Station Width = 6.5
Crew: Brauch, Jones
Notes: UTM's in NAD83, backpack electrofishing.

Species	Count	Length (mm)	Weight (g)	Status	Mark	TagID
BRK	1	147	30	2		
BRK	1	148	32	2		
BRK	1	133	28	2		
BRK	1	130	24	2		
BRK	1	175	56	2		
BRK	1	157	41	2		
BRK	1	157	40	2		
BRK	1	142	23	2		
BRK	1	103	10	2		
BRK	1	106	9	2		
BRK	1	121	16	1		
BRK	1	186	61	1		
BRK	1	141	28	1		
BRK	1	197	70	1		
BRK	1	182	56	1		
BRK	1	175	64	1		
BRK	1	181	64	1		
BRK	1	138	23	1		
BRK	1	154	36	1		
BRK	1	152	38	1		
BRK	1	215	89	1		
BRK	1	160	32	1		
BRK	1	155	36	1		
BRK	1	103	12	1		
BRK	1	164	50	1		
BRK	1	149	36	1		
BRK	1	167	50	1		
BRK	1	140	24	1		
BRK	1	144	38	1		
BRK	1	140	31	1		
BRK	1	112	17	1		
BRK	1	127	22	1		

EPA Station ID: SP-01
Water: Splains Gulch
Date:9/19/07
Location: Below Forest Road Crossing
Drainage: Gunnison
Water Code:49254
UTM Zone: 13T
UTM X: 321011m
UTM Y: 4301192m
Station Length = 300 ft
Station Width = 8.2 ft
Crew: Brauch, Jones, Gunn
Notes:UTM's in NAD83, backpack electrofishing.

Species	Count	Length (mm	Weight (g)	Status	Mark	TagID
BRK	1	180	88	1		
BRK	1	170	83	1		
BRK	1	156	59	1		
BRK	1	176	66	1		
BRK	1	184	66	1		
BRK	1	127	26	1		
BRK	1	101	15	1		
BRK	1	160	63	1		
BRK	1	186	72	1		
BRK	1	143	30	1		
BRK	1	55		1		
BRK	1	62		1		
BRK	1	65		1		
BRK	1	113	25	1		
BRK	1	52		1		
BRK	1	54		1		
BRK	1	55		1		
BRK	1	60		1		
BRK	1	110	14	1		
BRK	1	103	10	1		
BRK	1	58		1		
BRK	1	61		1		
BRK	1	60		1		
BRK	1	62		1		
BRK	1	62		1		
BRK	1	70		1		
BRK	1	64		1		
BRK	1	52		1		
BRK	1	61		1		
BRK	1	65		1		
BRK	1	59		1		
BRK	1	58		1		
BRK	1	58		1		
BRK	1	65		1		
BRK	1	58		1		
BRK	1	59		1		
BRK	1	53		1		

BRK	1	66		1
BRK	1	57		1
BRK	1	53		1
BRK	1	50		1
BRK	1	59		1
BRK	1	62		1
BRK	1	42		1
BRK	1	57		1
BRK	1	57		1
BRK	1	59		1
BRK	1	60		1
BRK	1	59		1
BRK	1	67		1
BRK	1	55		1
BRK	1	58		1
BRK	1	58		1
BRK	1	45		1
BRK	1	58		1
BRK	1	175	66	2
BRK	1	115	20	2
BRK	1	49		2
BRK	1	67		2
BRK	1	61		2
BRK	1	62		2
BRK	1	47		2
BRK	1	58		2
BRK	1	43		2
BRK	1	54		2

EPA Station: SP-00
Water: Splains Gulch
Date: 9/19/2007
Location: Above Confluence with Coal Creek
Drainage: Gunnison
Water Code: 49254
UTM Zone: 13T
UTM X: 320861m
UTM Y: 4302655m
Station Length 300 ft
Station Width 7.6 ft
Crew: Brauch, Jones, Gunn , Reese, Bosco

Notes: UTM's in NAD83; One third of flow going down side channel to east (Dry in 2006), backpack electrofishing

Species	Count	Length (mr	Weight (g)	Status	Mark	TagID
BRK	1	180	62	1		
BRK	1	55	12	1		
BRK	1	195	90	1		
BRK	1	160	56	1		
BRK	1	130	39	1		
BRK	1	150	55	1		
BRK	1	155	49	1		
BRK	1	185	92	1		
BRK	1	174	67	1		
BRK	1	215	114	1		
BRK	1	101	27	1		
BRK	1	142	50	1		
BRK	1	154	59	1		
BRK	1	211	119	1		
BRK	1	145	56	1		
BRK	1	160	58	1		
BRK	1	104	34	1		
BRK	1	156	43	1		
BRK	1	99	23	1		
BRK	1	121	31	1		
BRK	1	159	49	1		
BRK	1	61		1		
BRK	1	169	59	1		
BRK	1	105	24	1		
BRK	1	59		1		
BRK	1	47		1		
BRK	1	49		1		
BRK	1	164	55	1		
BRK	1	49		1		
BRK	1	57		1		
BRK	1	51		1		

BRK	1	58		1
BRK	1	44		1
BRK	1	61		1
BRK	1	57		1
BRK	1	54		1
BRK	1	52		1
BRK	1	61		1
BRK	1	61		1
BRK	1	52		1
BRK	1	57		1
BRK	1	54		1
BRK	1	60		1
BRK	1	69		1
BRK	1	60		1
BRK	1	62		1
BRK	1	50		1
BRK	1	62		1
BRK	1	62		1
BRK	1	53		1
BRK	1	52		1
BRK	1	55		1
BRK	1	57		1
BRK	1	57		1
BRK	1	55		1
BRK	1	47		1
BRK	1	55		1
BRK	1	60		1
BRK	1	152	43	1
BRK	1	153	46	1
BRK	1	105	29	1
BRK	1	125	25	1
BRK	1	124	21	1
BRK	1	99	18	1
BRK	1	103	23	1
BRK	1	104	17	1
BRK	1	118	22	1
BRK	1	95	12	1
BRK	1	105	15	1
BRK	1	115	20	1
BRK	1	101	14	2
BRK	1	180	70	2
BRK	1	158	37	2
BRK	1	171	53	2
BRK	1	174	63	2
BRK	1	109	13	2
BRK	8	yoy		2
BRK	9	yoy		1

Appendix C

Aquatic Toxicity Testing Report for Standard Mine

Appendix D

Sediment Toxicity Testing Report for Standard Mine

Standard Mine
Sediment Toxicity Testing Report
Final

Prepared for:

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Acronym List

ºC	Degrees Celsius
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
ESAT	Environmental Services Assistance Team
LC50	50% Lethal Concentration
MHRW	Moderately Hard Reconstituted Water MHRW
mL	Milliliter
ORD	Office of Research and Development
SAP	Sampling and Analysis Plan
SI	Site Inspection
SOP	Standard Operating Procedure
YCT	Yeast, Cerophyl, and Trout Chow

1.0 INTRODUCTION

A 10-day flow through sediment toxicity test was performed at the United States Environmental Protection Agency (EPA) Region 8 Laboratory to determine the acute toxicity of sediments collected from drainages associated with the Standard Mine, located in Gunnison County, Colorado. Site sediment tests and a reference test were conducted on the amphipod *Hyalella azteca* (*H. azteca*), with evaluation endpoints of growth and mortality. A 96-hour reference toxicity test was performed as a quality assurance measure using an aqueous stock solution, with an endpoint of mortality. This toxicity test report includes a brief background of the Standard Mine area, materials and methods, testing results, a discussion of results, and supporting references.

1.1 Background

The Standard Mine was part of the Ruby Mining District located in Gunnison County, Colorado. Mining activity initially began at the Standard Mine in or around 1874, with the most significant operations beginning in 1931. Operations included the mining of lead, zinc, silver, and gold until 1966, when the mine was abandoned.

The mine consists of many open, unmarked adits and shafts, giving access to 8,400 feet of mine workings on 6 levels. Historically, the site had a dilapidated mill and railroad tracks running 50 feet above ground with rotting wooden support poles. The former mine is near a popular hiking trail and has no access restrictions. Wastes at this mining site are estimated to be 53,560 cubic yards of waste rock and 29,340 cubic yards of mill tailings as well as seasonably variable amounts of water flowing out of the adits. The site is a mixed ownership site consisting of private claims and United States Forest Service land. EPA has conducted non-time critical removal actions at the site that include construction of a mine waste repository on USFS land, removal of the tailings impoundment and waste rock from levels 1, 2, and 3 to the repository, as well as site stabilization and drainage control measures. Elk Creek feeds into Coal Creek, which serves as a drinking water supply for the town of Crested Butte, located approximately four miles downstream from the former mine.

In 1999, a two-phase Site Inspection (SI) was conducted of the Ruby Mining District. Phase I was conducted in June 1999 to assess the environmental conditions during the high stream flow regime (spring runoff), and Phase II was conducted in September 1999 to assess the environmental conditions during the low stream flow regime (URS, 2000). The 1999 SI was limited to surface water since, according to the United States Geological Survey ([USGS], 1980), there are no extensive aquifer systems associated with the Ruby Mining District. SI results revealed elevated concentrations of the following metals during total metals analyses of the surface waters from Coal Creek and its tributaries: aluminum (Al), antimony (Sb), arsenic (As), beryllium (Be), cadmium (Cd), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), nickel (Ni), thallium (Tl), and zinc (Zn).

In 2005 and 2006, several sampling events were conducted at the site in order to evaluate temporal and geospatial changes in stream contaminant concentrations (surface water, sediment, and porewater), evaluate previously unidentified watershed influences and

biological tissue contaminant concentrations, evaluate existing macroinvertebrate assemblage, and evaluate toxicity to benthic and aquatic organisms. This data was utilized for the analysis of site conditions in the Human Health Risk Assessment (HHRA) and Baseline Ecological Risk Assessment (BERA), documents which were finalized in March of 2008 following the response to stakeholder comments on the external review draft.

In 2006 and 2007, EPA removal and preliminary remedial activities took place at the site. The first year included removal of a dilapidated mill, deconstructing the remaining railroad infrastructure, and diverting Elk Creek to the western side of the site in an effort to reduce inputs from adit drainage. In 2007, EPA conducted removal activities at the site which included construction of a mine waste repository on USFS land, removal of the tailings impoundment and waste rock from levels 1, 2, and 3 to the repository area, as well as site stabilization and drainage control measures. In 2007 the Remedial Program installed a passive treatment bioreactor pilot study to ascertain the effectiveness of this technology at remediating acid mine drainage from the level 1 adit. Additionally, several revegetation test plots were installed on waste rock located at level 98 to determine the ratio of soil amendments that is most effective for establishing plant growth on mine waste piles.

1.2 Objective

The objective of this series of toxicity tests was to support the biomonitoring being performed as part of site assessment activities at the Standard Mine. Growth and mortality results will be incorporated into a Biomonitoring Plan which will demonstrate current conditions of remediation effects on streams in the area.

2.0 MATERIALS AND METHODS

This section outlines the materials and methodology employed for the toxicity testing, including sediment collection procedures, water preparation and delivery system, test organisms, food preparation, and laboratory testing procedures. General test methods followed EPA methodology (EPA, 2000) and are discussed below. General testing criteria are included in Table 2.0-1.

2.1 Sediment Collection

Site sediment was collected in September 2007 from locations along Elk Creek, Coal Creek, and Splain's Gulch in accordance with the 2007 Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) for Standard Mine (ESAT, 2007). Using a Teflon hand trowel, sediment was taken from a depth of 0-6". Composite samples were collected at each location (along a 20 meter stretch) due to limited sediment volume observed in the field. Samples were stored in wide mouth 500 milliliter (mL) plastic containers and excess overlying water was decanted from each sample. The containers were placed on ice until received at the Region 8 laboratory, where they were then placed in a 4^{o}C cooler for preservation. Sample collection equipment was decontaminated in accordance with the SAP (ESAT, 2007).

2.2 Water Preparation and Delivery

Moderately hard reconstituted water (MHRW) was prepared in accordance with Smith et al. (1997). Preparation included adding 50 grams of calcium sulfate, 50 grams of calcium carbonate, 30 grams of magnesium sulfate, 96 grams of sodium bicarbonate, and 4 grams of potassium chloride to the laboratory stainless steel batch tank containing 1,000 liters of deionized water. Once MHRW was prepared, the batch tank was continuously aerated for the duration of the toxicity test. Water quality was measured to verify the following parameters had been met: hardness between 90 and 100 milligrams per liter (mg/L), alkalinity between 50 and 70 mg/L, conductivity between 330 and 360 millisiemens/centimeter, and pH between 7.8 and 8.2 (EPA, 2000). MHRW was delivered at a rate of two volumes of overlying water per day for each test chamber using the Wall Pump (a piston-type pump that delivers water at a low flow rate). One volume is equivalent to 175 mL of MHRW.

2.3 Test Organisms

H. azteca amphipod specimens were obtained from the EPA ORD laboratory (Cincinatti, Ohio) and used for sediment toxicity testing. Once received at the Region 8 laboratory, organisms were kept in their shipping bag and placed in a holding tank for approximately 48 hours for temperature and water quality acclimation. *H. azteca* were cultured at the ORD Laboratory (Cincinatti, Ohio)and shipped using MHRW water; therefore, water acclimation was not considered a substantial stress concern for the organisms. To reduce the potential of stress, the shipping bag was opened to allow a small amount of MHRW to mix with the shipping water (after temperature equilibration). This procedure was repeated several times through the course of one day until laboratory MHRW and shipping water were well mixed. The holding tank was aerated gently and additional MHRW was added for further acclimation of the organisms. At the time of testing, organisms were approximately 7 to 10 days old.

2.4 Food Preparation

Organisms were fed a Yeast, Cerophyl, and Trout Chow (YCT) mixture daily. YCT was prepared by adding 5 grams of Trout Chow to 1 liter of deionized water followed by homogenization in a blender. After homogenization the mixture was poured into a 2 liter separatory funnel, aerated, and allowed to digest for one week at room temperature. After the digestion period the aeration apparatus was removed and solid material was allowed to settle out for one hour, after which the supernatant was collected using a 110 mesh Nitex screen. Yeast solution was prepared by adding 5 grams of dry yeast to 1 liter deionized water followed by mixing. Cerophyl solution was prepared by adding 5 grams of alfalfa pellets to 1 liter of deionized water followed by homogenization in a blender. Equal parts of yeast, Trout Chow (supernatant), and cerophyl solutions were then added to a beaker and homogenized in a blender. The YCT mixture was then stored in a freezer or refrigerator until use. Refrigerated YCT was used within two weeks of storage. Feed dry weights for both the site sediment and reference tests are included in Table 2.4-1. All prepared YCT used for feeding *H. azteca* met performance criteria of 1.7 to 1.9 g solid/L.

2.5 Test Procedures

The following sections include the procedures employed for the site sediment and reference toxicity tests.

2.5.1 Site Sediment Toxicity Test

Site sediment was obtained from the following eight locations along Elk Creek, Coal Creek, and Splain's Gulch: Elk-00, Elk-06, Elk-08, Coal-15, Coal-20, Coal-Opp1, and reference sites SP-00 and SP-01. No duplicate samples were taken for this test. For quality assurance purposes testing was also performed on positive and negative sediment controls (positive controls were spiked with zinc sulfate while negative controls were not spiked). West Bearskin Sediment provided by the EPA ORD Laboratory (Duluth, Minnesota) was used for controls (positive and negative). Six replicates were tested for each location and each control. Testing chambers consisted of 300 mL beakers filled with 100 mL of sediment and 175 mL of overlying MHRW. Testing chambers were placed in a water bath to maintain temperatures of 22^{o}C during the test.

Prior to test initiation, ten organisms were counted and verified in disposable weigh boats, then transferred to test chambers using a pipette. A total of 10 organisms were added to testing chambers below the air-water interface. An additional 80 organisms were removed from the holding tank and dried for 24 hours in an 80 ^{o}C oven to determine an average dry weight per organism.

As previously stated, testing took place over a 10 day period. Overlying water quality (MHRW) was measured daily for dissolved oxygen (DO) and temperature. On the day of test initiation and test completion, overlying water was measured for alkalinity, hardness, conductivity, and pH. Organisms received 1 mL of YCT per test chamber on a daily basis. At the conclusion of the test, organisms were removed from the sediment (referred to as "picking") using pipettes, sieve, and/or Nitex screen. Before test initiation, personnel that would be involved with picking organisms from the sediment were required to demonstrate proficiency. This procedure was accomplished by capturing at least 90% of organisms placed into "practice" sediment. Only proficient personnel were allowed to participate at test conclusion. After collection of organisms, organisms were placed in aluminum weigh boats and counted. Then, the weigh boats were dried in an oven for 24 hours so that a post-test weight could be obtained for growth evaluation.

2.5.2 Reference Toxicity Test

Reference toxicity testing followed procedures outlined in EPA Method 100.1 and was carried out concurrently with the site sediment toxicity test. Test chambers consisted of 300 mL beakers, filled with 200 mL MHRW, and a piece of Nitex screen (2.5 cm x 5 cm) completely submerged in the aqueous solution. MHRW was spiked with potassium chloride (KCl) using a serial dilution approach. KCl concentrations were reduced by 50% starting with the highest concentration (referred to as 100%) until the lowest dilution percentage (6.25%) was reached. For example, the highest concentration (referred to as 100%) of KCl was 2000 mg/L, followed by 1000 mg/L (50%), 500 mg/L (25%), 250

mg/L (12.5%), and 125 mg/L (6.25%). The endpoint for the reference test was mortality, so no growth data was collected.

3.0 RESULTS

This section presents results for the site sediment and reference toxicity tests and addresses any issues or unforeseen conditions encountered during the testing period.

3.1 Site Sediment Toxicity Testing

Sediments collected from the Elk Creek and Coal Creek drainages appeared similar in their general makeup, with samples described as primarily inorganic with coarse, non-uniform particles. Percent moisture values (Figure 3.1-1) for samples collected from Elk Creek, Coal Creek, and Splain's Gulch were relatively low, with values ranging from 14% (Coal-20) to 27% (Elk-08). The highest moisture percentages were observed in the sample from site Coal-Opp1 (39%) and the control sediment (45%). These sediments were more organic in nature with a higher concentration of fine particles. Sediment samples were analyzed for total metals concentrations using EPA Method 8260 and results are listed in Table 3.1-1.

All test chambers met performance criteria with the overlying water quality parameters remaining consistent throughout the test, as recorded in Appendix A. Variability in alkalinity, hardness, conductivity, and pH was less than 25% within each test chamber (method requires less than 50%), and DO ranged between 5.6 to 6.6 mg/L, which met performance criteria of 2.5 mg/L. The overlying water temperatures did not deviate more than $\pm 2^{o}$C from 22^{o}C.

At the end of the duration of the test, organism mortality was counted. The results are displayed in Figure 3.1-2 with the negative control at 7% mortality (within the 80% survival performance criteria), and the positive control at 25% mortality. The reference locations (SP-00 and SP-01) showed 3% and 8% mortalities, respectively. Sites Coal-15, Coal-20, and Coal-Opp1 had mortality rates of 27%, 23%, and 17%. All Elk Creek sites had high mortality rates, with Elk-00 at 85% and Elk-06 and Elk-08 at 100% mortality.

Surviving organisms were collected at test completion and dry weights were obtained for growth and mortality (Table 3.1-2 and Figure 3.1-3). After completion of the test, growth was recorded for all sites with the exceptions of Elk-06 and Elk-08, where no data was available due to 100% mortality. An increase in growth was seen at all sites, although no growth was observed in the two controls. The highest growth increase was observed at Coal-Opp1, with a post-test weight of 0.155 mg/organism. The least amount of growth observed was in negative and positive controls, both of which had weights just below the representative average (0.035 and 0.036 mg/organism). Post-test weights for the remaining sites were as follows (in descending order): 0.140 mg/organism at Coal-20, 0.121 mg/org. at Elk-00, 0.081 mg/org. at Coal-15, 0.056 mg/org. at SP-00 and 0.046 mg/org. at SP-01.

3.2 Reference Toxicity Test

Overlying water quality parameters were consistent throughout the test and are listed in Appendix B. Day 2 temperature exceeded performance criteria in three testing chambers

(less than 1°C) and adjustments were made to the water bath to correct the increasing temperatures. Variability in alkalinity, hardness, conductivity, and pH was less than 32% within each test chamber, and DO levels ranged from 5.08 to 6.96 mg/L. Performance criterion for Method 100.1 requires no more than 50% change for alkalinity and hardness. DO must be maintained above 2.5 mg/L.

At test completion, organism mortality was counted with results included in Figure 3.2-1. The observed mortality in the control was 5%, which is within the 80% survival performance criteria. The following are the dilution series and mortality rates (in parentheses) from this test: 6.25% dilution (2.5% mortality), 12.5% (12.5%), 25% (77.5%), 50% (100%), and 100 % (100%). An LC50 of 390.35 mg/L, with an upper confidence limit of 436.68 mg/L and a lower confidence limit of 348.94 mg/L, was determined using the Trimmed Spearman-Karber method (Hamilton, 1977).

4.0 DISCUSSION

Results of the site sediment toxicity test indicate that the sites along Elk Creek are acutely toxic to *H. azteca*, with mortalities ranging from 85-100%. Substantially lower mortality rates (17-27%) were observed at sites from Coal Creek, and minimal mortality occurred at Splain's Gulch sites, with 3% mortality at SP-00 and 8% mortality at SP-01.

Coal Creek sites have historically had lower mortality rates than the 17-27% observed with this test. Coal-15 site showed higher mortality rates than Coal-Opp1 and Coal-20. One reason for the higher mortality at Coal-15 was that test chamber 2 had no surviving organisms, while all other testing chambers for that site showed 80% survival or greater. It is possible that organisms were not added to test chamber 2 resulting in the higher mortality percentage. Coal Creek sites showed the greatest average growth when compared to other sites tested. Coal Creek sites appeared to have greater organic content which could have contributed to greater growth by having more feed available to organisms.

The sediment toxicity samples were collected immediately following a storm event in the Coal Creek Watershed. Additionally, a slug of tailings impoundment material was accidentally released a week prior to the scheduled fieldwork. Therefore, it is possible that more contaminated sediment material was present during the 2007 event than the previous year. Site monitoring and data collection activities will continue in order to determine whether the increased mortality rates correspond to the particular weather event and construction activities at the Standard Mine site in the fall of 2007.

Splains Gulch showed minimal mortality at sites SP-00 (3%) and SP-01 (8%) and was not acutely toxic to *H. azteca*. Growth was less in Splain's Gulch sediments than sites along Coal Creek. This observation could be contributed to the lower organic material observed in the sediment from Splain's Gulch which may have resulted in less available feed for test organisms.

Results of the reference toxicity test showed an LC50 value comparable to that of other reference tests performed by the ORD laboratory. Results from 2007 reference testing on *H. azteca* at the EPA Region 8 laboratory showed calculated LC50 value for KCl at 390 mg/L. While the ORD laboratory performed similar tests in 2007 and showed LC50 values for KCl ranging from 281 mg/L to 479 mg/L with an average LC50 value of 375 mg/L. Based on these results, testing organisms appeared to be healthy and consistent with that seen in previous tests. Organisms did not appear to be stressed or otherwise more sensitive.

5.0 REFERENCES

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Tables

Table 2.0-1 Test Criteria for Hyalella Azteca 10-Day Sediment Toxicity Testing

Parameter	Test Criteria
Test Type	Whole-Sediment Toxicity Test with Overlying Water
Test Duration	10 Day WET Test, 96 Hour Reference Test
Endpoints	Mortality and Growth for Sediment, Mortality for Reference
Test Acceptability	Minimum Control Survival of 80% and Measurable Growth
Testing Chamber	300 mL Beaker
Number of Replicate Chambers	6 for Sediment, 4 for Reference
Sediment Volume	100 mL
Overlying Water Volume	175 mL
Renewal of Overlying Water	2 Volumes per Day (Continuous Flow)
Overlying Water Quality	Hardness, Alkalinity, Conductivity, and pH at Beginning and End
Aeration	None
Age of Organisms	7 to 14 Days Old at Start of Test
Number of Organisms per Chamber	10
Feeding	1 mL of YCT Once Daily
Temperature	22ºC± 1ºC (The instantaneous temperature must be ± 3ºC)
Illuminance	100 to 1000 lux
Photoperiod	16 Hours Light, 18 Hours Dark

Notes: Testing Criteria from Method 100.1
WET - Whole Effluent Toxicity

Table 2.4-1 Feed Dry Weight for Site Sediment and Reference Tests

H. azteca dry weights: Initial

Reading	Dry Weight (g)
1	0.00055
2	0.00061
3	0.00034
4	0.00080
5	0.00050
Average	**0.00056**

Number of Organisms:	38	
Organism Weight:	1.47E-05	g/organism
Organism Weight:	0.0147	mg/organism

H. azteca feed dry weight

Weigh boat:	1.3080	g
Weigh boat + 1 mL feed:	2.2809	g
1 mL wet feed:	0.9729	g
Weight boat + dry feed:	1.3097	g
Dry feed :	0.0017	g/mL
Dry feed :	1.7000	g/L

Table 3.1-1 Site Sediment Analytical Results

Total Metals (ug/L)

Location	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Thallium	Titanium	Vanadium	Zinc
COAL-15	5910D	<492UD	56500D	77.2D	<2.46UD	4000D	2600D	<2.46UD	5.50D	20.3D	13300D	74.9D	2230D	685D	0.048D	<4.92UD	2300D	605D	359D	1480D	<492UD	24.8D	<98.5UD	55.1D	<24.6UD	547D
COAL-20	5080D	<467UD	66800D	91.7D	<2.33UD	241D	2450D	<2.33UD	3.93D	4.51D	11200D	24600D	2050D	601D	0.036D	<4.67UD	1680D	625D	291D	2370D	<467UD	26.2D	<93.3UD	51.3D	<23.3UD	80.4D
COAL-OPP1	7600D	<495UD	84600D	121D	<2.48UD	10800D	4190D	<2.48UD	8.25D	44.1D	16300D	144D	2370D	1260D	0.075D	<4.95UD	4020D	640D	954D	3280D	<495UD	43.2D	142D	37.8D	<24.8UD	1280D
ELK-00	7890D	<1950UD	55200D	154D	<2.44UD	31700D	3290D	<2.44UD	24.3D	182D	19100D	1230D	2420D	6610D	0.018D	<4.88UD	8010D	754D	1170D	<975UD	<488UD	28.3D	<390UD	30.9D	<24.4UD	4650D
ELK-06	9690D	<987UD	63300D	126D	<2.47UD	29500D	3700D	<2.47UD	18.7D	233D	24400D	903D	3770D	5020D	0.027D	<4.93UD	8850D	1020D	1600D	1800D	<493UD	24.5D	<197UD	39.0D	<24.7UD	4780D
ELK-08	8560D	<1900UD	52500D	96.3D	<2.37UD	41300D	2490D	<2.37UD	28.0D	421D	26600D	1540D	2420D	8170D	0.026D	<4.74UD	8770D	699D	1740D	3010D	<474UD	18.4D	<379UD	30.7D	<23.7UD	5160D
SP-00	6190D	<458UD	1810D	116D	<2.29UD	214D	3570D	<2.29UD	4.45D	5.49D	12100D	10200D	2460D	533D	0.016D	<4.58UD	1660D	928D	448D	<229UD	<458UD	47.3D	<91.7UD	93.9D	<22.9UD	41.5D
SP-01	4720D	<469UD	726D	91.7D	<2.34UD	195D	2720D	<2.34UD	3.99D	6.91D	11500D	6550D	1820D	487D	0.021D	<4.69UD	1670D	768D	323D	<234UD	<469UD	38.6D	<93.7UD	144D	<23.4UD	38.3D

< - Less than
U - Indicates analyte not detected (result is reported as less than the reporting limit)
J - Indicates result is an estimated value (refer to analytical data package narrative for discussion)
D - Indicates sample was diluted

ug/L - micrograms per liter

Table 3.1-2
Organism Weight Data
Sediment Toxicity Testing
Standard Mine

Initial average weight of dried organisms (mg): 0.0371

Site I.D.	Weight of Oven Dried Pan (g)	Pan + Dried Organisms (g)	Dry Organisms (g)	Number of Survivors	Mean Weight per Survivor (mg)	Survivor Mean (mg)
Control-N-1	1.3147	1.3150	0.0003	9	0.0333	0.035
Control-N-2	1.3121	1.3125	0.0004	9	0.0444	
Control-N-3	1.3141	1.3144	0.0003	10	0.0300	
Control-N-4	1.3049	1.3052	0.0003	10	0.0300	
Control-N-5	1.3172	1.3176	0.0004	8	0.0500	
Control-N-6	1.3147	1.3149	0.0002	10	0.0200	
Control-P-1	1.3083	1.3087	0.0004	10	0.0400	0.036
Control-P-2	1.3255	1.3258	0.0003	9	0.0333	
Control-P-3	1.3252	1.3254	0.0002	5	0.0400	
Control-P-4	1.3219	1.3219	0.0000	1	0.0000	
Control-P-5	1.3317	1.3322	0.0005	10	0.0500	
Control-P-6	1.2985	1.2990	0.0005	10	0.0500	
Coal-15-1	1.3232	1.3242	0.0010	8	0.1250	0.081
Coal-15-2	1.3222	No Data	No Data	0	No Data	
Coal-15-3	1.3177	1.3184	0.0007	10	0.0700	
Coal-15-4	1.3197	1.3202	0.0005	9	0.0556	
Coal-15-5	1.3246	1.3252	0.0006	8	0.0750	
Coal-15-6	1.3062	1.3067	0.0005	9	0.0556	
Coal-20-1	1.3256	1.3276	0.0020	8	0.2500	0.140
Coal-20-2	1.3010	1.3016	0.0006	8	0.0750	
Coal-20-3	1.3055	1.3061	0.0006	6	0.1000	
Coal-20-4	1.3202	1.3209	0.0007	7	0.1000	
Coal-20-5	1.3296	1.3310	0.0014	8	0.1750	
Coal-20-6	1.3177	1.3185	0.0008	9	0.0889	
Coal-Opp-1	1.3190	1.3199	0.0009	8	0.1125	0.155
Coal-Opp-2	1.3120	1.3126	0.0006	9	0.0667	
Coal-Opp-3	1.3157	1.3176	0.0019	10	0.1900	
Coal-Opp-4	1.3152	1.3173	0.0021	6	0.3500	
Coal-Opp-5	1.3190	1.3195	0.0005	9	0.0556	
Coal-Opp-6	1.3126	1.3133	0.0007	8	0.0875	

Table 3.1-2
Organism Weight Data
Sediment Toxicity Testing
Standard Mine

Site I.D.	Weight of Oven Dried Pan (g)	Pan + Dried Organisms (g)	Dry Organisms (g)	Number of Survivors	Mean Weight per Survivor (mg)	Survivor Mean (mg)
Elk-00-1	1.3254	1.3257	0.0003	3	0.1000	0.121
Elk-00-2	1.3192	1.3193	0.0001	1	0.1000	
Elk-00-3	1.3234	No Data	No Data	0	No Data	
Elk-00-4	1.3226	1.3230	0.0004	3	0.1333	
Elk-00-5	1.3108	1.3111	0.0003	2	0.1500	
Elk-00-6	1.3061	No Data	No Data	0	No Data	
Elk-06-1	1.3216	No Data	No Data	0	No Data	No Data
Elk-06-2	1.3358	No Data	No Data	0	No Data	
Elk-06-3	1.3157	No Data	No Data	0	No Data	
Elk-06-4	1.3257	No Data	No Data	0	No Data	
Elk-06-5	1.3287	No Data	No Data	0	No Data	
Elk-06-6	1.3164	No Data	No Data	0	No Data	
Elk-08-1	1.3309	No Data	No Data	0	No Data	No Data
Elk-08-2	1.3285	No Data	No Data	0	No Data	
Elk-08-3	1.3211	No Data	No Data	0	No Data	
Elk-08-4	1.3147	No Data	No Data	0	No Data	
Elk-08-5	1.3195	No Data	No Data	0	No Data	
Elk-08-6	1.3117	No Data	No Data	0	No Data	
SP-00-1	1.3283	1.3288	0.0005	10	0.0500	0.056
SP-00-2	1.2974	1.2981	0.0007	10	0.0700	
SP-00-3	1.3123	1.3129	0.0006	10	0.0600	
SP-00-4	1.3064	1.3068	0.0004	9	0.0444	
SP-00-5	1.3140	1.3145	0.0005	9	0.0556	
SP-00-6	1.3216	1.3220	0.0004	10	0.0400	
SP-01-1	1.3215	1.3223	0.0008	9	0.0889	0.046
SP-01-2	1.3136	1.3138	0.0002	10	0.0200	
SP-01-3	1.3110	1.3114	0.0004	9	0.0444	
SP-01-4	1.3128	1.3134	0.0006	10	0.0600	
SP-01-5	1.3097	1.3100	0.0003	7	0.0429	
SP-01-6	1.3225	1.3227	0.0002	10	0.0200	

Figures

Figure 3.1-1 Site Sediment Moisture Content

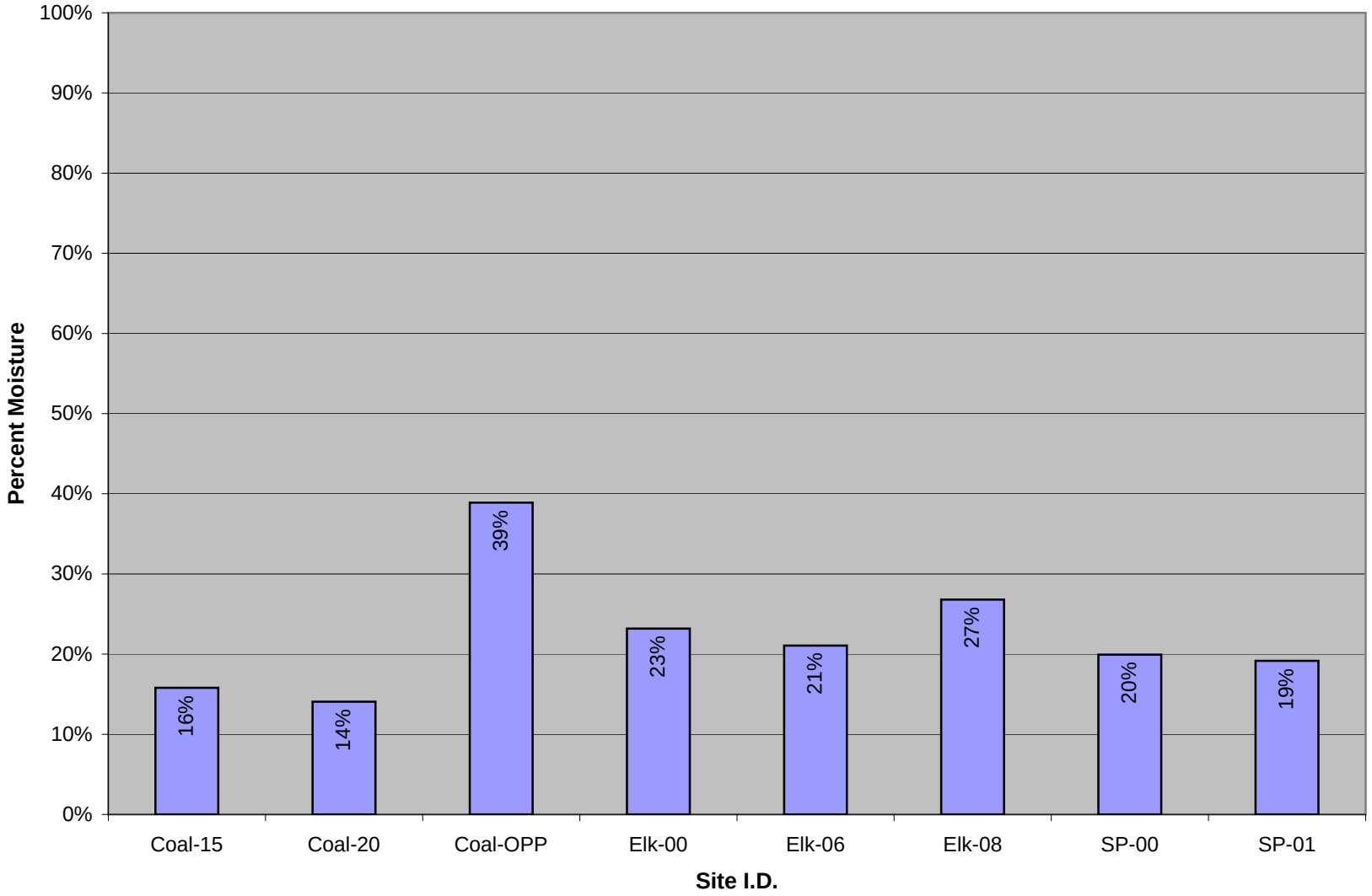


Figure 3.1-2 Site Sediment Organism Mortality

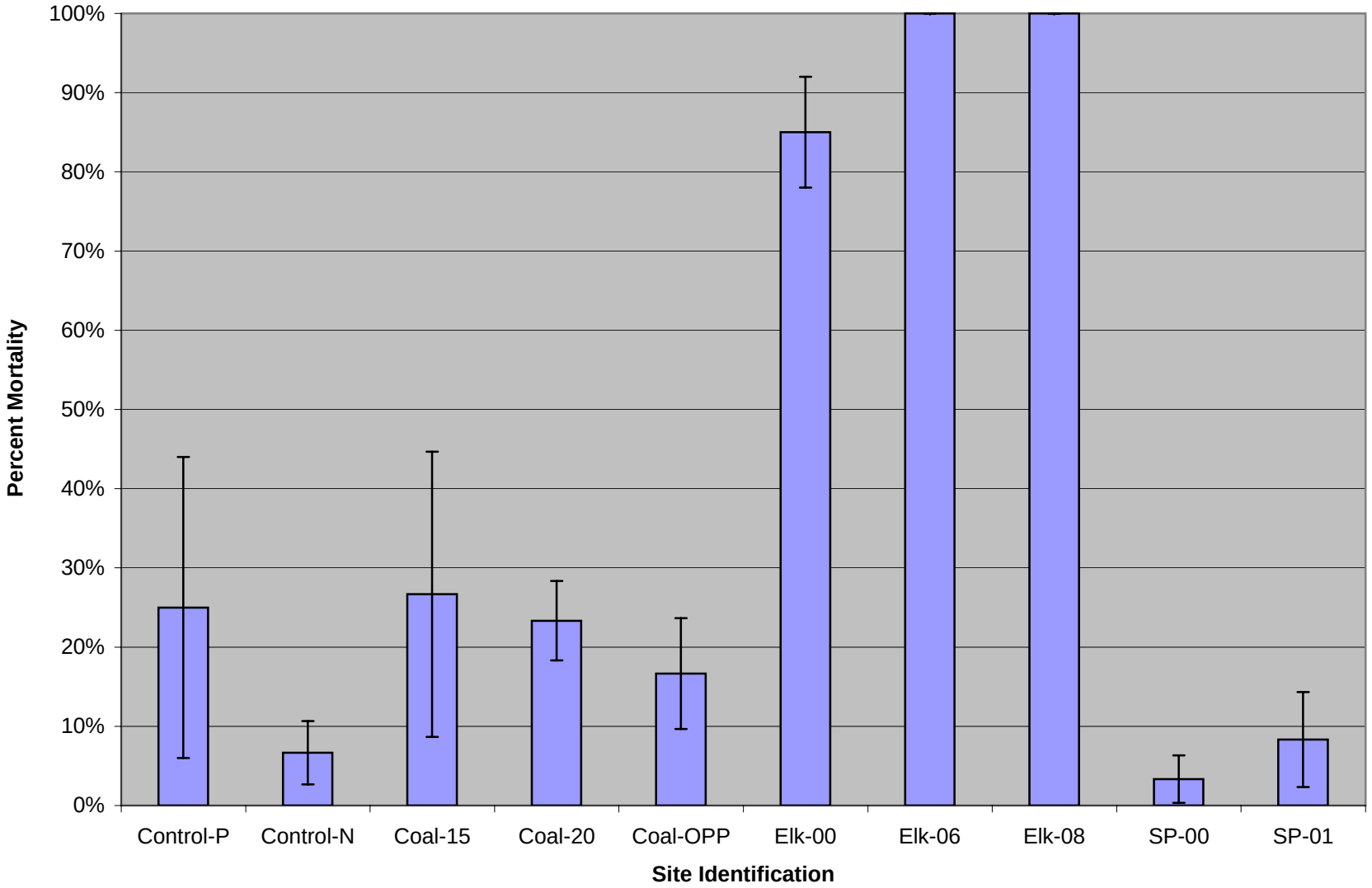


Figure 3.1-3 Site Sediment Growth Chart (Average Organism Weight)

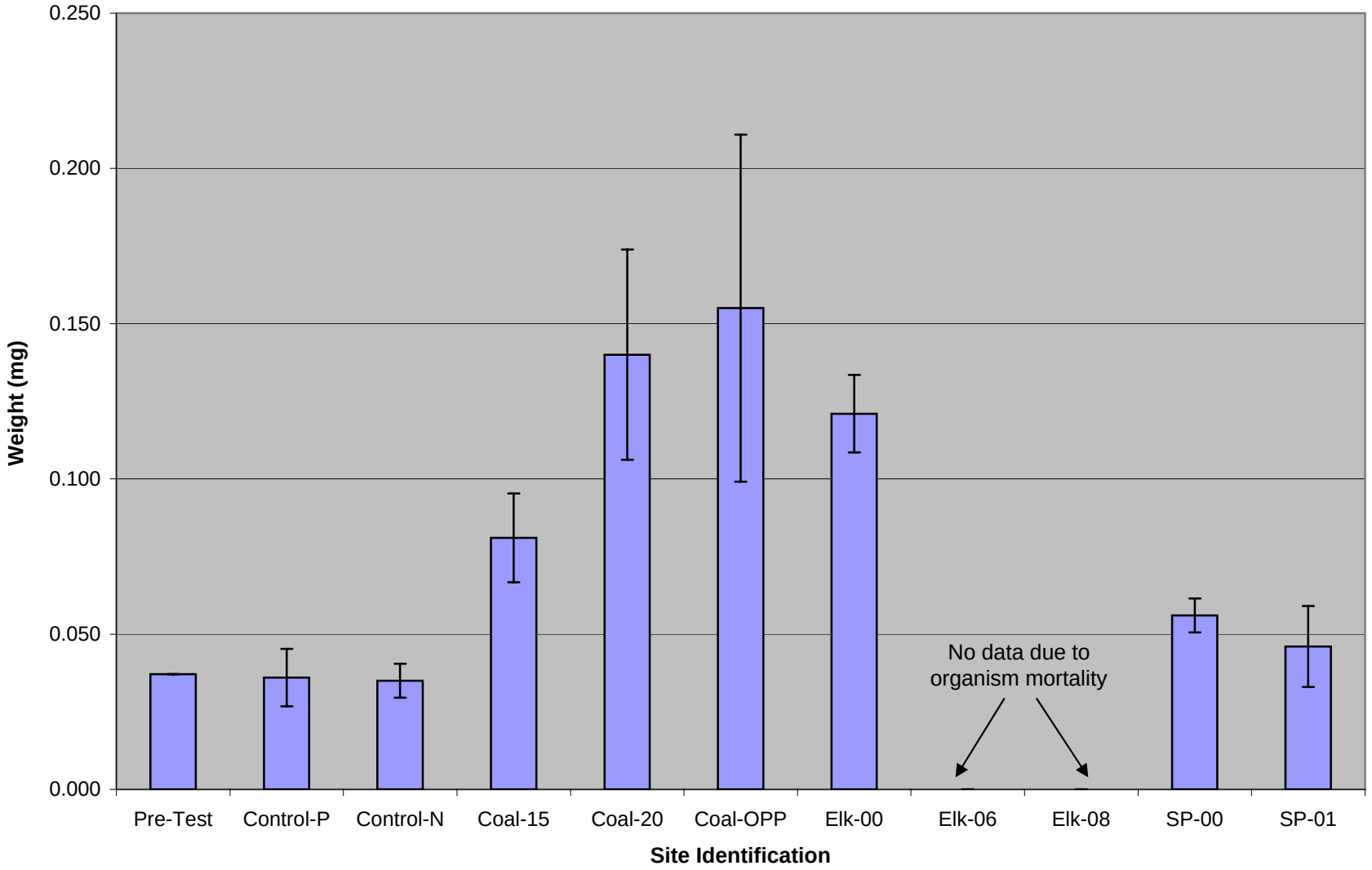
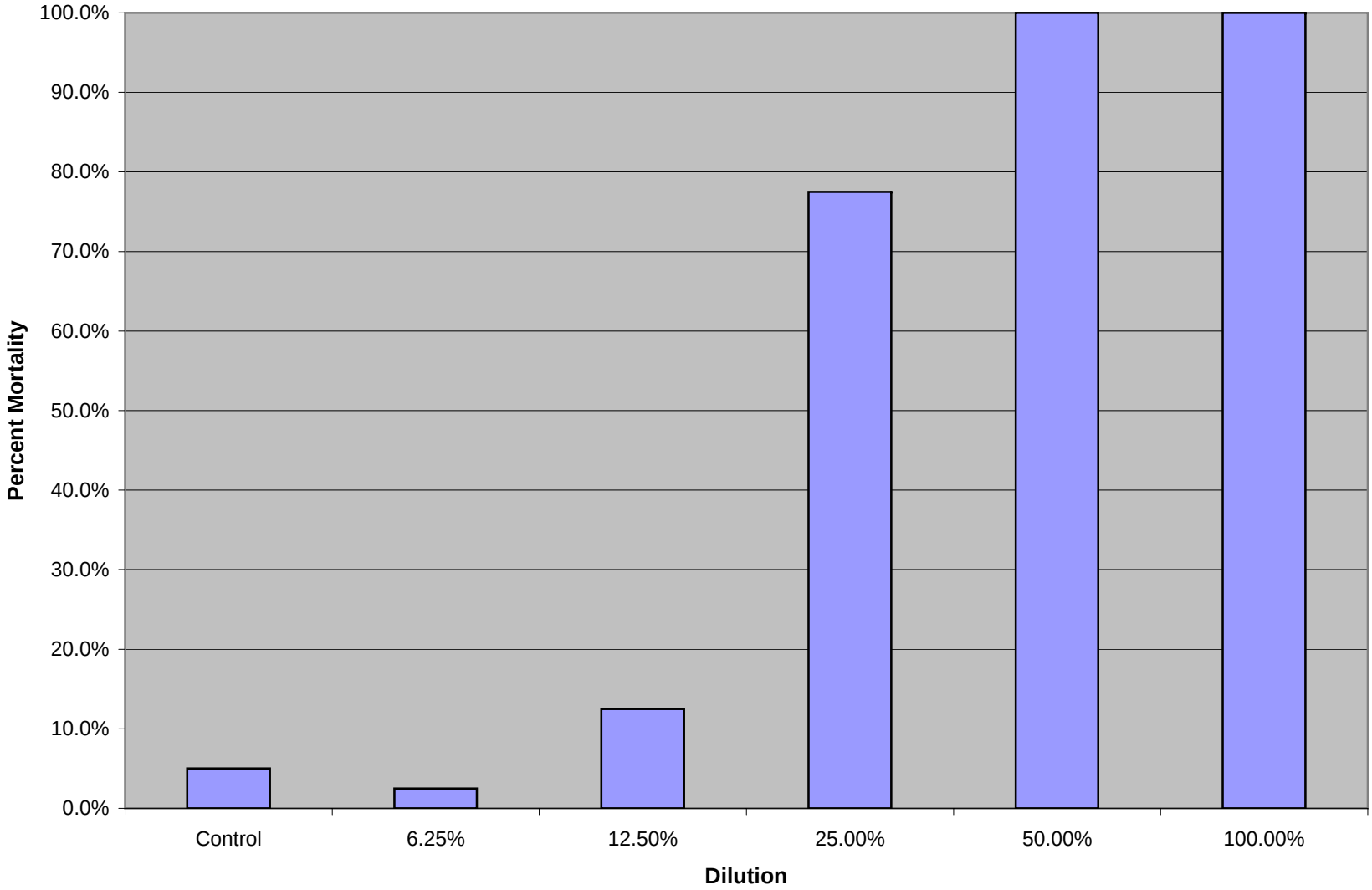


Figure 3.2-1 Reference Toxicity Test- Organism Mortality



Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Positive Control-1	pH	7.80										8.00
Positive Control-1	Conductivity (us/cm)	327.00										351.00
Positive Control-1	D.O. (mg/L)	6.48	5.11	5.52	5.30	5.61	4.73	6.65	6.42	5.46	4.66	4.71
Positive Control-1	Temp (C)	21.18	21.28	20.31	20.22	22.32	21.45	22.00	22.07	23.17	22.04	21.83
Positive Control-1	Hardness	87.60										92.40
Positive Control-1	Alkalinity	45.00										50.00
Positive Control-2	pH	7.70										8.00
Positive Control-2	Conductivity (us/cm)	315.00										315.00
Positive Control-2	D.O. (mg/L)	6.46	5.20	5.34	5.88	5.38	4.35	6.88	6.11	5.36	5.20	5.87
Positive Control-2	Temp (C)	21.54	21.11	21.11	21.17	22.50	21.73	22.07	22.14	23.26	21.87	22.07
Positive Control-2	Hardness	87.60										92.40
Positive Control-2	Alkalinity	45.00										50.00
Positive Control-3	pH	7.60										8.00
Positive Control-3	Conductivity (us/cm)	331.00										311.00
Positive Control-3	D.O. (mg/L)	6.22	4.97	5.79	5.55	5.71	4.31	6.86	6.31	5.61	3.90	4.16
Positive Control-3	Temp (C)	21.65	21.34	21.20	21.19	22.38	21.73	22.05	22.10	23.10	21.85	22.00
Positive Control-3	Hardness	87.60										92.40
Positive Control-3	Alkalinity	45.00										50.00
Positive Control-4	pH	7.60										8.00
Positive Control-4	Conductivity (us/cm)	338.00										325.00
Positive Control-4	D.O. (mg/L)	6.10	5.01	5.49	5.50	5.87	4.27	5.80	6.35	5.18	4.82	4.31
Positive Control-4	Temp (C)	21.62	21.01	21.20	21.21	22.29	21.75	22.07	22.13	22.96	22.02	22.11
Positive Control-4	Hardness	87.60										92.40
Positive Control-4	Alkalinity	45.00										50.00
Positive Control-5	pH	7.50										8.00
Positive Control-5	Conductivity (us/cm)	311.00										306.00
Positive Control-5	D.O. (mg/L)	6.13	5.27	5.87	5.53	5.56	4.54	5.93	6.26	5.66	5.48	5.63
Positive Control-5	Temp (C)	21.57	21.20	21.18	21.17	21.25	21.72	21.73	22.15	22.42	21.59	21.88
Positive Control-5	Hardness	87.60										92.40
Positive Control-5	Alkalinity	45.00										50.00
Positive Control-6	pH	7.60										8.00
Positive Control-6	Conductivity (us/cm)	310.00										304.00
Positive Control-6	D.O. (mg/L)	6.15	5.11	4.98	4.76	5.07	4.39	6.04	6.49	5.02	5.04	5.31
Positive Control-6	Temp (C)	21.52	21.11	21.01	21.02	22.40	21.69	21.92	22.01	23.05	21.82	22.00
Positive Control-6	Hardness	87.60										92.40
Positive Control-6	Alkalinity	45.00										50.00

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Negative Control-1	pH	7.60										8.10
Negative Control-1	Conductivity (us/cm)	290.00										298.00
Negative Control-1	D.O. (mg/L)	5.68	4.97	5.58	6.10	6.05	4.78	6.62	5.96	4.59	5.11	6.18
Negative Control-1	Temp (C)	21.17	21.32	20.73	21.02	22.02	21.13	22.00	21.96	22.88	21.77	21.70
Negative Control-1	Hardness	82.40										86.40
Negative Control-1	Alkalinity	45.00										50.00
Negative control-2	pH	7.60										8.10
Negative control-2	Conductivity (us/cm)	287.00										301.00
Negative control-2	D.O. (mg/L)	5.60	5.65	5.80	5.70	5.48	4.44	6.89	5.59	5.09	4.99	5.16
Negative control-2	Temp (C)	21.23	21.20	20.75	20.76	21.97	21.34	21.98	22.00	22.80	21.82	21.83
Negative control-2	Hardness	82.40										86.40
Negative control-2	Alkalinity	45.00										50.00
Negative Control-3	pH	7.60										8.20
Negative Control-3	Conductivity (us/cm)	309.00										302.00
Negative Control-3	D.O. (mg/L)	5.94	5.44	5.87	6.03	6.00	4.50	7.02	6.13	5.40	5.28	5.41
Negative Control-3	Temp (C)	21.23	21.33	20.77	20.78	22.03	21.40	22.01	21.87	22.89	21.83	21.80
Negative Control-3	Hardness	82.40										86.40
Negative Control-3	Alkalinity	45.00										50.00
Negative Control-4	pH	7.60										8.20
Negative Control-4	Conductivity (us/cm)	308.00										300.00
Negative Control-4	D.O. (mg/L)	6.05	5.21	5.76	5.94	5.29	4.35	6.84	6.38	5.40	5.18	5.97
Negative Control-4	Temp (C)	21.21	21.34	20.78	20.69	21.80	21.25	21.89	21.96	22.72	21.84	21.77
Negative Control-4	Hardness	82.40										86.40
Negative Control-4	Alkalinity	45.00										50.00
Negative Control-5	pH	7.70										8.10
Negative Control-5	Conductivity (us/cm)	308.00										302.00
Negative Control-5	D.O. (mg/L)	6.24	5.01	5.85	4.76	3.25	3.73	6.25	6.14	5.22	5.30	5.89
Negative Control-5	Temp (C)	21.06	21.40	20.71	21.02	21.96	21.27	21.97	22.10	22.79	21.79	21.78
Negative Control-5	Hardness	82.40										86.40
Negative Control-5	Alkalinity	45.00										50.00
Negative Control-6	pH	7.70										8.20
Negative Control-6	Conductivity (us/cm)	306.00										300.00
Negative Control-6	D.O. (mg/L)	6.33	4.97	5.59	5.89	4.90	4.00	6.83	6.34	5.22	5.16	5.86
Negative Control-6	Temp (C)	21.05	21.21	20.69	20.71	21.85	21.29	21.88	21.96	22.75	21.81	21.83
Negative Control-6	Hardness	82.40										86.40
Negative Control-6	Alkalinity	45.00										50.00

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Coal-15-1	pH	7.70										8.10
Coal-15-1	Conductivity (us/cm)	315.00										295.00
Coal-15-1	D.O. (mg/L)	6.31	4.47	4.11	5.01	4.84	4.42	6.11	6.23	4.96	4.98	5.45
Coal-15-1	Temp (C)	21.17	21.23	20.70	20.99	21.39	21.11	21.61	21.50	22.77	21.46	21.23
Coal-15-1	Hardness	90.80										84.80
Coal-15-1	Alkalinity	55.00										52.50
Coal-15-2	pH	7.70										8.00
Coal-15-2	Conductivity (us/cm)	331.00										300.00
Coal-15-2	D.O. (mg/L)	6.20	4.11	4.78	5.24	5.10	4.45	6.13	6.07	4.90	4.86	5.76
Coal-15-2	Temp (C)	21.14	21.20	20.79	20.82	21.49	21.15	21.68	21.60	22.79	21.53	21.45
Coal-15-2	Hardness	90.80										84.80
Coal-15-2	Alkalinity	55.00										52.50
Coal-15-3	pH	7.70										8.00
Coal-15-3	Conductivity (us/cm)	315.00										302.00
Coal-15-3	D.O. (mg/L)	6.26	4.59	6.24	6.49	5.82	4.32	6.76	6.24	4.95	4.83	5.66
Coal-15-3	Temp (C)	21.24	21.23	20.89	20.97	21.53	21.30	21.67	21.73	22.95	21.59	21.66
Coal-15-3	Hardness	90.80										84.80
Coal-15-3	Alkalinity	55.00										52.50
Coal-15-4	pH	7.70										8.10
Coal-15-4	Conductivity (us/cm)	314.00										300.00
Coal-15-4	D.O. (mg/L)	6.25	4.01	5.20	5.38	5.41	4.38	6.33	6.20	4.88	4.77	5.26
Coal-15-4	Temp (C)	21.27	21.30	20.82	21.02	21.56	21.28	21.66	21.61	22.87	21.56	21.62
Coal-15-4	Hardness	90.80										84.80
Coal-15-4	Alkalinity	55.00										52.50
Coal-15-5	pH	7.80										8.10
Coal-15-5	Conductivity (us/cm)	314.00										302.00
Coal-15-5	D.O. (mg/L)	6.23	4.91	4.93	5.36	5.33	4.41	6.51	6.27	4.92	4.98	6.14
Coal-15-5	Temp (C)	21.28	21.28	20.92	20.93	21.78	21.39	21.75	21.73	22.95	21.56	21.69
Coal-15-5	Hardness	90.80										84.80
Coal-15-5	Alkalinity	55.00										52.50
Coal-15-6	pH	7.70										8.00
Coal-15-6	Conductivity (us/cm)	314.00										301.00
Coal-15-6	D.O. (mg/L)	6.29	4.76	5.51	5.72	5.35	4.34	6.81	6.29	5.20	5.23	5.57
Coal-15-6	Temp (C)	21.36	21.29	20.98	20.92	21.86	21.40	21.86	21.81	23.00	21.68	21.78
Coal-15-6	Hardness	90.80										84.80
Coal-15-6	Alkalinity	55.00										52.50

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Coal-20-1	pH	7.70										8.10
Coal-20-1	Conductivity (us/cm)	394.00										304.00
Coal-20-1	D.O. (mg/L)	6.31	5.01	5.64	5.88	5.22	4.52	6.86	6.11	5.27	5.05	5.49
Coal-20-1	Temp (C)	21.34	21.21	21.02	21.07	21.98	21.50	21.91	21.86	23.17	21.62	21.91
Coal-20-1	Hardness	105.20										88.80
Coal-20-1	Alkalinity	60.00										57.50
Coal-20-2	pH	7.80										8.00
Coal-20-2	Conductivity (us/cm)	323.00										323.00
Coal-20-2	D.O. (mg/L)	6.27	4.94	5.05	5.95	5.36	4.71	6.07	5.07	4.65	4.53	5.16
Coal-20-2	Temp (C)	21.40	21.50	21.16	21.17	22.07	21.58	21.92	21.97	23.40	21.82	21.91
Coal-20-2	Hardness	105.20										88.80
Coal-20-2	Alkalinity	60.00										57.50
Coal-20-3	pH	7.80										8.00
Coal-20-3	Conductivity (us/cm)	320.00										301.00
Coal-20-3	D.O. (mg/L)	6.41	4.71	5.99	6.11	5.51	4.30	6.56	5.55	4.81	5.18	5.83
Coal-20-3	Temp (C)	21.36	21.34	21.09	21.08	22.07	21.53	21.97	21.94	23.39	21.79	21.90
Coal-20-3	Hardness	105.20										88.80
Coal-20-3	Alkalinity	60.00										57.50
Coal-20-4	pH	7.70										8.00
Coal-20-4	Conductivity (us/cm)	318.00										298.00
Coal-20-4	D.O. (mg/L)	6.50	4.01	6.63	6.28	5.31	4.36	6.74	6.04	5.17	5.18	5.55
Coal-20-4	Temp (C)	21.52	21.24	21.01	21.04	22.06	21.53	21.93	21.90	23.30	21.78	21.81
Coal-20-4	Hardness	105.20										88.80
Coal-20-4	Alkalinity	60.00										57.50
Coal-20-5	pH	7.80										8.10
Coal-20-5	Conductivity (us/cm)	318.00										302.00
Coal-20-5	D.O. (mg/L)	6.27	5.11	6.13	5.82	4.97	4.29	6.62	6.15	5.13	5.12	5.78
Coal-20-5	Temp (C)	21.35	21.27	21.13	21.26	22.24	21.60	22.00	22.00	23.41	21.82	21.92
Coal-20-5	Hardness	105.20										88.80
Coal-20-5	Alkalinity	60.00										57.50
Coal-20-6	pH	7.80										8.10
Coal-20-6	Conductivity (us/cm)	319.00										298.00
Coal-20-6	D.O. (mg/L)	6.33	4.71	5.71	5.52	5.29	4.28	6.54	6.15	5.25	5.19	5.78
Coal-20-6	Temp (C)	21.51	21.40	21.24	21.23	22.31	21.67	22.01	22.09	23.37	21.86	21.89
Coal-20-6	Hardness	105.20										88.80
Coal-20-6	Alkalinity	60.00										57.50

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Coal-Opp-1	pH	7.90										8.10
Coal-Opp-1	Conductivity (us/cm)	312.00										297.00
Coal-Opp-1	D.O. (mg/L)	6.50	4.97	5.76	6.24	5.35	4.49	6.88	6.08	5.24	5.16	5.85
Coal-Opp-1	Temp (C)	21.15	21.32	21.13	21.18	22.01	21.33	21.64	21.63	22.91	21.38	21.52
Coal-Opp-1	Hardness	85.20										87.60
Coal-Opp-1	Alkalinity	55.00										60.00
Coal-Opp-2	pH	7.80										8.10
Coal-Opp-2	Conductivity (us/cm)	312.00										299.00
Coal-Opp-2	D.O. (mg/L)	6.60	5.11	5.48	5.71	5.45	4.39	5.34	6.29	5.27	5.13	5.79
Coal-Opp-2	Temp (C)	21.28	21.20	21.15	21.17	22.00	21.25	21.60	21.54	22.81	21.35	21.43
Coal-Opp-2	Hardness	85.20										87.60
Coal-Opp-2	Alkalinity	55.00										60.00
Coal-Opp-3	pH	7.80										8.10
Coal-Opp-3	Conductivity (us/cm)	314.00										303.00
Coal-Opp-3	D.O. (mg/L)	6.43	4.36	5.27	5.65	5.88	4.42	6.43	6.35	5.19	4.62	4.98
Coal-Opp-3	Temp (C)	21.33	21.32	21.25	21.27	22.14	21.40	21.68	21.67	22.82	21.34	21.52
Coal-Opp-3	Hardness	85.20										87.60
Coal-Opp-3	Alkalinity	55.00										60.00
Coal-Opp-4	pH	7.80										8.00
Coal-Opp-4	Conductivity (us/cm)	314.00										302.00
Coal-Opp-4	D.O. (mg/L)	6.39	4.10	5.48	5.64	5.74	4.39	6.84	5.96	4.81	4.23	4.86
Coal-Opp-4	Temp (C)	21.38	21.22	21.23	21.24	22.02	21.33	21.58	21.67	22.60	21.24	21.31
Coal-Opp-4	Hardness	85.20										87.60
Coal-Opp-4	Alkalinity	55.00										60.00
Coal-Opp-5	pH	7.80										8.00
Coal-Opp-5	Conductivity (us/cm)	314.00										305.00
Coal-Opp-5	D.O. (mg/L)	6.39	4.05	5.94	5.83	5.81	4.35	6.60	6.13	4.88	5.09	5.38
Coal-Opp-5	Temp (C)	21.37	21.45	21.23	21.25	22.12	21.43	21.73	21.76	22.84	21.29	21.54
Coal-Opp-5	Hardness	85.20										87.60
Coal-Opp-5	Alkalinity	55.00										60.00
Coal-Opp-6	pH	7.80										8.00
Coal-Opp-6	Conductivity (us/cm)	315.00										309.00
Coal-Opp-6	D.O. (mg/L)	6.45	4.11	5.24	4.18	3.61	4.39	6.70	6.24	5.16	5.18	5.77
Coal-Opp-6	Temp (C)	21.44	21.52	21.27	21.34	22.13	21.36	21.69	21.73	22.77	21.29	21.31
Coal-Opp-6	Hardness	85.20										87.60
Coal-Opp-6	Alkalinity	55.00										60.00

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
ELK-00-1	pH	6.90										8.00
ELK-00-1	Conductivity (us/cm)	326.00										309.00
ELK-00-1	D.O. (mg/L)	6.21	4.87	4.32	4.83	4.91	5.04	6.34	5.97	5.05	5.27	5.38
ELK-00-1	Temp (C)	21.39	20.89	20.99	21.00	21.25	20.66	21.99	21.61	22.90	21.60	21.52
ELK-00-1	Hardness	88.00										84.80
ELK-00-1	Alkalinity	60.00										52.50
ELK-00-2	pH	7.10										8.00
ELK-00-2	Conductivity (us/cm)	329.00										306.00
ELK-00-2	D.O. (mg/L)	6.34	4.18	4.95	5.30	4.97	4.95	6.14	6.17	4.92	5.12	5.42
ELK-00-2	Temp (C)	21.44	21.01	20.91	20.90	21.61	21.19	22.03	21.78	23.05	21.85	21.81
ELK-00-2	Hardness	88.00										84.80
ELK-00-2	Alkalinity	60.00										52.50
ELK-00-3	pH	7.10										8.00
ELK-00-3	Conductivity (us/cm)	382.00										304.00
ELK-00-3	D.O. (mg/L)	6.42	4.87	4.97	5.34	4.84	4.86	6.13	6.07	4.98	5.00	5.63
ELK-00-3	Temp (C)	21.40	21.20	20.87	20.87	21.66	21.28	22.04	21.92	22.06	21.83	21.84
ELK-00-3	Hardness	88.00										84.80
ELK-00-3	Alkalinity	60.00										52.50
ELK-00-4	pH	7.20										8.00
ELK-00-4	Conductivity (us/cm)	319.00										306.00
ELK-00-4	D.O. (mg/L)	5.85	4.71	4.40	4.18	4.53	4.65	5.98	5.90	4.97	4.88	5.12
ELK-00-4	Temp (C)	21.37	21.10	20.90	20.92	21.70	21.36	22.07	21.92	21.93	21.80	21.86
ELK-00-4	Hardness	88.00										84.80
ELK-00-4	Alkalinity	60.00										52.50
ELK-00-5	pH	7.30										8.00
ELK-00-5	Conductivity (us/cm)	378.00										309.00
ELK-00-5	D.O. (mg/L)	6.18	4.24	5.06	5.49	5.24	4.35	5.63	5.94	4.62	4.81	4.95
ELK-00-5	Temp (C)	21.34	21.07	20.92	20.92	21.74	21.35	22.10	21.95	23.00	21.87	21.92
ELK-00-5	Hardness	88.00										84.80
ELK-00-5	Alkalinity	60.00										52.50
ELK-00-6	pH	7.40										8.00
ELK-00-6	Conductivity (us/cm)	329.00										304.00
ELK-00-6	D.O. (mg/L)	6.19	4.91	5.27	5.65	5.66	4.58	6.39	6.19	4.96	4.97	5.25
ELK-00-6	Temp (C)	21.34	21.27	20.92	20.92	21.84	21.49	22.12	22.03	23.10	21.90	21.93
ELK-00-6	Hardness	88.00										84.80
ELK-00-6	Alkalinity	60.00										52.50

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
ELK-06-1	pH	7.60										8.20
ELK-06-1	Conductivity (us/cm)	342.00										305.00
ELK-06-1	D.O. (mg/L)	6.46	4.71	5.30	5.58	4.93	4.37	6.65	6.10	5.17	5.30	4.97
ELK-06-1	Temp (C)	21.36	21.41	21.04	21.11	21.78	21.32	21.91	21.92	23.15	21.76	21.83
ELK-06-1	Hardness	91.60										84.80
ELK-06-1	Alkalinity	55.00										55.00
ELK-06-2	pH	7.50										8.20
ELK-06-2	Conductivity (us/cm)	359.00										308.00
ELK-06-2	D.O. (mg/L)	6.29	4.11	5.29	5.16	5.05	4.30	6.46	6.11	4.98	4.88	5.45
ELK-06-2	Temp (C)	21.40	21.23	21.01	21.02	21.82	20.95	21.98	21.96	23.15	21.80	21.87
ELK-06-2	Hardness	91.60										84.80
ELK-06-2	Alkalinity	55.00										55.00
ELK-06-3	pH	7.60										8.10
ELK-06-3	Conductivity (us/cm)	315.00										306.00
ELK-06-3	D.O. (mg/L)	6.19	4.01	4.97	5.36	5.26	4.53	6.39	6.10	5.19	5.05	5.43
ELK-06-3	Temp (C)	21.51	21.41	21.00	21.01	21.91	21.16	21.90	22.02	23.17	21.78	21.96
ELK-06-3	Hardness	91.60										84.80
ELK-06-3	Alkalinity	55.00										55.00
ELK-06-4	pH	7.70										8.10
ELK-06-4	Conductivity (us/cm)	315.00										305.00
ELK-06-4	D.O. (mg/L)	6.20	4.17	5.68	6.07	5.67	4.39	6.49	6.22	5.38	5.09	5.74
ELK-06-4	Temp (C)	21.53	21.40	20.97	21.01	22.02	21.45	22.05	22.02	23.27	21.87	22.02
ELK-06-4	Hardness	91.60										84.80
ELK-06-4	Alkalinity	55.00										55.00
ELK-06-5	pH	7.70										8.10
ELK-06-5	Conductivity (us/cm)	313.00										299.00
ELK-06-5	D.O. (mg/L)	6.42	4.99	5.89	6.17	6.05	4.57	6.76	6.15	5.47	5.38	5.94
ELK-06-5	Temp (C)	21.46	21.20	20.95	20.96	21.63	21.33	21.88	21.73	23.11	21.73	21.78
ELK-06-5	Hardness	91.60										84.80
ELK-06-5	Alkalinity	55.00										55.00
ELK-06-6	pH	7.70										8.10
ELK-06-6	Conductivity (us/cm)	312.00										301.00
ELK-06-6	D.O. (mg/L)	6.45	3.93	5.74	5.42	5.52	4.55	6.04	6.27	5.32	5.07	5.77
ELK-06-6	Temp (C)	21.25	21.29	21.01	21.00	21.53	21.18	21.71	21.64	22.90	22.01	21.61
ELK-06-6	Hardness	91.60										84.80
ELK-06-6	Alkalinity	55.00										55.00

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
ELK-08-1	pH	7.50										8.10
ELK-08-1	Conductivity (us/cm)	343.00										304.00
ELK-08-1	D.O. (mg/L)	6.10	3.74	5.64	5.26	5.64	4.61	6.45	5.79	5.13	5.06	5.34
ELK-08-1	Temp (C)	21.55	21.24	21.03	21.04	22.00	21.59	22.19	22.14	23.20	22.07	22.00
ELK-08-1	Hardness	86.40										85.60
ELK-08-1	Alkalinity	55.00										57.50
ELK-08-2	pH	7.40										8.10
ELK-08-2	Conductivity (us/cm)	315.00										302.00
ELK-08-2	D.O. (mg/L)	6.01	3.64	5.63	5.76	5.26	4.56	6.56	5.93	5.05	5.09	5.47
ELK-08-2	Temp (C)	21.54	21.25	20.91	20.98	22.04	21.58	22.20	22.18	23.32	22.07	22.09
ELK-08-2	Hardness	86.40										85.60
ELK-08-2	Alkalinity	55.00										57.50
ELK-08-3	pH	7.50										8.20
ELK-08-3	Conductivity (us/cm)	315.00										298.00
ELK-08-3	D.O. (mg/L)	6.23	4.10	5.24	5.54	5.49	4.59	6.30	5.57	5.24	5.19	5.37
ELK-08-3	Temp (C)	21.38	21.50	20.98	20.99	21.82	21.41	21.98	21.97	23.23	21.87	21.88
ELK-08-3	Hardness	86.40										85.60
ELK-08-3	Alkalinity	55.00										57.50
ELK-08-4	pH	7.50										8.10
ELK-08-4	Conductivity (us/cm)	314.00										301.00
ELK-08-4	D.O. (mg/L)	6.47	4.91	4.95	5.60	5.70	4.69	5.85	6.35	5.39	5.21	5.67
ELK-08-4	Temp (C)	21.38	21.29	21.13	21.15	21.78	21.38	21.94	21.85	23.22	21.76	21.81
ELK-08-4	Hardness	86.40										85.60
ELK-08-4	Alkalinity	55.00										57.50
ELK-08-5	pH	7.60										8.10
ELK-08-5	Conductivity (us/cm)	314.00										302.00
ELK-08-5	D.O. (mg/L)	6.50	4.71	5.62	6.01	6.10	4.84	6.62	6.30	5.40	5.32	5.54
ELK-08-5	Temp (C)	21.36	21.09	20.94	20.89	21.70	21.37	21.93	21.91	23.18	21.70	21.81
ELK-08-5	Hardness	86.40										85.60
ELK-08-5	Alkalinity	55.00										57.50
ELK-08-6	pH	7.60										8.20
ELK-08-6	Conductivity (us/cm)	314.00										301.00
ELK-08-6	D.O. (mg/L)	6.42	4.11	5.60	6.06	5.77	4.63	6.88	6.43	5.47	5.54	5.81
ELK-08-6	Temp (C)	21.36	21.37	20.81	20.82	21.70	21.34	21.91	21.83	23.11	21.73	21.78
ELK-08-6	Hardness	86.40										85.60
ELK-08-6	Alkalinity	55.00										57.50

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
SP-00-1	pH	7.80										8.20
SP-00-1	Conductivity (us/cm)	324.00										315.00
SP-00-1	D.O. (mg/L)	6.28	5.01	5.31	5.12	5.16	4.27	6.46	5.91	4.91	4.79	5.47
SP-00-1	Temp (C)	21.59	21.24	21.27	21.26	22.39	21.70	22.13	22.20	23.37	21.90	22.11
SP-00-1	Hardness	86.00										86.80
SP-00-1	Alkalinity	55.00										55.00
SP-00-2	pH	7.80										8.20
SP-00-2	Conductivity (us/cm)	321.00										314.00
SP-00-2	D.O. (mg/L)	6.26	5.21	5.91	5.81	5.33	4.39	6.58	5.95	4.94	4.87	5.69
SP-00-2	Temp (C)	21.67	21.20	21.27	21.34	22.58	21.77	22.23	22.24	23.66	22.12	22.22
SP-00-2	Hardness	86.00										86.80
SP-00-2	Alkalinity	55.00										55.00
SP-00-3	pH	7.80										8.10
SP-00-3	Conductivity (us/cm)	315.00										309.00
SP-00-3	D.O. (mg/L)	6.42	5.45	5.28	5.81	5.33	4.48	6.52	5.72	5.35	5.37	5.90
SP-00-3	Temp (C)	21.52	21.27	21.22	21.23	22.22	21.52	21.95	21.92	23.25	21.70	21.83
SP-00-3	Hardness	86.00										86.80
SP-00-3	Alkalinity	55.00										55.00
SP-00-4	pH	7.80										8.10
SP-00-4	Conductivity (us/cm)	314.00										308.00
SP-00-4	D.O. (mg/L)	6.41	5.44	5.94	6.07	5.63	4.49	6.38	6.15	5.28	5.32	5.78
SP-00-4	Temp (C)	21.32	21.45	21.16	21.15	22.06	21.48	21.85	21.76	23.00	21.67	21.72
SP-00-4	Hardness	86.00										86.80
SP-00-4	Alkalinity	55.00										55.00
SP-00-5	pH	7.80										8.20
SP-00-5	Conductivity (us/cm)	313.00										307.00
SP-00-5	D.O. (mg/L)	6.40	4.90	5.24	5.22	5.86	4.38	7.12	6.27	5.45	5.39	5.86
SP-00-5	Temp (C)	21.31	21.30	21.15	21.19	22.01	21.41	21.80	21.95	23.06	21.58	21.56
SP-00-5	Hardness	86.00										86.80
SP-00-5	Alkalinity	55.00										55.00
SP-00-6	pH	7.80										8.20
SP-00-6	Conductivity (us/cm)	312.00										305.00
SP-00-6	D.O. (mg/L)	6.21	4.11	4.91	5.55	5.30	4.44	6.83	6.34	5.46	5.34	6.01
SP-00-6	Temp (C)	20.88	21.24	21.38	21.42	27.00	21.40	21.74	21.68	23.02	21.53	21.60
SP-00-6	Hardness	86.00										86.80
SP-00-6	Alkalinity	55.00										55.00

Appendix A
Water Chemistry Data
Site Sediment - Standard Mine

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
SP-01-1	pH	7.80										8.20
SP-01-1	Conductivity (us/cm)	319.00										302.00
SP-01-1	D.O. (mg/L)	6.54	4.97	5.88	6.02	5.71	4.38	6.96	6.40	5.37	5.27	5.38
SP-01-1	Temp (C)	21.32	21.45	21.23	21.24	22.21	21.53	21.90	21.80	23.01	21.51	21.63
SP-01-1	Hardness	87.60										89.60
SP-01-1	Alkalinity	52.50										55.00
SP-01-2	pH	7.80										8.20
SP-01-2	Conductivity (us/cm)	314.00										303.00
SP-01-2	D.O. (mg/L)	6.47	4.50	5.67	5.40	5.67	4.43	6.99	6.29	5.29	5.11	5.25
SP-01-2	Temp (C)	21.43	21.30	21.27	21.26	22.18	21.51	21.84	21.76	23.13	21.70	21.77
SP-01-2	Hardness	87.60										89.60
SP-01-2	Alkalinity	52.50										55.00
SP-01-3	pH	7.80										8.20
SP-01-3	Conductivity (us/cm)	314.00										306.00
SP-01-3	D.O. (mg/L)	6.37	5.99	5.99	6.11	5.76	4.42	6.64	5.54	5.10	5.14	5.06
SP-01-3	Temp (C)	21.42	21.32	21.30	21.32	22.33	21.65	21.99	21.99	23.24	21.74	21.84
SP-01-3	Hardness	87.60										89.60
SP-01-3	Alkalinity	52.50										55.00
SP-01-4	pH	7.80										8.10
SP-01-4	Conductivity (us/cm)	313.00										305.00
SP-01-4	D.O. (mg/L)	6.39	5.11	4.23	5.11	5.56	4.37	6.90	6.15	5.52	5.13	5.31
SP-01-4	Temp (C)	21.45	21.32	21.38	21.32	22.43	21.72	22.07	21.99	23.26	21.41	22.01
SP-01-4	Hardness	87.60										89.60
SP-01-4	Alkalinity	52.50										55.00
SP-01-5	pH	7.80										8.10
SP-01-5	Conductivity (us/cm)	318.00										303.00
SP-01-5	D.O. (mg/L)	6.35	5.39	4.90	5.58	5.83	4.47	6.81	5.90	5.22	5.31	5.96
SP-01-5	Temp (C)	21.41	21.33	21.35	21.35	22.28	21.52	21.93	21.86	23.12	21.59	21.80
SP-01-5	Hardness	87.60										89.60
SP-01-5	Alkalinity	52.50										55.00
SP-01-6	pH	7.70										8.10
SP-01-6	Conductivity (us/cm)	313.00										300.00
SP-01-6	D.O. (mg/L)	6.49	5.20	5.49	6.07	5.91	4.45	6.76	5.89	5.25	5.20	6.13
SP-01-6	Temp (C)	21.35	21.20	21.21	21.18	22.10	21.47	21.75	21.75	23.00	21.59	21.72
SP-01-6	Hardness	87.60										89.60
SP-01-6	Alkalinity	52.50										55.00

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Control-1	pH	7.90				7.91
Control-1	Conductivity (us/cm)	323.00				419.00
Control-1	D.O. (mg/L)	6.53	6.79	6.80	6.75	6.72
Control-1	Temp (C)	20.68	20.53	23.19	21.12	21.23
Control-1	Hardness	80.80				100.00
Control-1	Alkalinity	50.00				65.00
Control-2	pH	8.00				7.91
Control-2	Conductivity (us/cm)	316.00				387.00
Control-2	D.O. (mg/L)	6.48	6.56	6.43	6.63	6.47
Control-2	Temp (C)	20.96	21.23	23.87	21.74	21.48
Control-2	Hardness	80.80				100.00
Control-2	Alkalinity	50.00				65.00
Control-3	pH	8.00				7.91
Control-3	Conductivity (us/cm)	312.00				369.00
Control-3	D.O. (mg/L)	6.38	6.46	6.51	6.41	6.72
Control-3	Temp (C)	21.19	21.38	22.62	21.80	21.57
Control-3	Hardness	80.80				100.00
Control-3	Alkalinity	50.00				65.00
Control-4	pH	8.00				7.91
Control-4	Conductivity (us/cm)	315.00				376.00
Control-4	D.O. (mg/L)	6.07	6.66	6.08	6.55	6.52
Control-4	Temp (C)	20.98	21.37	24.89	22.05	21.61
Control-4	Hardness	80.80				100.00
Control-4	Alkalinity	50.00				65.00

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Ref-6.25%-1	pH	7.80				7.85
Ref-6.25%-1	Conductivity (us/cm)	375.00				390.00
Ref-6.25%-1	D.O. (mg/L)	6.76	6.81	5.36	6.15	6.75
Ref-6.25%-1	Temp (C)	21.23	21.35	24.61	21.73	21.40
Ref-6.25%-1	Hardness	82.00				105.20
Ref-6.25%-1	Alkalinity	50.00				65.00
Ref-6.25%-2	pH	7.90				7.85
Ref-6.25%-2	Conductivity (us/cm)	381.00				391.00
Ref-6.25%-2	D.O. (mg/L)	6.37	6.48	5.85	6.81	6.52
Ref-6.25%-2	Temp (C)	21.29	21.45	24.91	21.99	21.44
Ref-6.25%-2	Hardness	82.00				105.20
Ref-6.25%-2	Alkalinity	50.00				65.00
Ref-6.25%-3	pH	8.00				7.85
Ref-6.25%-3	Conductivity (us/cm)	383.00				389.00
Ref-6.25%-3	D.O. (mg/L)	6.81	6.76	5.85	6.87	6.43
Ref-6.25%-3	Temp (C)	21.38	21.42	24.52	22.11	21.46
Ref-6.25%-3	Hardness	82.00				105.20
Ref-6.25%-3	Alkalinity	50.00				65.00
Ref-6.25%-4	pH	8.00				7.85
Ref-6.25%-4	Conductivity (us/cm)	385.00				388.00
Ref-6.25%-4	D.O. (mg/L)	6.86	6.73	5.83	6.85	6.23
Ref-6.25%-4	Temp (C)	21.33	21.29	24.56	22.10	21.47
Ref-6.25%-4	Hardness	82.00				105.20
Ref-6.25%-4	Alkalinity	50.00				65.00

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Ref-12.5%-1	pH	8.00				7.99
Ref-12.5%-1	Conductivity (us/cm)	401.00				399.00
Ref-12.5%-1	D.O. (mg/L)	6.83	6.71	5.79	6.29	5.75
Ref-12.5%-1	Temp (C)	21.25	21.30	24.09	21.89	21.38
Ref-12.5%-1	Hardness	80.40				111.60
Ref-12.5%-1	Alkalinity	50.00				67.50
Ref-12.5%-2	pH	8.00				7.99
Ref-12.5%-2	Conductivity (us/cm)	404.00				407.00
Ref-12.5%-2	D.O. (mg/L)	6.76	6.64	5.46	6.71	6.35
Ref-12.5%-2	Temp (C)	22.06	21.44	24.62	22.13	21.36
Ref-12.5%-2	Hardness	80.40				111.60
Ref-12.5%-2	Alkalinity	50.00				67.50
Ref-12.5%-3	pH	8.00				7.99
Ref-12.5%-3	Conductivity (us/cm)	402.00				413.00
Ref-12.5%-3	D.O. (mg/L)	6.57	6.48	5.53	6.83	6.52
Ref-12.5%-3	Temp (C)	21.96	21.25	24.68	22.11	21.33
Ref-12.5%-3	Hardness	80.40				111.60
Ref-12.5%-3	Alkalinity	50.00				67.50
Ref-12.5%-4	pH	8.00				7.99
Ref-12.5%-4	Conductivity (us/cm)	399.00				400.00
Ref-12.5%-4	D.O. (mg/L)	6.91	6.83	5.47	6.92	6.31
Ref-12.5%-4	Temp (C)	21.84	21.28	24.64	22.08	21.33
Ref-12.5%-4	Hardness	80.40				111.60
Ref-12.5%-4	Alkalinity	50.00				67.50

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Ref-25%-1	pH	8.00				7.99
Ref-25%-1	Conductivity (us/cm)	423.00				420.00
Ref-25%-1	D.O. (mg/L)	6.91	6.83	5.47	6.34	6.37
Ref-25%-1	Temp (C)	21.36	21.21	23.21	21.88	21.29
Ref-25%-1	Hardness	81.60				114.40
Ref-25%-1	Alkalinity	50.00				70.00
Ref-25%-2	pH	8.00				7.99
Ref-25%-2	Conductivity (us/cm)	417.00				422.00
Ref-25%-2	D.O. (mg/L)	6.82	6.79	5.48	6.79	6.63
Ref-25%-2	Temp (C)	21.38	21.26	24.15	21.83	21.22
Ref-25%-2	Hardness	81.60				114.40
Ref-25%-2	Alkalinity	50.00				70.00
Ref-25%-3	pH	8.00				7.99
Ref-25%-3	Conductivity (us/cm)	412.00				419.00
Ref-25%-3	D.O. (mg/L)	6.89	6.74	5.33	6.80	6.53
Ref-25%-3	Temp (C)	21.40	21.29	25.34	21.86	21.21
Ref-25%-3	Hardness	81.60				114.40
Ref-25%-3	Alkalinity	50.00				70.00
Ref-25%-4	pH	8.00				7.99
Ref-25%-4	Conductivity (us/cm)	418.00				424.00
Ref-25%-4	D.O. (mg/L)	6.96	6.83	5.40	6.84	6.51
Ref-25%-4	Temp (C)	21.43	21.21	24.59	22.05	21.28
Ref-25%-4	Hardness	81.60				114.40
Ref-25%-4	Alkalinity	50.00				70.00

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Ref-50%-1	pH	8.00				8.00
Ref-50%-1	Conductivity (us/cm)	382.00				390.00
Ref-50%-1	D.O. (mg/L)	6.83	6.76	5.34	5.97	6.13
Ref-50%-1	Temp (C)	22.07	21.32	24.32	21.84	21.13
Ref-50%-1	Hardness	78.00				112.40
Ref-50%-1	Alkalinity	50.00				70.00
Ref-50%-2	pH	8.00				8.00
Ref-50%-2	Conductivity (us/cm)	387.00				385.00
Ref-50%-2	D.O. (mg/L)	6.79	6.75	5.03	6.57	6.42
Ref-50%-2	Temp (C)	21.38	21.31	24.25	21.76	21.20
Ref-50%-2	Hardness	78.00				112.40
Ref-50%-2	Alkalinity	50.00				70.00
Ref-50%-3	pH	8.00				8.00
Ref-50%-3	Conductivity (us/cm)	392.00				395.00
Ref-50%-3	D.O. (mg/L)	6.76	6.61	5.08	6.60	6.63
Ref-50%-3	Temp (C)	21.37	21.20	25.23	21.80	21.14
Ref-50%-3	Hardness	78.00				112.40
Ref-50%-3	Alkalinity	50.00				70.00
Ref-50%-4	pH	8.00				8.00
Ref-50%-4	Conductivity (us/cm)	395.00				398.00
Ref-50%-4	D.O. (mg/L)	6.75	6.71	5.38	6.67	6.62
Ref-50%-4	Temp (C)	21.35	21.24	24.38	21.80	21.20
Ref-50%-4	Hardness	78.00				112.40
Ref-50%-4	Alkalinity	50.00				70.00

Appendix B
Water Chemistry Data
Reference Toxicity Test

Site I.D.	Parameter	Day 0	Day 1	Day 2	Day 3	Day 4
Ref-100%-1	pH	8.00				7.97
Ref-100%-1	Conductivity (us/cm)	395.00				402.00
Ref-100%-1	D.O. (mg/L)	6.57	6.48	6.80	5.80	5.98
Ref-100%-1	Temp (C)	21.38	21.23	23.29	21.76	21.16
Ref-100%-1	Hardness	80.80				110.00
Ref-100%-1	Alkalinity	50.00				65.00
Ref-100%-2	pH	8.00				7.97
Ref-100%-2	Conductivity (us/cm)	398.00				406.00
Ref-100%-2	D.O. (mg/L)	6.42	6.36	6.46	6.43	6.32
Ref-100%-2	Temp (C)	21.37	21.30	23.90	21.75	21.17
Ref-100%-2	Hardness	80.80				110.00
Ref-100%-2	Alkalinity	50.00				65.00
Ref-100%-3	pH	8.00				7.97
Ref-100%-3	Conductivity (us/cm)	399.00				412.00
Ref-100%-3	D.O. (mg/L)	6.41	6.34	6.41	6.20	6.23
Ref-100%-3	Temp (C)	21.82	21.35	23.90	21.84	21.20
Ref-100%-3	Hardness	80.80				110.00
Ref-100%-3	Alkalinity	50.00				65.00
Ref-100%-4	pH	8.00				7.97
Ref-100%-4	Conductivity (us/cm)	405.00				419.00
Ref-100%-4	D.O. (mg/L)	6.51	6.30	6.12	6.18	6.20
Ref-100%-4	Temp (C)	21.31	21.29	25.03	21.80	21.22
Ref-100%-4	Hardness	80.80				110.00
Ref-100%-4	Alkalinity	50.00				65.00

Appendix E

Sampling Trip Report June and September 2007

Standard Mine Site
Gunnison County, Colorado

SAMPLING TRIP REPORT
JUNE AND SEPTEMBER 2007

February 2008

Prepared by:
U.S. Environmental Protection Agency
Region 8, Ecosystems Protection and Remediation
Program Support-Technical Assistance Unit
1595 Wynkoop Street
Denver, CO 80202

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Gunnison County, Colorado

1.0 INTRODUCTION

The Environmental Protection Agency (EPA), working in cooperation with the U.S. Fish and Wildlife Service (USFWS), Colorado Department of Public Health and Environment (CDPHE), the Colorado Division of Wildlife (CO DOW), Coal Creak Watershed Coalition (CCWC), and EPA Region 8 Environmental Services Assistance Team (ESAT), conducted sampling at the Standard Mine in accordance with the Sampling and Analysis Plan / Quality Assurance Project Plan (SAP/QAPP), 2007 Sampling Events, Standard Mine, dated June 2007. This Trip Report describes activities specific to the September sampling event, although a brief explanation of the June sampling event will also be included. Field activities followed the applicable EPA Standard Operating Procedures (SOPs) as described in the SAP/QAPP.

The Standard Mine 2007 sampling activities included two separate events to characterize conditions at the site during spring high-flow and fall low-flow regimes. The first event during high flow conditions occurred from June 11-13, 2007 and involved the collection of standard field parameters (temperature, dissolved oxygen, pH, conductivity, and stream flows) and surface water. The second event during low flow conditions occurred from September 17-20, 2007 and required the collection of standard field parameters (temperature, dissolved oxygen, pH, conductivity, and stream flows), surface water, bulk sediment, surface water and sediment for toxicity testing, macroinvertebrates, and fish. Each event involved sampling at stations previously identified in past site investigations, in addition to three opportunistic samples taken in June and ten upper wetland samples collected in September, as described in Tables 1 and 2.

The June 2007 sampling activities included the collection of: ninety surface water samples at eighteen stations (dissolved metals; total recoverable metals; alkalinity and anions; DOC). The September 2007 sampling activities included the collection of: one hundred twenty surface water samples at twenty nine stations (dissolved metals; total recoverable metals; alkalinity and anions; DOC); twenty two bulk sediment sample stations (total recoverable metals); eight surface water and sediment toxicity testing stations (fathead minnow and rainbow trout 96-hour tests, *Hyalella azteca* 14-day tests); eleven macroinvertebrate samples (RBP metrics); and eight fish shocking locations (density and biomass).

Samples of surface water, bulk sediment, and toxicity testing waters/sediment were submitted to the ESAT chemists at the Region 8 laboratory for Target Analyte List (TAL) metals analysis (total recoverable and dissolved), anions and alkalinity, and DOC. CO DOW assumed responsibility for the identification of, and biomass results from, fish collected at the designated stations. Macroinvertebrate samples were submitted to Syracuse Research Corporation (SRC) for sorting, counting, and identification by a subcontractor, GEI consultants. All of the information collected during the 2007 June and September sampling events will be compiled into a final Sampling Activities Report (SAR).

2.0 BACKGROUND

The Standard Mine was part of the Ruby Mining District in Gunnison County, which is located in southwestern Colorado near the town of Crested Butte. Historic mining activities started in 1874, with the most significant operations occurring in 1931. The mine primarily extracted lead, zinc, silver, and gold until 1966 when it was abandoned.

The purpose of the 2007 site investigation was the gathering of data to establish site conditions following removal activities which occurred in 2006 and 2007, determine surface water contaminations of potential concern in upper wetlands areas at Levels 98 and 5, and assist with the evaluation of the feasibility of passive and active treatment alternatives for adit discharges at the site. Results from the June and September 2007 sampling activities will be compared to results from previous years as part of a biological monitoring program to further the analysis of conditions at the Standard Mine Site.

3.0 SITE ACTIVITIES

The June sampling team consisted of two EPA employees, Jennifer Slavick and Christina Progess (EPA RPM), and one CDPHE employee, Jim Lewis (State RPM). Descriptions of the sample station locations are provided in Table 1 and the extent of sampling is shown in Figure 1. The September sampling team consisted of two EPA employees, Jennifer Slavick and Susan Griffin, two US Fish and Wildlife Service (FWS) employees, Dan Wall (Region 8 Liaison) and Laura Archuleta (San Luis Valley, Colorado field office), and a local representative from the SMAG, Anthony Poponi, who is also the field sampling coordinator for the Coal Creek Watershed Coalition. Two ESAT employees, Francisco Lapostol and John Wieber, collected surface water samples from eight station locations for

the toxicity tests to be conducted by ESAT at the Region 8 Laboratory. Dan Braugh and other employees from CO DOW performed the fish shocking requirements of the sampling plan. Descriptions of the sample station locations are listed in Table 2 with Figures 1 and 2 providing an aerial representation of the site.

Water quality parameters were measured with Hydrolab multi-probe instrumentation. The required data included pH, temperature (°C), dissolved oxygen (mg/L), and conductivity (µS/cm), and was recorded in a site-specific field notebook. This information, which was collected at each station location for surface water samples, is provided in Table 2. Site photos for select sample areas in June and September are attached in Appendix A and Appendix B, respectively.

Density and biomass results from the fish shocking field activities will be provided to EPA by CO DOW, and those results will be included in the final SAR. An analysis of the 2007 fish data compared to previous years will be presented in a biological monitoring report for the Standard Mine Site.

4.0 SAMPLING AND ANALYSIS

All surface water, sediment, and toxicity testing water/sediment samples were submitted to ESAT for Target Analyte List (TAL) metals analysis (total recoverable and dissolved), anions and alkalinity, and DOC. Water samples were collected by immersing certified clean 250-mL HDPE bottles into the stream, pouring the first water samples into 250-mL HDPE Nalgene filter units (dissolved metals and DOC), and then collecting secondary water samples (total recoverable metals and anions/alkalinity). Sediment samples were collected into 8-oz (bulk analysis) and 1-L (toxicity testing and spin-down porewater) plastic jars using dedicated, disposable plastic scoops. Toxicity testing waters were collected into multiple 1-gallon HDPE cubitainers and transported back to the Region 8 laboratory to initiate toxicity tests within 24-hours of the sample collection. The aforementioned samples were submitted to the following ESAT laboratory:

ESAT, TechLaw, Inc.
16194 West 45th Drive
Golden, Colorado 80403

Field personnel collected samples to be analyzed according to the appropriate EPA Test Methods as described in the SAP/QAPP, dated June 2007.

Macroinvertebrate samples were sent through Syracuse Research Corporation (SRC) to a subcontractor, G.E.I. Consultants, for sorting, identification, and counting, in accordance with EPA Rapid Bioassessment Protocol (RBP) Methods. Eleven samples were sent to the following laboratory:

G.E.I. Consultants
Attn. Suzanne Pargee
5575 S. Sycamore St., Suite 201
Littleton, CO 80120

During the June 2007 event, surface water duplicate (QC) samples were collected at sample locations Coal-25 and Elk-10, and two field blanks were submitted for analysis. In the course of the September 2007 event, surface water duplicate (QC) samples were collected at sample locations Coal-15 and Elk-08, and one sediment duplicate (QC) sample was collected at sample location Coal-15. All of the samples from both June and September were submitted for the appropriate TAL metals (total recoverable and dissolved), DOC, anions/alkalinity analyses, as described previously.

The complete analytical chemistry sample results for all parameters will be included in a final Sampling Activities Report (SAR) prepared by ESAT contractors. ESAT will provide interim electronic data deliverables (EDDs) until the Scribe database for Standard Mine is finalized.

5.0 FIELD SAMPLING PLAN DEVIATIONS

The following deviations from the SAP/QAPP, dated June 2007, were made in the field based on recommendations by the site team and Standard Mine RPM:

- During the June 2007 sampling event, three opportunistic samples were collected at stations designated as Elk-12, SM-SEEP-01, and SM-SEEP-02. Table 1 provides a narrative description of the station locations and the photos in Appendix A visually portray the areas in which the samples were collected.

- On the first day of the September sampling, Monday 17, 2007, it rained most of the day with precipitation having fallen throughout the previous weekend. These weather conditions resulted in slightly higher flows and murky water in Coal Creek; therefore, the surface water samples should be considered representative of storm event conditions, particularly the water collected for toxicity testing.

- The surface water toxicity testing samples were collected by ESAT prior to the scheduled start of the September sampling event on Sunday 16 and Monday 17. These samples were collected during a storm event and will therefore provide condition-specific information of toxicity. One station location, Elk-06, was missed during the sampling event. Preliminary results from toxicity testing of the storm event samples indicated 100% mortality at the stations above, Elk-08, and below, Elk-05, data which suggests there would have been 100% mortality at Elk-06, which was missed during sample collection. Therefore, ESAT was not directed to sample again or perform a secondary toxicity test.

- In coordination with the RPM, Christina Progess, the sampling team determined in the field the exact sampling locations for the surface water samples collected from the upper wetland systems at Levels 98 and 5 of the Standard Mine site. Detailed descriptions of these locations are provided in Table 2, Figure 2 provides an aerial depiction of the stations, and Appendix B contains site-specific photos from the September sampling.

- Due to a delay in the subcontracting mechanism, macroinvertebrate samples from the September event were not transferred to the necessary lab until Tuesday, October 16, 2007. In order to maintain sample integrity, samples were preserved with ethanol in the field, kept in a cooler at the EPA Region 8 laboratory, and shipped to G.E.I Consultants in coolers with ice.

TABLE 1
June 2007 Sample Location Descriptions

Sample Stations	Location Description
Coal-10	Coal Creek approximately 50 yards upstream of Keystone Mine WWTP outfall.
Coal-Opp1	Coal Creek upstream of iron fen outfall.
Coal-15	Coal Creek 100+ meters downstream of Elk Creek confluence.
Coal-20	Coal Creek approximately 50 yards upstream of Elk Creek confluence.
Coal-25	Coal Creek downstream from Independence and Anthracite/Ruby confluence.
SP-00	Splain's Gulch immediately above confluence with Coal Creek.
SP-01	Upper Splain's Gulch above road crossing: reference location.
Elk-00	Elk Creek at CO-12 crossing approximately 100 yards upstream of confluence with Coal Creek.
Elk-01	CO DOW station for fish shocking located .1 M above C.R. 12 and upstream from Elk-00.
Elk-05	Elk Creek approximately 130 ft. downstream of confluence of several seeps that feed Elk Creek from the eastern bank.
Elk-06	Elk Creek upstream of sampling location Seep-01.
Elk-08	Elk Creek downstream of Copley Lake outfall.
Elk-10	Elk Creek approximately 30 meters below historic tailings impoundment.
Elk-29	Elk Creek upstream of the primary mine site and downstream of confluence of individual Elk Creek flows (tributaries near headwaters).
Cop-00	Copley Lake outfall.
SM-00	Standard Mine adit as it passes through the flume.
The following are three opportunity stations sampled during the June 2007 event.	
Elk-12	Elk Creek upstream from Elk-10 located within engineered channel and formerly underneath the support beams for old railroad trestle, which have since been removed.
SM-SEEP-01	Seep located below the Standard Mine portal and immediately above the north end of the tailings impoundment, south of the mill foundation.
SM-SEEP-02	Seep emanating from east hillside near Level 1 adit portal; sample taken approximately 100 yards uphill from 1st of debris piles near the adit.

TABLE 2
September 2007 Sample Location Descriptions

Sample Stations	Location Description
Coal-10	Coal Creek approximately 50 yards upstream of Keystone Mine WWTP outfall.
Coal-Opp1	Coal Creek upstream of iron fen outfall.
Coal-15	Coal Creek 100+ meters downstream of Elk Creek confluence.
Coal-20	Coal Creek approximately 50 yards upstream of Elk Creek confluence.
Coal-25E	CO DOW station (GU2096) for fish shocking located .3 M above Splain's Gulch.
Coal-25	Coal Creek downstream from Independence and Anthracite/Ruby confluence.
SP-00	Splain's Gulch immediately above confluence with Coal Creek.
SP-01	Upper Splain's Gulch above road crossing: reference location.
Elk-00	Elk Creek at CO-12 crossing approximately 100 yards upstream of confluence with Coal Creek.
Elk-01	CO DOW station for fish shocking located .1 M above C.R. 12 and upstream from Elk-00.
Elk-05	Elk Creek approximately 130 ft. downstream of confluence of several seeps that feed Elk Creek from the eastern bank.
Elk-06	Elk Creek upstream of sampling location Seep-01.
Elk-08	Elk Creek downstream of Copley Lake outfall.
Elk-10	Elk Creek approximately 30 meters below historic tailings impoundment.
Elk-29	Elk Creek upstream of the primary mine site and downstream of confluence of individual Elk Creek flows (tributaries near headwaters).
Cop-00	Copley Lake outfall.
SM-00	Standard Mine adit as it passes through the flume.
The following are ten new stations sampled during the September 2007 event in order to characterize the upper wetland areas at Levels 5 and 98 of the mine site.	
Level 98 WL-1	Sampled in Elk Creek channel below wetland seep influences flowing through waste rock at Level 98.
Level 98 WL-2	Facing downstream, farthest left seep from wetland below Level 98 Adit. Sampled amongst trees ~20m upstream of Elk Creek confluence.
Level 98 WL-3	Facing downstream, farthest right seep from wetland below Level 98 Adit. Sampled ~25m downstream of berm near Level 98 WL-4 station.
Level 98 WL-4	Downstream of vegetation test plots and approximately 50m downstream of Level 98 Adit discharge in waste rock piles.
Level 98 Adit	Sampled approximately 15m downstream of the Level 98 Adit opening, above the seep flowing down the hillside.
Level 98 WL-5	Above adit indraw coming down the slope; runs into wetland system east of adit drainage.
Level 5 WL-1	Flowing seep approximately 75m downstream of waste rock piles at Level 5.
Level 5 WL-2	Sampled immediately below road between waste rock and wetlands.
Level 5 WL-3	Sampled at the toe of waste rock pile on the right.
Level 5 Adit	Sampled directly in pool at the mouth of the Level 5 Adit.

TABLE 3
June 2007 Field Water Quality Parameters

Surface Water

Station Locations	Date	Time	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Flow (cfs)
Coal-10	06/11/2007	14:53	7.57	9.51	8.20	59.00	44.78
Coal-Opp1	06/11/2007	15:53	7.55	9.22	7.97	58.00	39.06
Coal-15	06/11/2007	16:50	7.75	8.40	7.95	53.00	40.98
Coal-20	06/11/2007	17:10	7.98	8.43	7.91	41.00	31.19
Coal-25	06/11/2007	18:28	7.72	9.24	7.62	45.00	12.28
SP-00[A]	06/12/2007	11:15	7.24	4.58	8.89	36.00	19.22
SP-01	06/12/2007	12:18	7.47	5.28	8.51	31.00	10.20
Elk-00[B]	06/12/2007	17:58	7.85	7.42	8.09	96.00	-----
Elk-05	06/12/2007	14:30	7.64	5.94	8.38	81.00	10.30
Elk-06	06/12/2007	14:46	7.34	7.32	8.10	75.00	6.46
Elk-08	06/12/2007	15:57	7.34	7.32	8.10	75.00	6.46
Elk-10[A]	06/13/2007	9:35	6.40	4.74	8.70	76.00	1.94
Elk-29	06/13/2007	11:45	7.04	6.69	9.02	37.00	1.39
Cop-01	06/12/2007	16:10	7.65	11.06	7.49	22.00	1.44
SM-00	06/13/2007	10:35	4.19	3.75	9.21	397.00	0.13
The following are opportunity sample stations collected during spring high flows in 2007.							
Elk-12	06/13/2007	12:25	6.65	7.13	9.63	68.00	2.04
SM-SEEP-01[C]	06/13/2007	17:23	4.53	6.46	9.21	222.00	0.02
SM-SEEP-02[C]	06/13/2007	11:40	7.07	5.33	9.72	61.00	-----

Notes: [A] Duplicate (QC) Location

[B] A height of 1.5 was read on the EPA flume gauge at this location. It was later discovered that the flume data transmitter was not working and an accurate flow was not obtained. Refer to sample location ELK-05 for the Elk Creek flow.

[C] These two seeps were sampled for the first time during this sampling event. SM-SEEP-01 is located below the Standard Mine portal and immediately above the north end of the tailings impoundment south of the mill foundation. SM-SEEP-02 is a seep emanating from the east hillside near Level 1 adit portal with the sample taken approximately 100 yards uphill from 1st of debris piles near the adit.

TABLE 4
September 2007 Field Water Quality Parameters

Surface Water

Station Locations	Date	Time	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Flow (cfs)
Coal-10	09/17/07	14:50	6.52	8.90	8.17	136.5	21.29
Coal-Opp1	09/17/07	16:00	7.11	9.19	7.56	121.3	14.48
Coal-15[A]	09/17/07	17:05	7.30	8.15	7.56	115.4	10.49
Coal-20	09/17/07	17:40	7.45	8.53	7.47	89.8	6.89
Elk-00	09/17/07	18:39	7.15	6.62	8.28	181.6	2.53
Coal-25	09/18/07	9:06	6.50	5.22	7.20	91.1	0.82
SP-00	09/18/07	10:00	6.82	4.55	8.27	55.6	0.65
SP-01	09/18/07	11:08	7.19	5.53	8.79	47.3	0.43
Elk-05	09/18/07	15:09	6.93	7.57	8.41	160.2	1.20
Elk-06	09/18/07	15:27	6.74	8.65	7.61	180.2	0.62
Elk-08[A]	09/18/07	16:25	6.80	9.41	7.69	165.2	0.63
Cop-01	09/18/07	17:09	7.01	6.88	7.99	32.8	0.01
Elk-10	09/19/07	9:57	6.41	6.32	7.84	177.9	0.27
Elk-29	09/19/07	11:08	6.76	6.37	7.94	53.1	0.16
SM-00	09/19/07	11:20	5.76	4.33	7.86	530.6	0.29
The following are new stations in 2007 to characterize upper wetland areas at Levels 5 and 98.							
Level 98 WL-1	09/19/07	13:35	6.57	11.50	7.08	59.4	Not collected
Level 98 WL-2	09/19/07	13:41	6.57	14.61	5.10	72.5	Not collected
Level 98 WL-4	09/19/07	13:59	6.59	17.29	5.72	72.6	Not collected
Level 98 WL-3	09/19/07	14:04	6.64	19.58	5.25	80.5	Not collected
Level 98 Adit	09/19/07	14:28	4.44	11.94	4.12	197.8	Not collected
Level 98 WL-5	09/19/07	14:45	5.91	13.11	5.57	42.3	Not collected
Level 5 WL-1	09/19/07	15:23	3.43	14.94	5.13	468.1	Not collected
Level 5 WL-2	09/19/07	15:55	3.09	11.42	5.95	809.0	Not collected
Level 5 WL-3	09/19/07	15:35	4.11	10.86	7.86	345.5	Not collected
Level 5 Adit	09/19/07	15:23	5.72	5.22	6.77	214.0	Not collected

Notes: [A] Duplicate (QC) location


Figure 1. Standard Mine 2007 Surface Water Sampling Locations
Surface Water Sampling Location
Date: December 4, 2007
References:
Imagery - One-foot aerial photography from Spectrum Mapping (July 13, 2006)
Surface Water Sampling Locations - US-EPA Region 8 (2007)
Map Projection/Coordinate System: UTM, Meters, Zone 13 North, NAD 83
Miles
0
0.25
0.5
EPA
TechLaw
US-EPA Region 8
Montana
North Dakota
South Dakota
Wyoming
Standard Mine Superfund Site
Utah
Colorado
Elk-29
SM-00
Elk-10
Cop-01
Elk-08
Irwin Lake Road
Standard Mine Road
Elk-06
Elk-05
Coal-10
County Road 12
Coal-Opp1
Elk-00
Coal-15
Coal-25
County Road 12
SP-00
Coal-20
SP-01

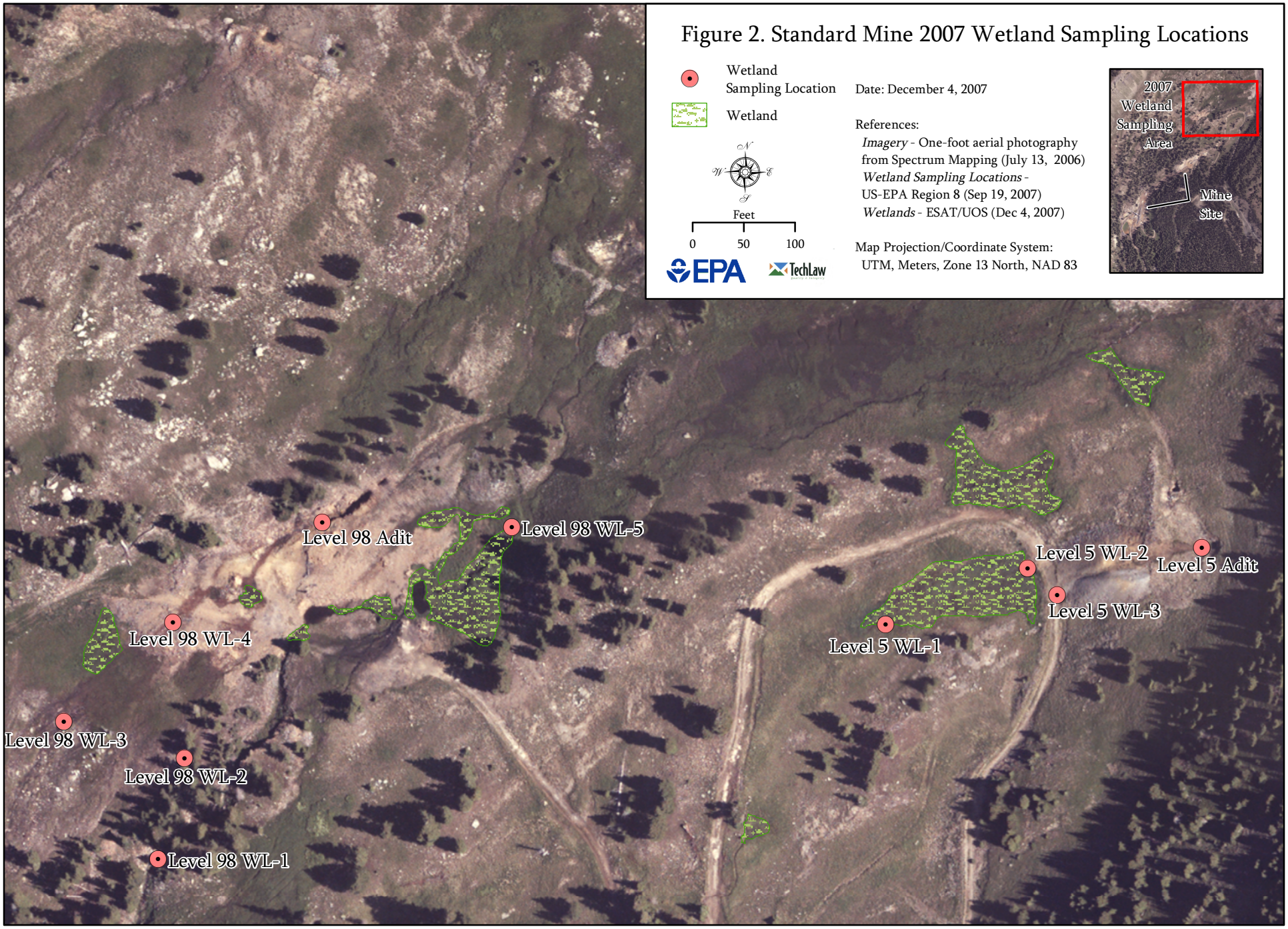


Figure 2. Standard Mine 2007 Wetland Sampling Locations
Wetland Sampling Location
Wetland
N
W
E
S
Feet
0
50
100
EPA
TechLaw
Date: December 4, 2007
References:
Imagery - One-foot aerial photography from Spectrum Mapping (July 13, 2006)
Wetland Sampling Locations - US-EPA Region 8 (Sep 19, 2007)
Wetlands - ESAT/UOS (Dec 4, 2007)
Map Projection/Coordinate System:
UTM, Meters, Zone 13 North, NAD 83
2007 Wetland Sampling Area
Mine Site
Level 98 Adit
Level 98 WL-5
Level 98 WL-4
Level 98 WL-3
Level 98 WL-2
Level 98 WL-1
Level 5 WL-2
Level 5 Adit
Level 5 WL-3
Level 5 WL-1

June 2007 Sampling Event


SM-SEEP-01 Down Gradient


SM-SEEP-01


SM-SEEP-01 Lower Level


Elk-12 Upstream


Elk-12 Downstream


Elk Upstream of SM-00 Inflow


Lower Level from SM-00 Inflow


SM-00 Pond Discharging to Elk


SM-00 Adit and retaining pond


SM-00 Adit and flume gauge


SM-00 Adit

Appendix A: Site Photos

SM-SEEP-02 East slope

SM-SEEP-02

Clean Water Diversion Located East of Level 1 with a Culvert Under Road to Upper Mine

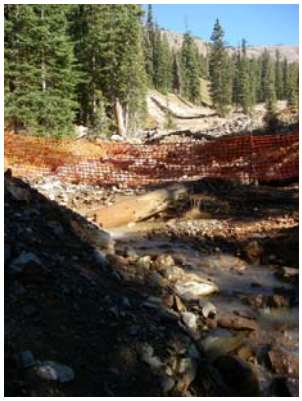
Off-site Source Controls

September 2007 Sampling Event


Coal-10 Downstream


Elk-00 Downstream


Elk-00 Upstream


Elk-10 Upstream


Site Activity Upstream of Elk-10


Former Tailings Impoundment


Site Activity at Tailings Impoundment


Site Activity at Tailings Impoundment


Site Activity at Level 1


Site Activity at Lower Level 1


Level 98 WL-1 Upstream


Level 98 WL-2 Downstream


Level 98 WL-3 Upstream

Appendix A: Site Photos

Sample Processing at Elk-00

Level 98 WL-3
Sample Technique

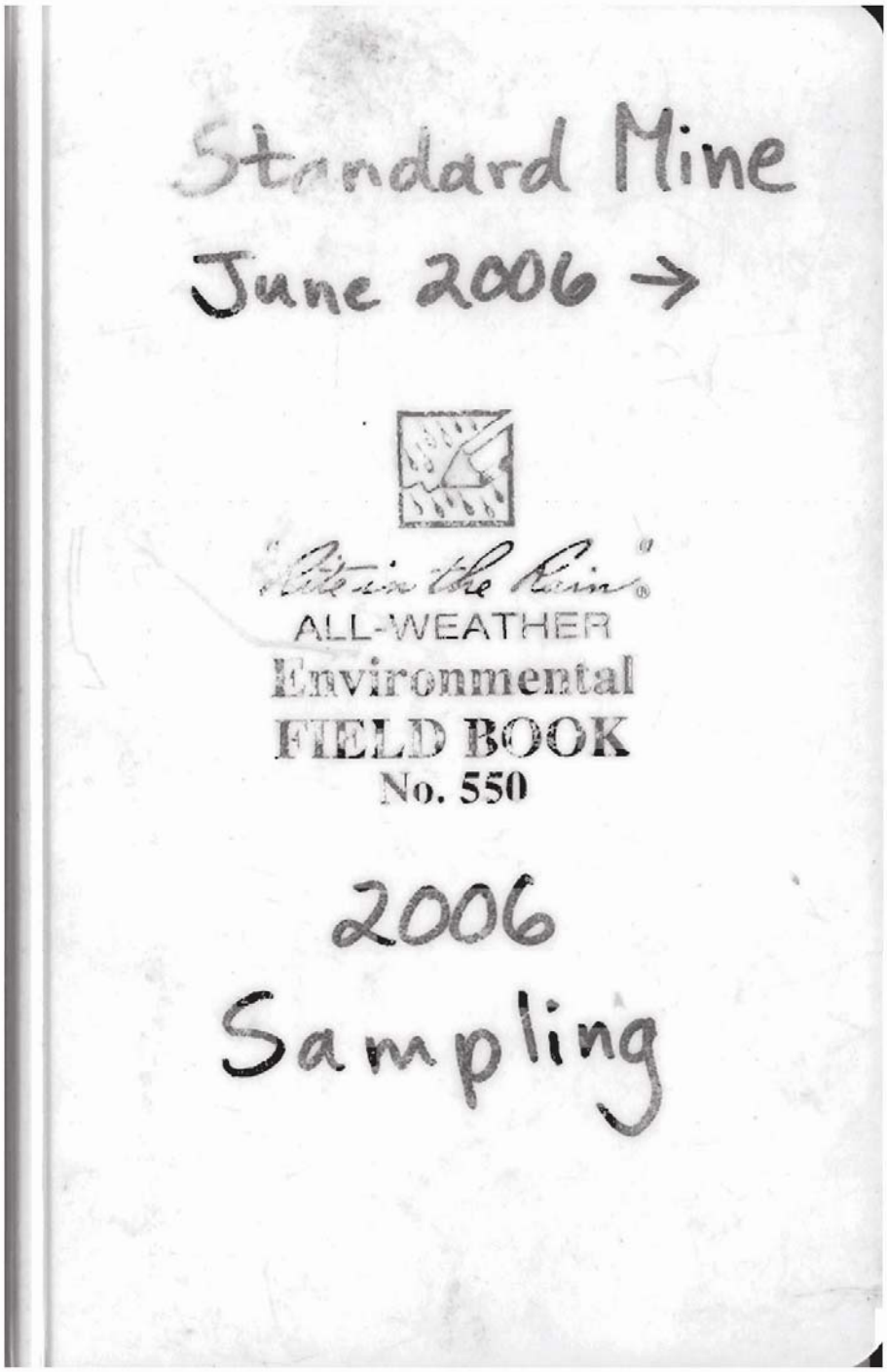
Level 5 WL-1 Sample Technique

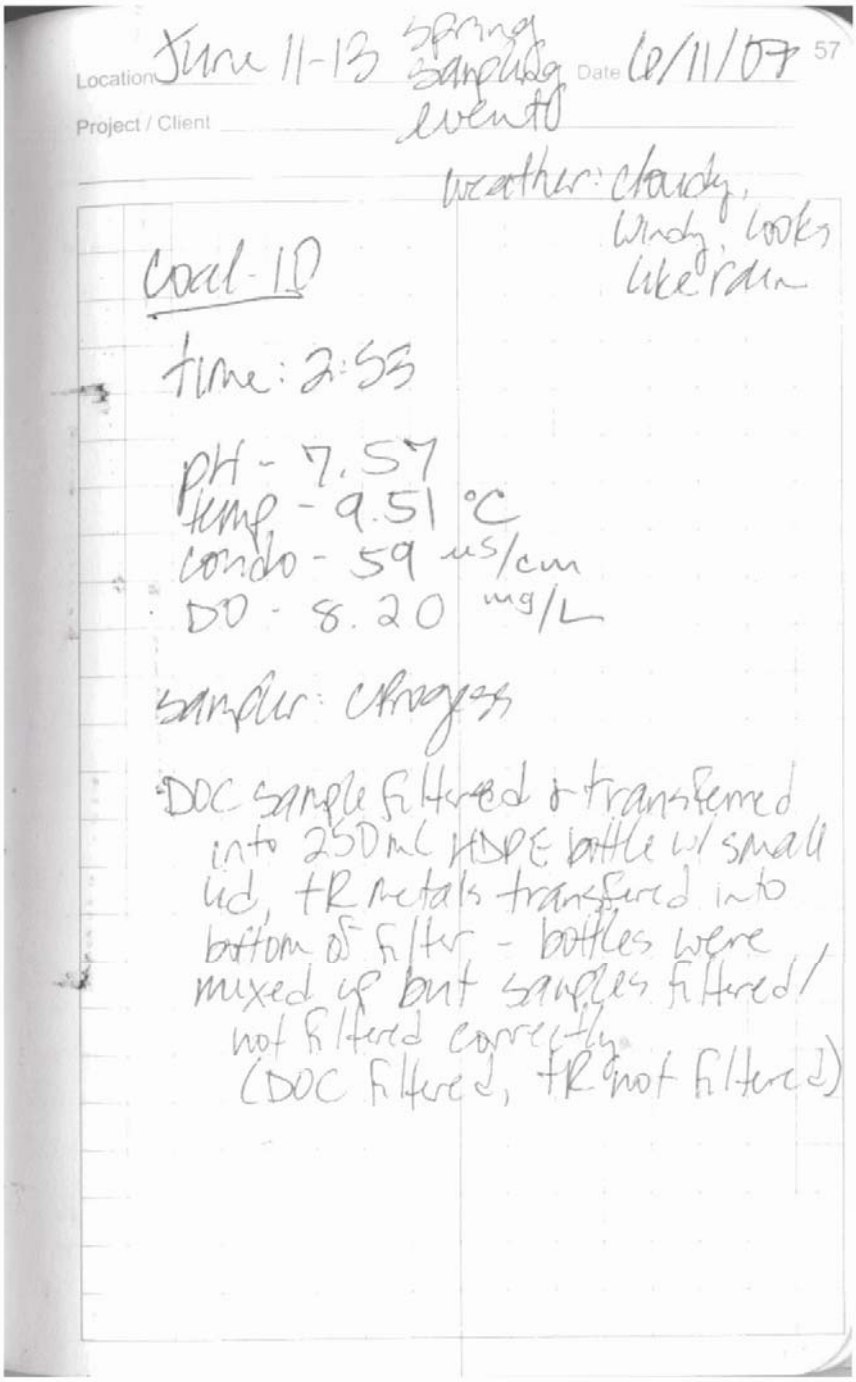
Level 5 WL-1 Up Gradient

Level 5 WL-Adit

Level 5 WL-Adit Down Gradient

June 2007 Sampling Event





Location June 11-13 Spring sampling event Date 6/11/07 57

Project / Client

weather: cloudy, windy, looks like rain

Cond-10

time: 2:55

pH - 7.57
temp - 9.51 °C
condo - 59 us/cm
DO - 8.20 mg/L

sample: Chrysler

DOC sample filtered & transferred into 250mL HDPE bottle w/ small lid, TR metals transferred into bottom of filter - bottles were mixed up but samples filtered/not filtered correctly (DOC filtered, TR not filtered)

58

Location Spring 07 Sampling Date 6/11/07
Project / Client Standard Mine
Time: 3:53pm Coal-Opp 1

Samples taken at CCWC Coal 12 location (staked location) upstream of iron fen

pH - 7.55
Condo - 58 uS/cm
Temp - 9.22°C
DO - 7.97 mg/L

Station: Coal-Opp 1

Location Spring '07 Sampling Date 6/11/07 59
Project / Client Standard Mine
Time: 4:50 pm Coal-15

Samples taken at staked CCWC Coal 15 location. Flow taken upstream of SW samples because of fast flow & deep stream

pH - 7.75
Condo - 53 uS/cm
Temp - 8.40°C
DO - 7.95 mg/L

Samplers: Slavick
Progess
Lewis

Station: Coal-15

60
Location: Spring '07 Sampling Date: 6/11/07
Project / Client: Standard Mine
Time: 5:10 pm Station: Coal-20

Samples taken 10-20 ft. upstream of confl Coal-20 staked location

pH - 7.98
Temp - 8.43 °C
Condo - 41 µs/cm
DO - 7.91 mg/L

Samplers: Slavick
Progess
Lewis

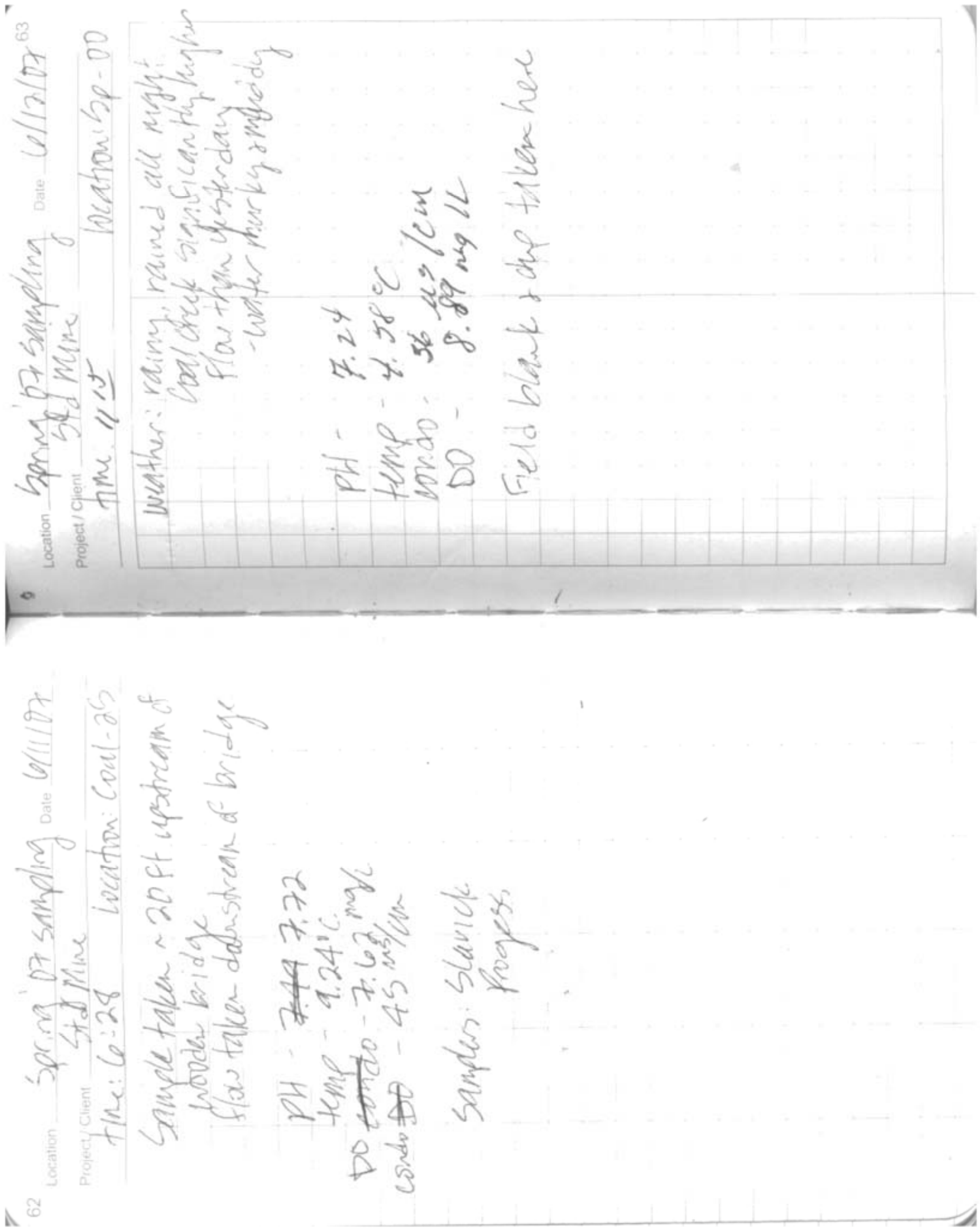
61
Location: Spring '07 sampling Date: 6/11/07
Project / Client: Std Mine
Time: 5:54 pm Station: Elk DD

samples taken 20ft upstream of wooden bridge

pH - 7.85
temp 7.42 °C
DO ~~[illegible]~~ - 8.09 mg/L
condo - 96 µs/cm

samplers: Slavick
Rogers

no flow measurements taken because flume installed ~ 300 ft downstream - flume reading = 1.5 @ 5:44 pm 6/11/07



62

Location Spring '07 sampling Date 6/11/07

Project / Client Std Mine

time: 6:28 Location: Coal-25

Sample taken ~ 20 ft upstream of wooden bridge

flow taken downstream of bridge

pH - ~~7.44~~ 7.72

temp - 9.24°C

DO ~~condo~~ - 7.62 mg/L

condo ~~DO~~ - 45 uS/cm

Samplers: Slavick Progess

63

Location Spring '07 sampling Date 6/12/07

Project / Client Std Mine

time 11:15 location: Sp-DD

weather: rainy, rained all night

Coal Creek significantly higher flow than yesterday

- water murky & muddy

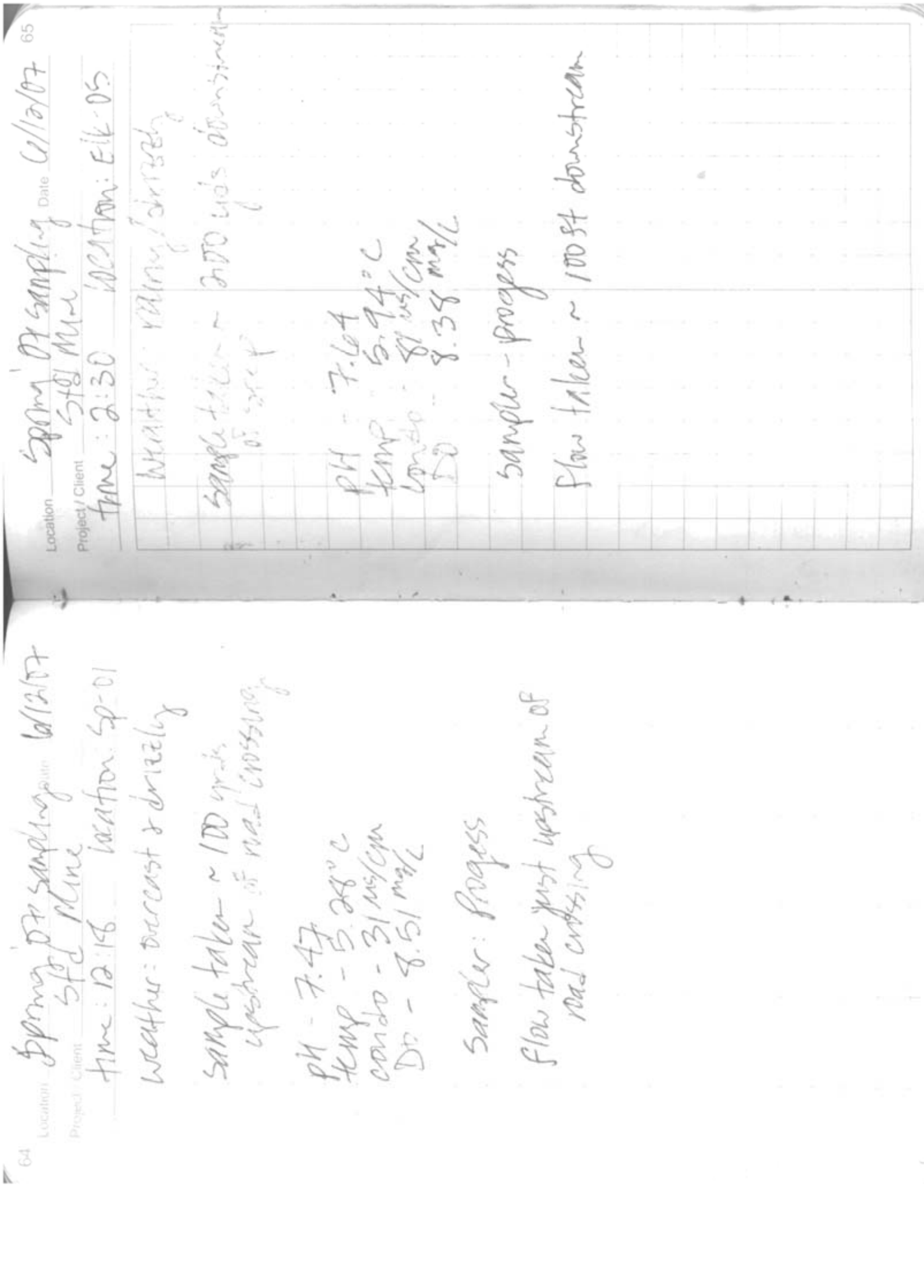
pH - 7.24

temp - 4.58°C

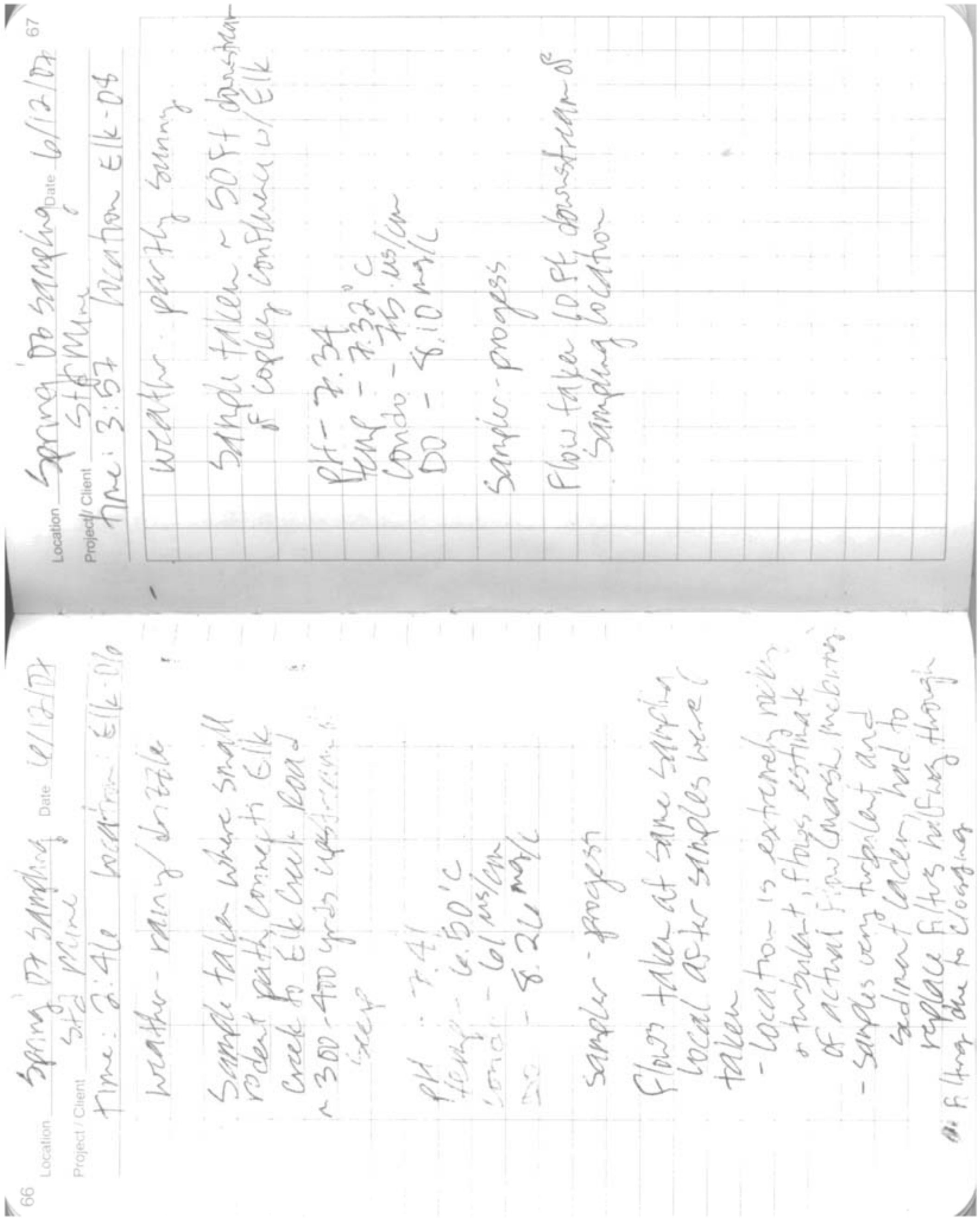
condo - 56 uS/cm

DO - 8.89 mg/L

Field blank & dup taken here


64
Location: Spring '07 sampling Date 6/12/07
Project / Client: Std Mine
time: 12:16 location SP-01
weather: overcast & drizzly
sample taken ~ 100 yds upstream of road crossing
pH - 7.47
temp - 5.28° C
condo - 31 uS/cm
DO - 8.51 mg/L
Sampler: Progress
Flow taken just upstream of road crossing

65
Location: Spring '07 sampling Date 6/13/07
Project / Client: Std Mine
time: 2:30 location: Elk-05
weather: rainy/drizzly
sample taken ~ 200 yds downstream of ...
pH - 7.64
temp - 5.94° C
condo - 81 uS/cm
DO - 8.38 mg/L
Sampler - progress
Flow taken ~ 100 ft downstream



66

Location: Spring 07 Sampling Date 6/12/07
Project / Client: Std Mine
Time: 2:46 location: Elk-06

weather - rainy/drizzle

Sample taken where small rodent path connects to Elk Creek to Elk Creek Road ~300-400 yds upstream seep

pH - 7.41
Temp - 6.50 °C
Cond - 61 us/cm
DO - 8.26 mg/L

Sampler - progess

Flow taken at same sampling local after samples were taken
- location is extremely riffly & turbulent, flows estimate of actual flow (Marsh McBirney)
- samples very turbulent and sediment laden, had to replace filters halfway through
** filter change due to clogging

67

Location: Spring '07 Sampling Date 6/12/07
Project / Client: Std Mine
Time: 3:57 location Elk-08

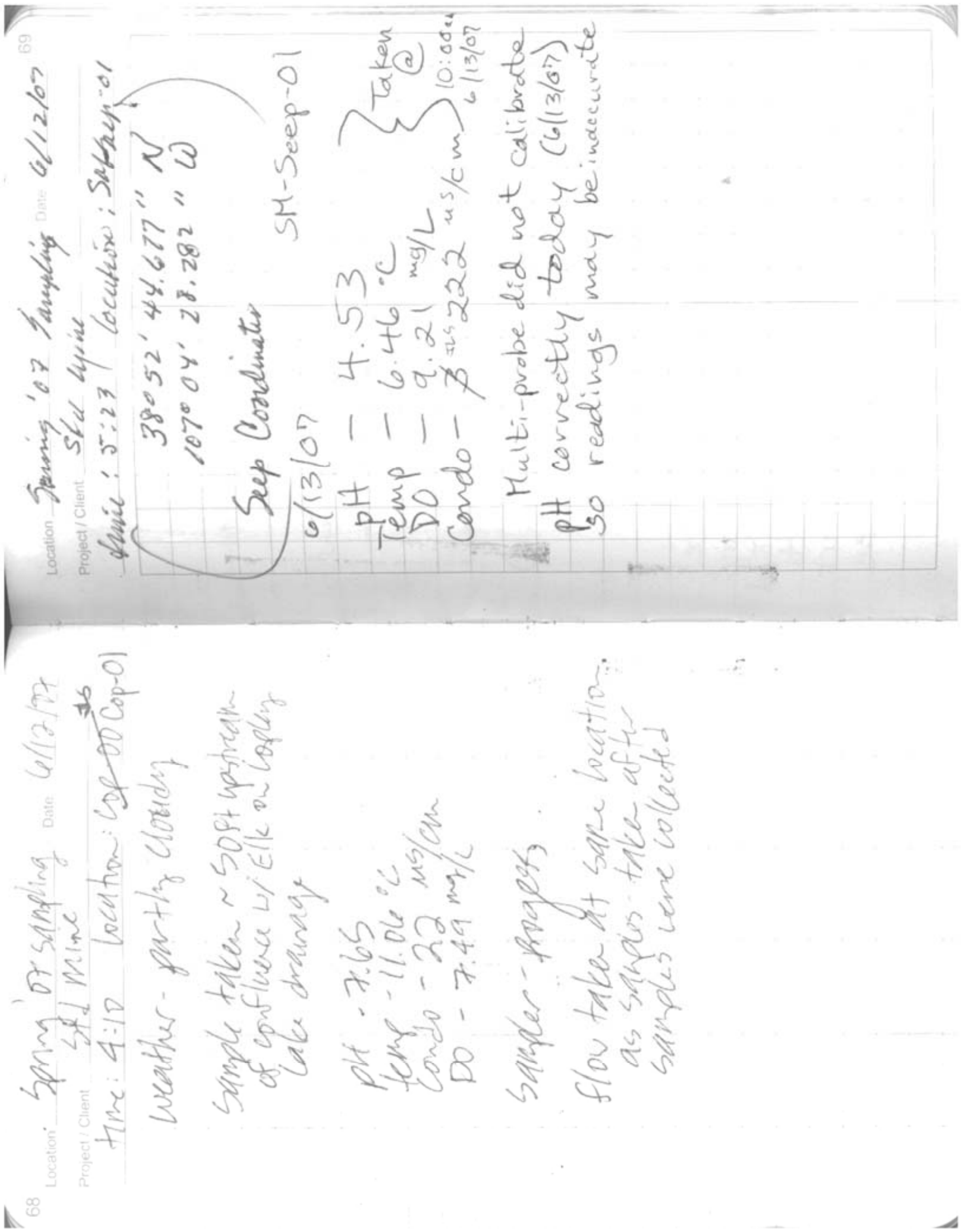
weather - partly sunny

Sample taken ~ 50 ft downstream of Copley confluence w/ Elk

pH - 7.34
Temp - 7.32 °C
Cond - 75 us/cm
DO - 8.10 mg/L

Sampler - progess

Flow taken 10 ft downstream of sampling location



68

Location: Spring '07 Sampling Date 6/12/07
Project / Client: Std Mine
Time: 4:10 location: ~~Cop 00~~ Cop-01

Weather - partly cloudy

Sample taken ~50ft upstream of confluence w/ Elk on Lofting lake drainage

pH - 7.65
temp - 11.06 °C
Condo - 22 uS/cm
DO - 7.49 mg/L

Sampler - Rogers

Flow taken at same location as samples take after samples were collected

69

Location: Spring '07 Sampling Date 6/12/07
Project / Client: Std Mine
Time: 5:23 / location: SM-Seep-01

38° 52' 44.677" N
107° 04' 28.282" W

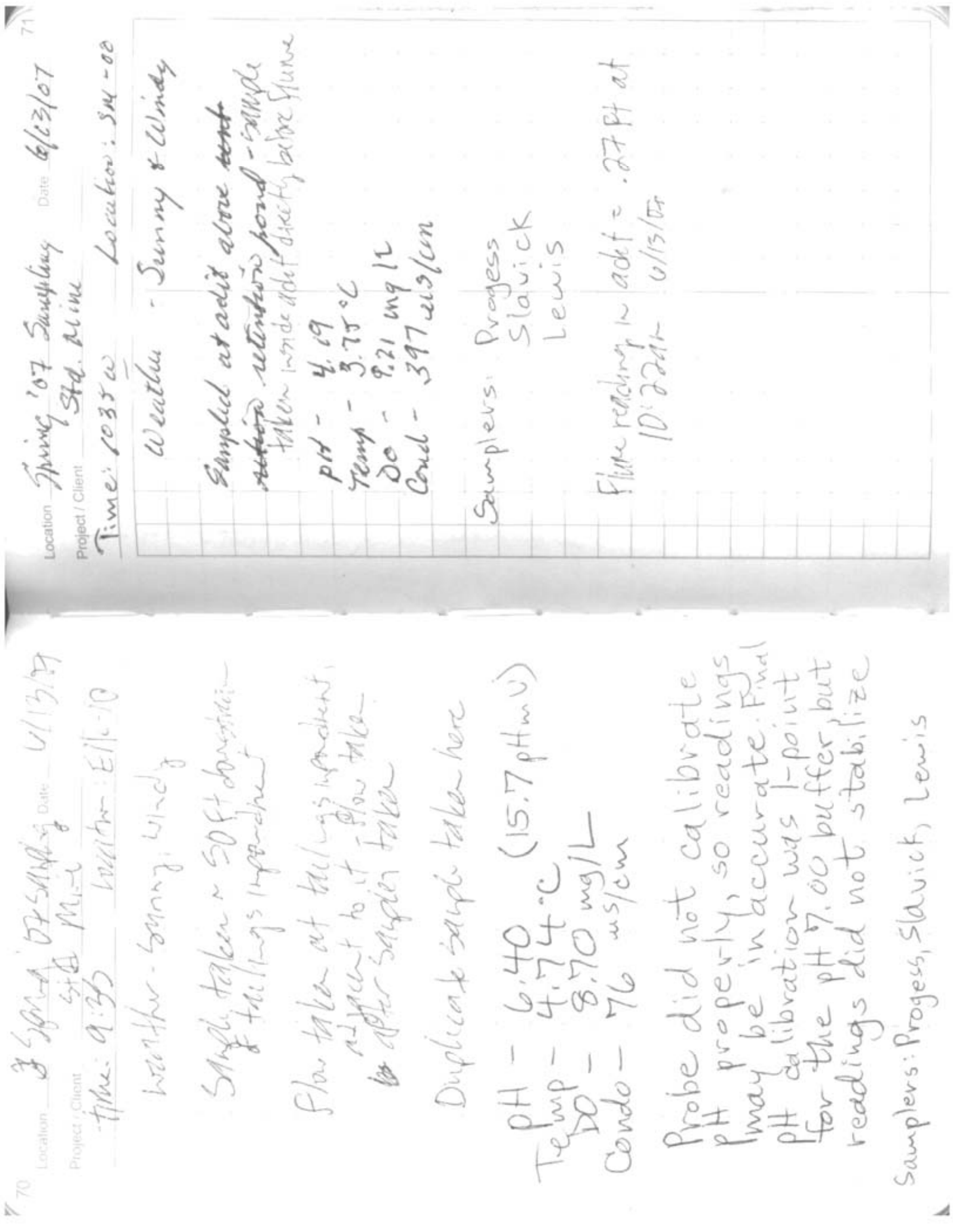
Seep Coordinates

SM-Seep-01

6/13/07
pH — 4.53
Temp — 6.46 °C
DO — 9.21 mg/L
Condo — 222 uS/cm

Taken @ 10:00am 6/13/07

Multi-probe did not calibrate pH correctly today (6/13/07) so readings may be inaccurate



70

Location 3 Spring 07 Sampling Date 6/13/07
Project / Client Std Mine
time: 9:35 Location: Elk-10

Weather - Sunny, Windy

Sample taken ~ 50 ft downstream & tailings impoundment

Flow taken at tailings impoundment, adjacent to it - flow taken after sample taken

Duplicate sample taken here

pH - 6.40 (15.7 pH mV)
Temp - 4.74 °C
DO - 8.70 mg/L
Condo - 76 uS/cm

Probe did not calibrate pH properly, so readings may be inaccurate. Final pH calibration was 1-point for the pH 7.00 buffer, but readings did not stabilize

Samplers: Progess, Slavick, Lewis

71

Location Spring '07 Sampling Date 6/13/07
Project / Client Std. Mine
Time: 1035 a Location: SM-00

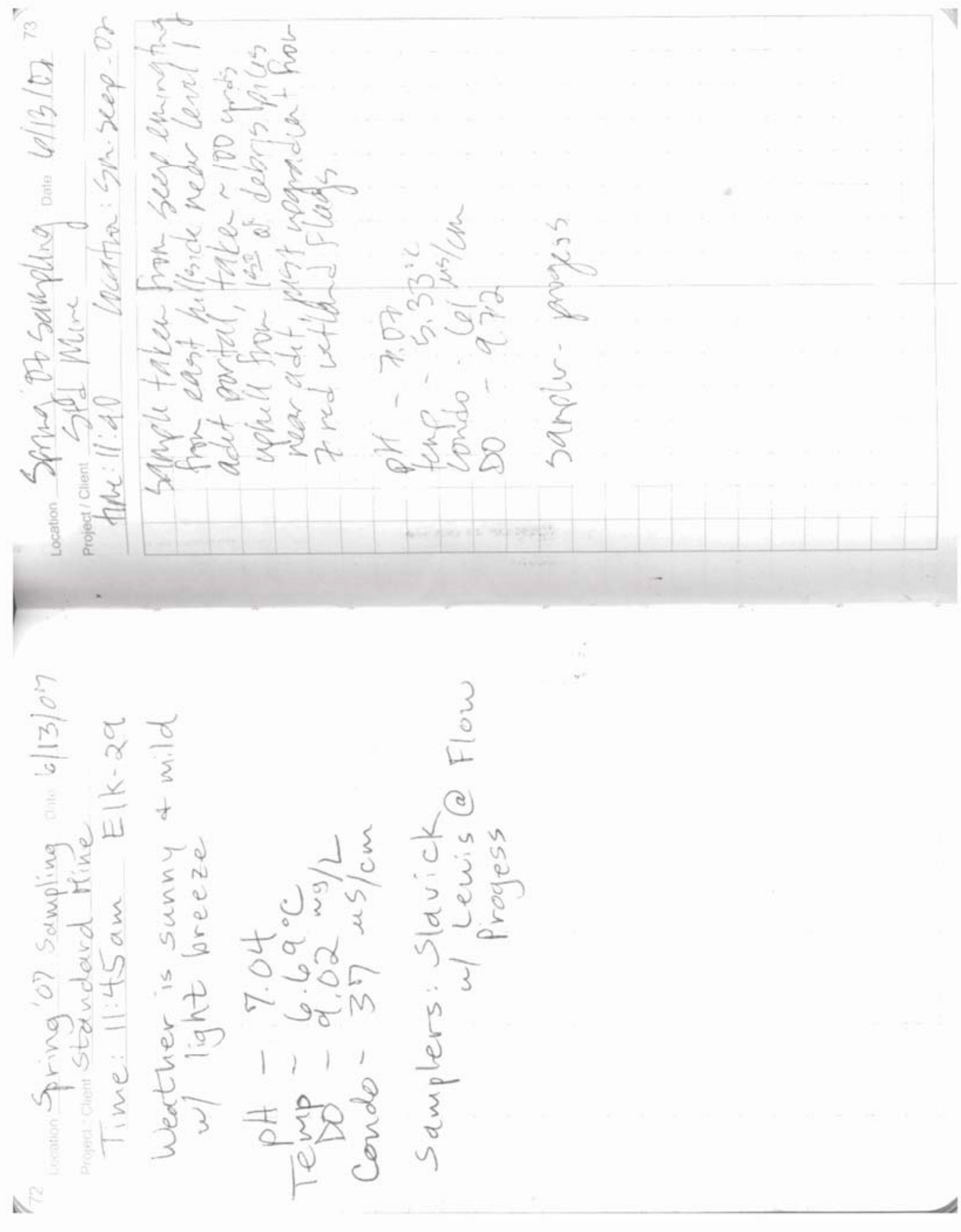
Weather - Sunny & Windy

Sampled at adit above ~~sed~~ ~~retention~~ retention pond - sample taken inside adit directly before flume

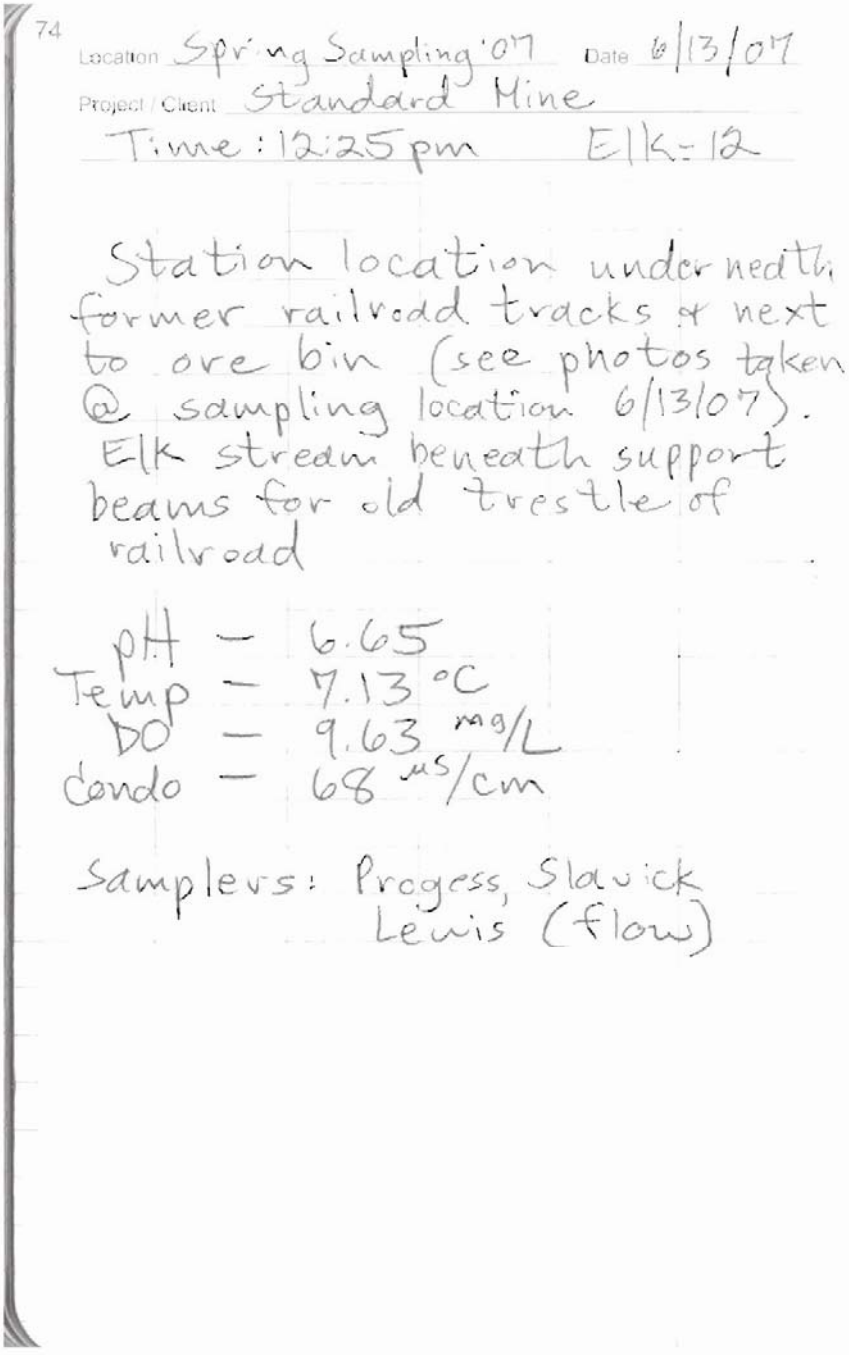
pH - 4.19
Temp - 3.75 °C
DO - 9.21 mg/L
Cond - 397 uS/cm

Samplers: Progess
Slavick
Lewis

Flume reading in adit = .27 ft at 10:22 am 6/13/07


72
Location Spring '07 Sampling Date 6/13/07
Project / Client Standard Mine
Time: 11:45am Elk-29
Weather is sunny + mild
w/ light breeze
pH – 7.04
Temp – 6.69°C
DO – 9.02 mg/L
Condo – 37 uS/cm
Samplers: Slavick
w/ Lewis @ Flow
Progess

73
Location Spring 07 Sampling Date 6/13/07
Project / Client Std Mine
Time: 11:40 Location: SM-seep-07
Sample taken from seep emerging
from east hillside near level 1
adit portal, taken ~ 100 yards
uphill from pile of debris/pilings
near adit, past vegetation + flow
7 red wetland flags
pH – 7.07
temp – 5.33°C
Condo – 61 uS/cm
DO – 9.72
Sampler – progress



74

Location Spring Sampling '07 Date 6/13/07

Project / Client Standard Mine

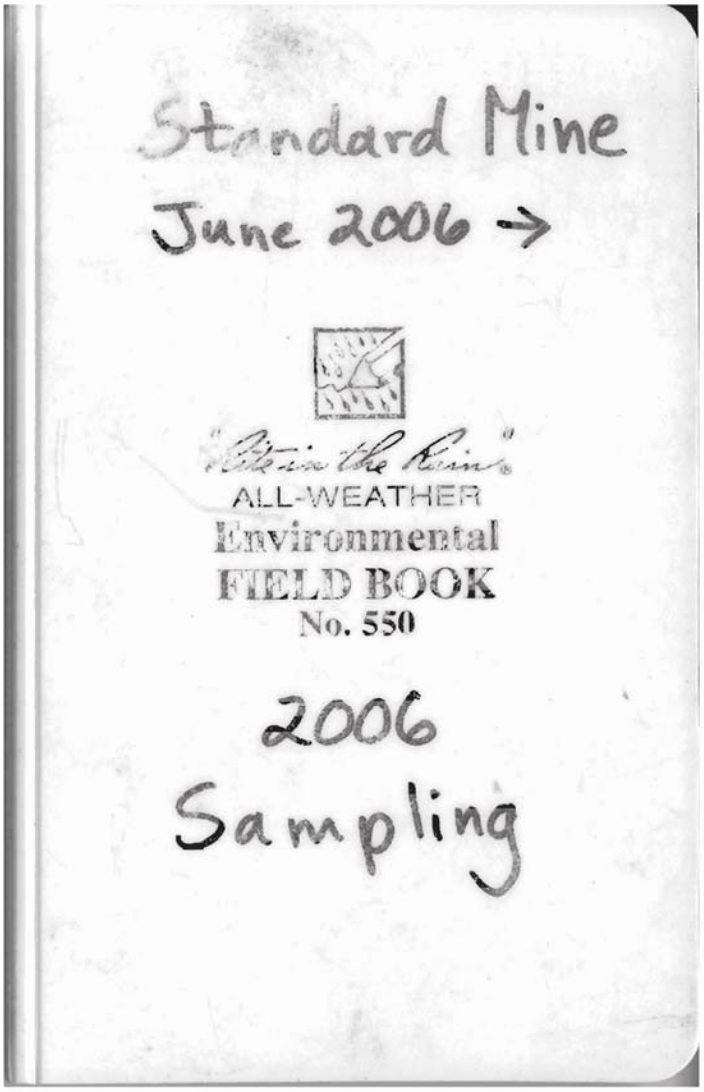
Time: 12:25 pm Elk-12

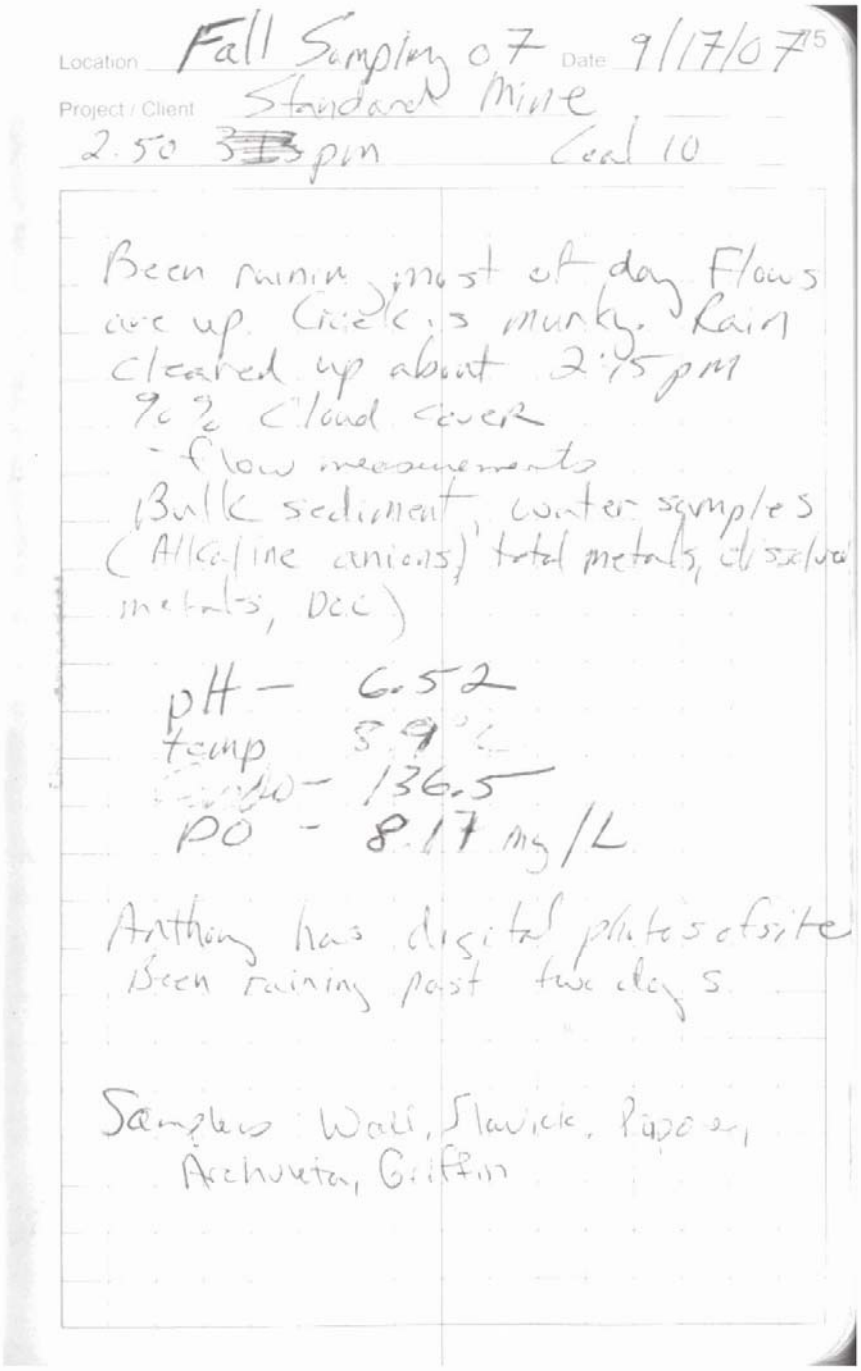
Station location underneath former railroad tracks & next to ore bin (see photos taken @ sampling location 6/13/07). Elk stream beneath support beams for old trestle of railroad

pH – 6.65
Temp – 7.13 °C
DO – 9.63 mg/L
Condo – 68 µs/cm

Samplers: Progess, Slavick
Lewis (flow)

September 2007 Sampling Event





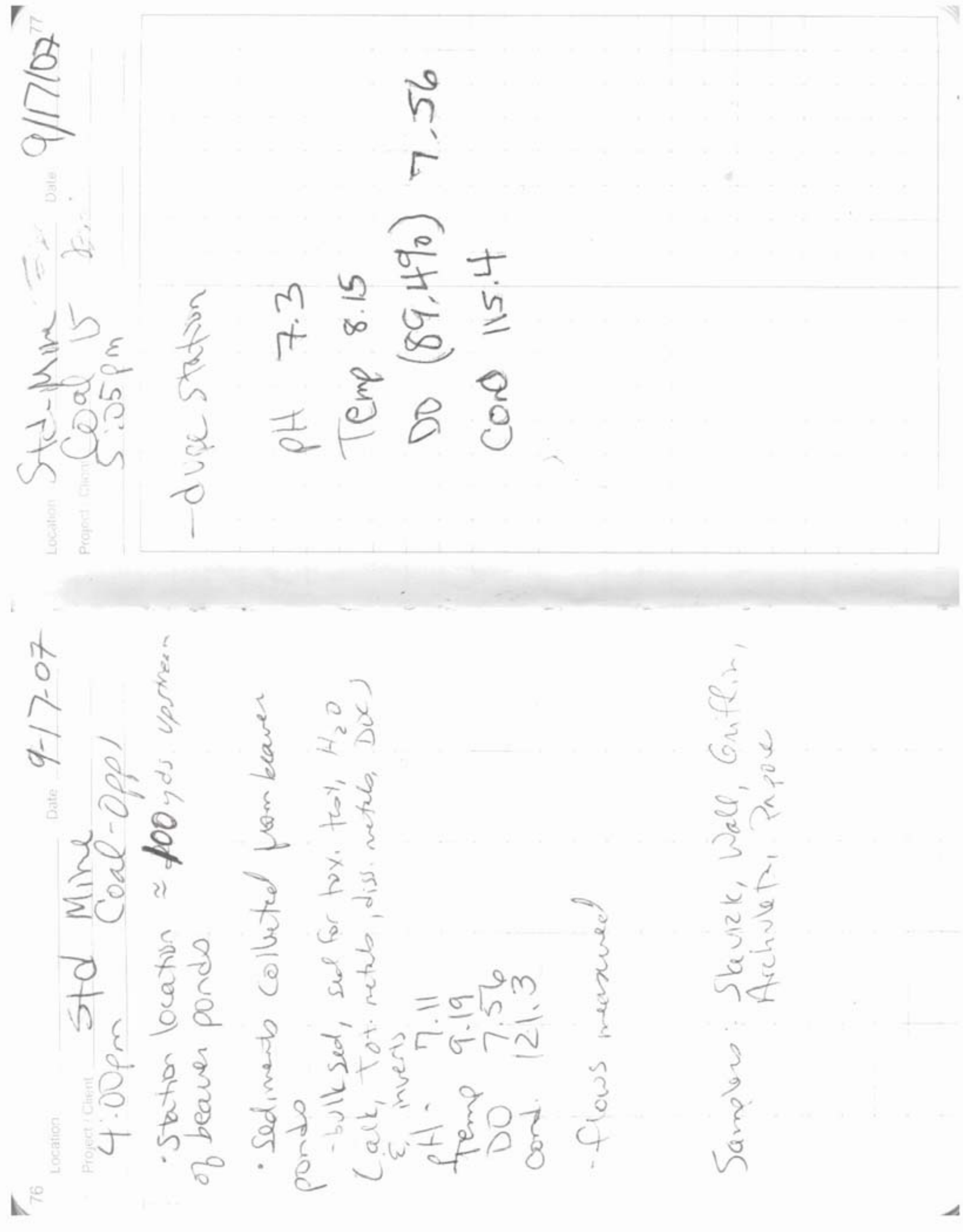
Location Fall Sampling 07 Date 9/17/07
Project / Client Standard Mine
2.50 ~~3~~ pm Coal 10

Been raining most of day Flows are up. Creek is murky. Rain cleared up about 2:15 pm
90% Cloud cover
- flow measurements
(Bulk sediment, water samples (Alkaline anions) total metals, dissolved metals, DOC)

pH - 6.52
temp 5.9°C
cond - 136.5
DO - 8.17 mg/L

Anthony has digital photos of site
Been raining past two days

Samplers Wall, Slavick, Papoe, Archuleta, Griffin



76

Location Date 9-17-07
Project / Client Std Mine
4:00pm Coal-Opp1

· Station location ≈ 100 yds upstream of beaver ponds

· Sediments collected from beaver ponds
- bulk sed, sed for tox. test, H_2O (alk, Tot. metals, diss. metals, DOC) & inverts

pH · 7.11
Temp 9.19
DO 7.56
cond. 121.3

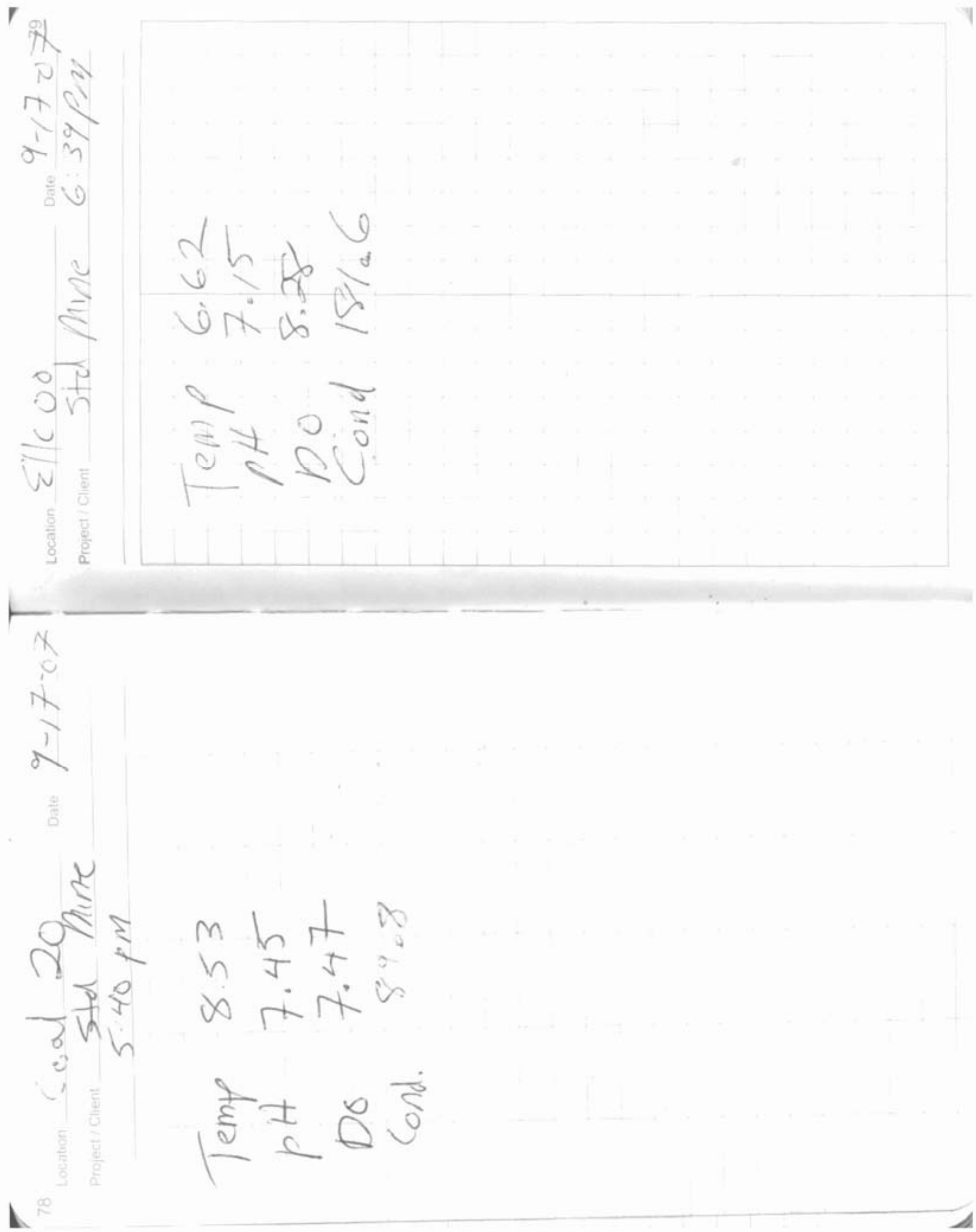
- flows measured

Samplers: Skeuzk, Wall, Griffin, Archuleta, Pappe

Location Std-Mine Date 9/17/07 77
Project / Client Coal 15
5:05pm

- dupe station

pH 7.3
Temp 8.15
DO (89.4%) 7.56
Cond 115.4



78
Location Coal 20
Project / Client Std Mine
5:40 pm
Date 9-17-07

Temp 8.53
pH 7.45
DO 7.47
Cond. 89.8

79
Location Elk 00
Project / Client Std Mine
Date 9-17-07
6:39 PM

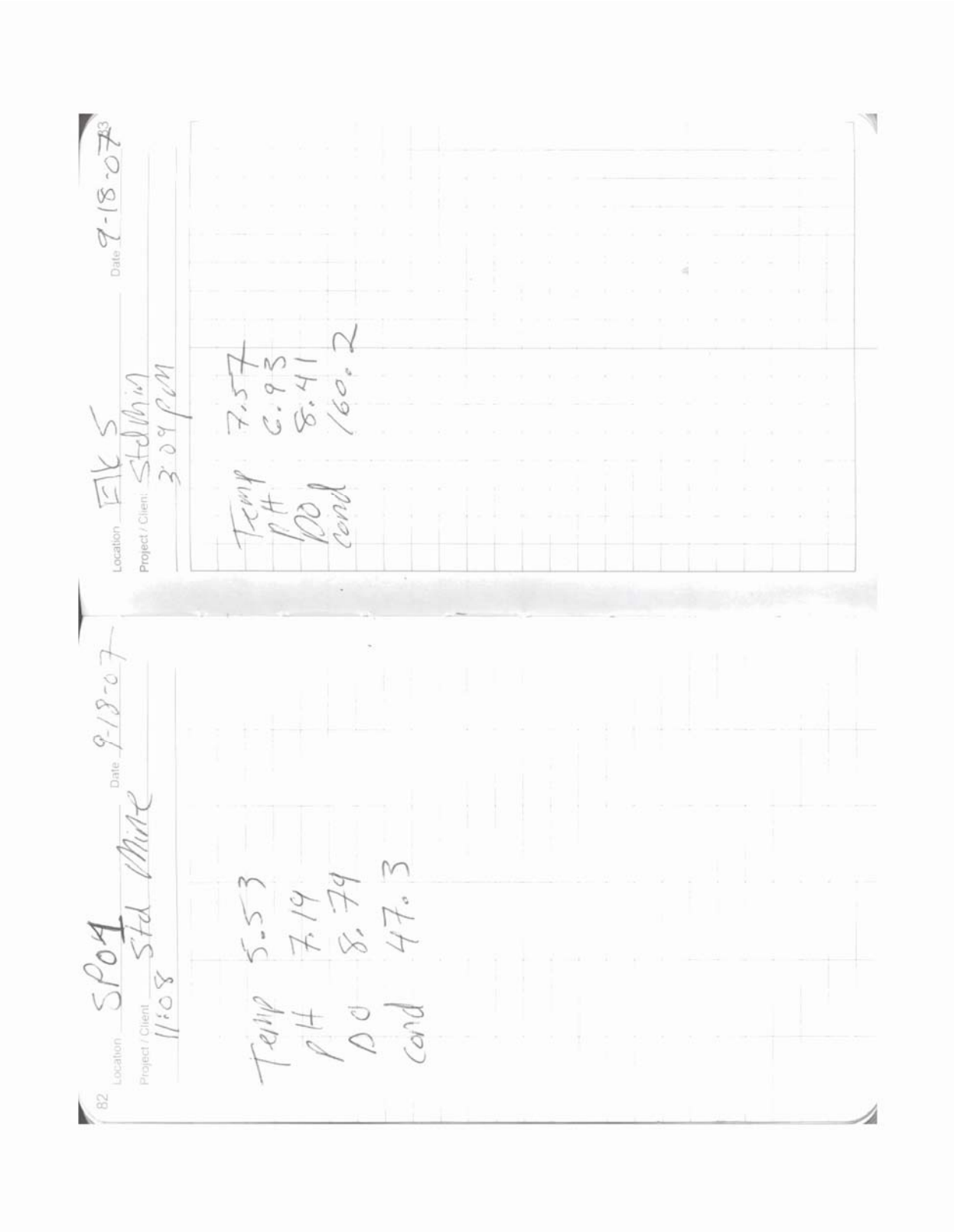
Temp 6.62
pH 7.15
DO 8.38
Cond 131.6

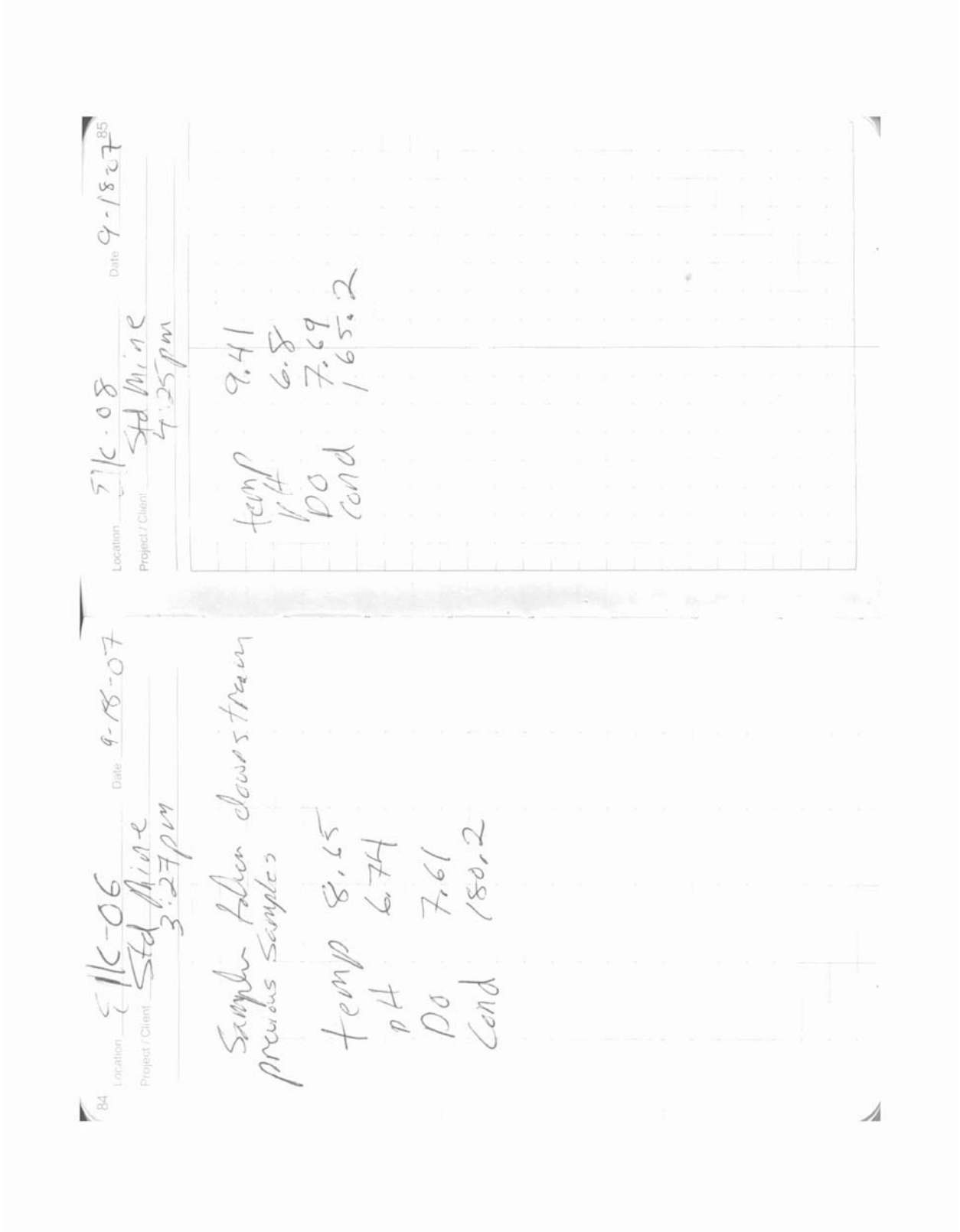
Location SPOO Date 9-18-07
Project / Client Std Mine 10:00AM

Temp 4.55
pH 6.82
DO 8.27
Cond 55.6

Location Cond 25 Date 9-18-07
Project / Client Std Mine 2:00PM

Temp 5.22
pH 6.50
DO 7.2
Cond 91.1


Location ELK S
Date 9-18-07
Project / Client Stillwin
3:09 pm
Temp 7.557
pH 6.93
DO 8.41
cond 160.2
Location SP01
Date 9-18-07
Project / Client Std Mine
11:08
Temp 5.53
pH 7.19
DO 8.79
cond 47.3


Location 711-08
Project / Client Std Mine
Date 9-18-07
4:35pm
temp 9.41
pH 6.85
DO 7.69
cond 165.2
Location 711-06
Project / Client Std Mine
Date 9-18-07
3:27pm
Sample taken downstream
previous sample
temp 8.45
pH 6.74
DO 7.61
Cond 180.2

86

Location Cop-01 Date 9-18-07

Project / Client Std Mine

5:04 pm

pH 7.01

temp 6.58

DO 7.99

Cond 32.8

Location Elk 10 Date 9-19-07 87

Project / Client Std Mine

9:57 Am

Right below construction culvert mark

temp 6.32

pH 6.41

DO 7.54

cond 177.9

89
Location SM-00 Date 9-19-07
Project / Client Std. Mine 11:20am

Temp 4.33
pH 5.76
DO 7.96
Cond 530.6

88
Location E16 29 Date 9-19-07
Project / Client Std Mine
11:08 AM

Temp 6.37
pH 6.76
DO 7.94
Cond 53.01

90

Location Level 98 WL-1 Date 09-19-2007

Project / Client Std Mine

1:35 pm Aep - hydrolab

Temp 11.50
pH 6.57
DO 7.08
Cond. 59.4

in the creek channel below wetland seep influence, flowing through waste rock at Level 98

GPS units taken:

107 04 16.024 W
38 52 59.198 N

Location Level 98 WL-2 Date 09-19-07 #1

Project / Client Std Mine

1:44 pm

Temp 14.61
pH 6.57
DO 5.10
Cond. 72.5

~~left~~ when looking downstream left most seep coming from ~~center~~ wetland below Level 98 exit sampled in amongst trees ~ 20m upstream of confluence w/ Elk Creek

107 04 15.794 W
38 52 00.174 N

92

Location Level 98W-4 Date 9-19-07

Project / Client Std mine

1:59 pm

Temp = 17.29

pH 6.59

DO 5.72

conductivity = 72.6

downstream of revegetation test plots and 50m downstream of adit discharge in waste rock piles

107 04 15.981 W

38 53 01.486 N

93

Location Level 98 W-3 Date 9-19-07

Project / Client Std

2:04

Temp = 19.58

pH = 6.64

DO = 5.25

Cond = 80.5

25m downstream of berm near Level 98 W-4 Sample) when looking downstream for right seep.

107 04 17.348 W

38 53 00.545 N

94

Location Level 98 Adit Date 09-19-07
Project / Client Std Mine
2:28 pm

Temp = 11.94
pH = 4.44
DO = 4.12
Cond = 197.8

15m downstream of adit opening but above the seep coming down the hillside
107 04 14.254 W
38 53 02.584 N

Location Level 98 WL-5 Date 09-19-07 95
Project / Client 2:45 pm

Temp = 13.11
pH = ~~5.4~~ 5.91
DO = 5.57
Cond = 42.3

Above adit in draw coming down the slope runs into wetland system east of adit drainage
GPS
107 04 11.932 W
38 53 02.541 N

96
Location Level 5 WL-1 Date 09-19-07
Project / Client Std Mine
3:23pm

Temp = 14.94
pH 3.43
DO 5.13
Cond = 468.1

flowing seep 75m downstream of waste rock piles at Level 5

GPS 107 04 07.282W
38 53 01.720 N

97
Location Level 5 WL-2 Date 09-19-07
Project / Client
355pm

Temp 11.42
pH 3.09
Do 5.95
Cond 809.02

just below road s/w waste rock and wetlands

GPS
167

GPS (Realized potential problem w/ saving data points in Trimble unit #, so duplicate stations recorded at this & subsequent Level 5 stations)

107 04 05.538 W
38 53 02.298 N
(Trimble ID = Level 5 WL-2a)

98
Location Level 5 WL-3 Date 07-19-07
Project / Client 3rd mine
335 pm

Temp 10.86
PH 4.11
DO #1 7.82
Cond 345.5

at the of waste rock pile on the right.

GPS
107 04 05.156 W
38 53 02.050 N
(Trimble ID = Level 5 WL-3b)

99
Location Level 5 - Adit Date 09-19-07
Project / Client Std mine
323 pm

Temp = 5.22
PH = 5.72
DO = 6.77
Cond = 214.0

Directly in pool at mouth of Level 5 adit

GPS
107 04 03.486 W
38 53 02.483 N
(Trimble ID = Level 5 Adit a)

September 2007 Sampling Event

Page 1 of 1

Stream Discharge Form

Sampling Station: Coal-10 Sampling Crew: Anthony Poponi, Jennifer Slavick

Facility/Site: Standard Mine Date/Time: 9/17/2007 1457

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm	Depth Units ☑ ft ☐ m ☐ cm	Velocity Units ☑ ft/s ☐ m/s

Total Stream Width: 23.8 Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
0.6		1.1	0.2	0	0
1.7			0.7	-0.02	-0.0154
2.8			0.6	0.85	0.561
3.9			0.8	0.54	0.4752
5.0			0.6	1.00	0.66
6.1			0.7	1.49	1.1473
7.2			0.5	2.34	1.287
8.3			0.6	1.67	1.1022
9.4			0.6	2.14	1.4124
10.5			0.5	2.21	1.2155
11.6			0.5	2.38	1.309
12.7			0.6	2.17	1.4322
13.8			0.6	1.93	1.2738
14.9			0.7	1.75	1.3475
16.0			0.6	2.06	1.3596
17.1			0.6	1.85	1.221
18.2			0.6	1.48	0.9768
19.3			0.7	1.64	1.2628
20.4			0.8	1.62	1.4256
21.5			0.9	1.11	1.0989
22.6			0.9	0.72	0.7128
23.7			0.7	0.03	0.0231
~~24.8 ols~~					
Total Discharge:					21.2883

Pocket w/ upstream eddy

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

24.4 − .6 = 23.8

20 | 23.8 (1.19) → 3.8/180

* Heavy rainstorm all morning through early afternoon; stream very turpid, spooded

Page 1 of 1

Stream Discharge Form

Sampling Station: Coal-Opp1 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-17-2007 / 3:59 pm

☐ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm		Depth Units ☑ ft ☐ m ☐ cm		Velocity Units ☑ ft/s ☐ m/s	
Total Stream Width: ~~22.1~~ SLS 21.4			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
0.7		1.0	0.2	-0.24	-0.048
1.7			0.9	-0.17	-0.153
2.7			1.2	0.76	0.912
3.7			1.2	1.98	2.376
4.7			0.8	0.44	0.352
5.7			0.9	1.76	1.584
6.7			0.8	SLS ~~1.50~~ 1.46	1.168
7.7			0.9	2.10	1.89
8.7			0.8	1.44	1.152
9.7			0.5	2.12	1.06
10.7			0.6	1.76	1.056
11.7			0.6	1.47	0.882
12.7			0.6	0.57	0.342
13.7			0.5	1.34	0.67
14.7			0.3	0.91	0.273
15.7			0.2	0.64	0.128
16.7			0.4	0.47	0.188
17.7			0.3	0.83	0.249
18.7			0.2	SLS ~~0.20~~ 0.54	0.108
19.7			0.2	0.78	0.156
20.7			0.2	0.21	0.042
21.7			0.3	0.32	0.096
		↓			
Total Discharge:					14.483

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

* 15 sec. average at every station

22.1
0.7
21.4

1.07
20 | 21.4
20
1.40
-20
0

Page 1 of 1

Stream Discharge Form

Sampling Station: Coal-15 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-17-2007 / 5:05 pm

☑ Velocity Area

Distance Units	Depth Units	Velocity Units
☑ ft ☐ m ☐ cm	☑ ft ☐ m ☐ cm	☑ ft/s ☐ m/s

Total Stream Width: 10.4 Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
0.9		.5	0.5	-.14	-0.035
1.4			0.8	-0.08	-0.032
1.9			0.8	0.20	0.08
2.4			0.8	0.24	0.096
2.9			1.0	0.35	0.175
3.4			1.1	0.57	0.3135
3.9			1.2	0.90	0.54
4.4			1.4	1.09	0.763
4.9			1.5	1.17	0.8775
5.4			1.4	0.95	0.665
5.9			1.2	0.95	0.57
6.4			1.5	1.14	0.855
6.9			1.2	1.48	0.888
7.4			0.8	1.89	0.756
7.9			0.6	2.13	0.639
8.4			1.3	1.72	1.118
8.9			1.0	1.86	0.93
9.4			0.7	1.87	0.6545
9.9			0.9	1.09	0.4905
10.4			0.7	0.59	0.2065
10.9			0.7	-0.16	-0.056
11.4		↓	0.1	-0.09	-0.0045
Total Discharge:					10.49

☐ Timed Filling

Volume Units	Time Units
☐ l ☐ qt ☐ gal	☐ sec ☐ min

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 inch	0.50 h_a^2	225 h_a^2
2 inch	1.02 h_a^2	458 h_a^2
4 inch	2.08 h_a^2	932 h_a^2
8 inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

*Raining again at 5:00pm (steady drizzle)

11.3 − 0.9 = 10.4

.52
20 | 10.40
-10 0↓
40

Page 1 of 1

Stream Discharge Form

Sampling Station: Coal-20 Sampling Crew: A. Paponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-17-2007 / 5:40 pm

☒ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm	Depth Units ☐ ft ☐ m ☐ cm	Velocity Units ☐ ft/s ☐ m/s
Total Stream Width:	Meter Type:	

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
3.2		0.4	0.4	0.03	0.0048
3.6		1	0.4	0.07	0.0112
4.0			0.8	0.35	0.112
4.4			0.8	0.53	0.1696
4.8			0.7	0.90	0.252
5.2			0.8	1.03	0.3296
5.6			0.7	1.26	0.3528
6.0			0.7	1.95	0.546
6.4			0.5	3.02	0.604
6.8			0.8	0.62	0.1984
7.2			0.9	1.92	0.6912
7.6			1.0	2.16	0.864
8.0			1.0	2.24	0.896
8.4			1.0	1.77	0.708
8.8			0.7	0.93	0.2604
9.2			0.7	0.77	0.2156
9.6			0.8	0.95	0.304
10.0			0.8	0.44	0.1408
10.4			1.0	-0.02	-0.008
10.8			1.0	0.02	0.008
11.2			1.1	0.16	0.0704
11.6		↓	1.0	0.25	0.1000
12.0			1.0	0.15	0.0600
↓			↓	↓	
Total Discharge:					6.8928
12.4		↓	0.5	0.01	0.0020

☒ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal	Time Units ☐ sec ☐ min

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

12.6 − 2.9 = 5

12.6 − 3.2 = 9.4

20 | 9.40 (.47) − 80 = 140

Page 1 of 2

Stream Discharge Form

Sampling Station: Coal-25 Sampling Crew: AP, LA, JS

Facility/Site: Standard Mine Date/Time: 9-18-07 / 9:00am

☐ Velocity Area

Distance Units ☒ ft ☐ m ☐ cm	Depth Units ☒ ft ☐ m ☐ cm	Velocity Units ☒ ft/s ☐ m/s

Total Stream Width: 5.2 Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
2.4		0.2	0.2	0.35	0.014
.6		0.2	0.2	0.26	0.0104
.8			0.2	-0.11	-0.0044
3.0			0.2	-0.13	-0.0052
.2			0.2	-0.04 ~~-0.0~~	-0.0016
.4			0.2	0.27	0.0108
.6			0.2	0.54	0.0216
.8			0.3	0.72	0.0432
4.0			0.3	0.28	0.0168
.2			0.3	0.06	0.0036
.4			0.2	0.43	0.0172
.6			0.2	0.59	0.0236
.8			0.2	0.72	0.0288
5.0			0.2	0.95	0.0380
.2			0.3	0.96	0.0576
.4			0.3	1.07	0.0642
.6			0.3	0.18	0.0108
.8			0.4	0.80	0.0640
6.0			0.4	0.72	0.0576
.2			0.3	1.25	0.0756
.4			0.3	0.71	0.0426
.6			0.3	0.94	0.0564
.8			0.2	1.00	0.0400
Total Discharge:					

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal	Time Units ☐ sec ☐ min	

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

7.6
-2.4
5.2

Over for last flow measurements

Page 2 of 2

Stream Discharge Form

Sampling Station: _____ Sampling Crew: _____

Facility/Site: _____ Date/Time: _____

☐ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
7.0		0.2	0.2	1.04	0.0416
.2		0.2	0.3	0.72	0.0432
.4		↓	0.2	0.87	0.0348
.6		↓	0.2	0.35	0.0140
Total Discharge:					0.8192

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

Page 1 of 1

Stream Discharge Form

Sampling Station: SP-00 Sampling Crew: A. Popani, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-18-2007 / 10:00 am

☐ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm		Depth Units ☑ ft ☐ m ☐ cm		Velocity Units ☑ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
1.4		0.20	0.2	0.36	0.0144
1.6			0.2	0.07	0.0028
1.8			0.2	0.40	0.0160
2.0			0.2	0.23	0.0092
2.2			0.2	0.38	0.0152
2.4			0.2	0.09	0.0036
2.6			0.3	0.36	0.0216
2.8			0.3	0.69	0.0414
3.0			0.3	0.58	0.0348
3.2			0.3	0.72	0.0432
3.4			0.3	0.79	0.0474
3.6			0.3	-0.07	-0.0042
3.8			0.3	0.09	0.0054
4.0			0.4	0.47	0.0376
4.2			0.4	0.88	0.0704
4.4			0.4	1.23	0.0984
4.6			0.4	0.68	0.0544
4.8			0.2	1.68	0.0672
5.0			0.2	1.24	0.0496
5.2			0.2	0.23	0.0092
5.4		↓	0.2	0.29	0.0116
Total Discharge:					0.6492

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

5.4
−1.4
4.0

* Chilly morning, fog still lingers

Page 1 of 2

Stream Discharge Form

Sampling Station: SP-01 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-18-2007 / 11:06 am

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm	Depth Units ☑ ft ☐ m ☐ cm	Velocity Units ☑ ft/s ☐ m/s
Total Stream Width:	Meter Type:	

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
0.9		0.1	0.1 *	0	0
1.0			0.2	0.09	0.0018
1.1			0.2	0.59	0.0118
1.2			0.2	0.79	0.0158
1.3			0.2	0.72	0.0144
1.4			0.2	0.85	0.0170
1.5			0.2	1.69	0.0338
1.6			0.2*	2.03	0.0406
1.7			0.2*	1.73	0.0346
1.8			0.2	1.37	0.0274
1.9			0.2	1.22	0.0244
2.0			0.2	0.41	0.0082
2.1			0.2	0.10	0.0020
2.2			0.3	0.44	0.0132
2.3			0.3	0.66	0.0198
2.4			0.3	0.69	0.0207
2.5			0.2	0.75	0.0150
2.6			0.3	0.75	0.0225
2.7			0.3	0.95	0.0285
2.8			0.3	1.15	0.0345
2.9		↓	0.3	0.84	0.0252
3.0			0.3	0.50	0.0150
3.1		↓	0.3	0.23	0.0069
Total Discharge:					

(continued)

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

3.6 − .9 = 2.5

*Slightly shallow depth for flow at the first station & others marked *

Page 2 of 2

Stream Discharge Form

Sampling Station: SP-01 (continued) Sampling Crew:

Facility/Site: Date/Time:

☐ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
3.2		0.1	0.3	-0.02	-0.0006
3.3		↓	0.2	-0.12	-0.0024
3.4		↓	0.2	-0.05	-0.0010
3.5		↓	0.2	-0.07	-0.0014
3.6		↓	0.2	-0.09	-0.0018
Total Discharge:					0.4259

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

Page 1 of 1

Stream Discharge Form

Sampling Station: Elk-00 | Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine | Date/Time: 9-17-2007 / 6:05 pm

☐ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
				Total Discharge:	

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☒ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8 12"

h_a = Upstream gauge height in feet = 0.75'

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	$0.50\ h_a^2$	$225\ h_a^2$
2 Inch	$1.02\ h_a^2$	$458\ h_a^2$
4 Inch	$2.08\ h_a^2$	$932\ h_a^2$
8 Inch	$4.22\ h_a^2$	$1900\ h_a^2$
Total Flow (cfs & gpm)		

*Flume size = 12" Stage = 0.75

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

* Flow reading TBD based on Flume gauge sheet.

Page 1 of 2

Stream Discharge Form

Sampling Station: Elk-05 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-18-2007 / 3:09 pm

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm		Depth Units ☑ ft ☐ m ☐ cm		Velocity Units ☑ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
0.6		0.15	0.3	-0.18	-0.0081
0.75			0.3	-0.21	-0.00945
0.90			0.4	-0.20	-0.0120
1.05			0.4	-0.13	-0.0078
1.20			0.3	0.01	0.00045
1.35			0.3	0.23	0.01035
1.50			0.4	0.62	0.0372
1.65			0.3	1.02	0.0459
1.80			0.2	1.26	0.0378
1.95			0.2	1.10	0.0330
2.10			0.2	1.24	0.0372
2.25			0.2	1.58	0.0474
2.40			0.3	1.88	0.0846
2.55			0.3	1.88	0.0846
2.70			0.4	2.14	0.1284
2.85			0.5	1.15	0.08625
3.00			0.6	1.19	0.1071
3.15			0.6	1.12	0.1008
3.30			0.6	0.87	0.0783
3.45			0.5	1.00	0.0750
3.60			0.5	1.57	0.11775
3.75			0.5	1.26	0.0945
3.90			0.5	0.09	0.00675
↓ continued ...			Total Discharge:	↓ continued	

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

4.4
- .6
3.8

Page 2 of 2

Stream Discharge Form

Sampling Station: Elk-05 (continued) Sampling Crew:

Facility/Site: Standard Mine Date/Time:

☐ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
4.05		0.15	0.3	-0.15	-0.00675
4.20		↓	0.2	0.56	0.0168
4.35		↓	0.2	0.51	0.0153
Total Discharge:					1.20135

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 inch	0.50 h_a^2	225 h_a^2
2 inch	1.02 h_a^2	458 h_a^2
4 inch	2.08 h_a^2	932 h_a^2
8 inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

Page 1 of 1

Stream Discharge Form

Sampling Station: Elk-06 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-18-2007 / 3:36pm

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm	Depth Units ☑ ft ☐ m ☐ cm	Velocity Units ☑ ft/s ☐ m/s

Total Stream Width: Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
1.8		0.2	0.3	0.62	0.0372
2.0			0.2	0.47	0.0188
2.2			0.3	0.57	0.0342
2.4			0.2	0.51	0.0204
2.6			0.2	0.68	0.0272
2.8			0.2	0.57	0.0228
3.0			0.2	0.82	0.0328
3.2			0.2	0.66	0.0264
3.4			0.2	0.63	0.0252
3.6			0.2	0.62	0.0248
3.8			0.2	0.60	0.0240
4.0			0.4	0.71	0.0568
4.2			0.3	0.80	0.0480
4.4			0.4	1.06	0.0848
4.6			0.3	1.13	0.0678
4.8			0.3	0.66	0.0396
5.0			0.4	0.31	0.0248
5.2			0.4	0.11	0.0088
5.4			0.3	0.14	0.0084
5.6			0.2	-0.11	-0.0044
5.8		↓	0.2	-0.15	-0.0060
Total Discharge:					0.6224

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

5.8 * Location slightly downstream (~100 m almost) from previous Elk-06 stations in other years.

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Stream Discharge Form

Sampling Station: Elk-08 Sampling Crew: A. Paponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-18-2007/4:31 pm

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
3.4		0.10	0.1	0.50	0.0050
3.5		0.10	0.1	0.62	0.0062
3.6			0.2	0.76	0.0152
3.7			0.2	0.84	0.0168
3.8			0.2	1.10	0.0220
3.9			0.3	1.20	0.0360
4.0			0.3	1.64	0.0492
4.1			0.3	1.68	0.0504
4.2			0.3	1.60	0.0480
4.3			0.4	1.47	0.0588
4.4			0.4	1.61	0.0644
4.5			0.4	1.58	0.0632
4.6			0.4	1.36	0.0544
4.7			0.4	1.00	0.0400
4.8			0.4	0.53	0.0212
4.9			0.4	0.34	0.0136
5.0			0.4	0.35	0.0140
5.1			0.4	0.23	0.0092
5.2			0.4	0.24	0.0096
5.3			0.4	0.29	0.0116
5.4			0.5	0.15	0.0075
5.5			0.5	0.18	0.0090
5.6		↓	0.5	0.09	0.0045
↓		Total Discharge:	↓	↓	0.6298

~~continued...~~ ~~...continued~~

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

5.4

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Stream Discharge Form

Sampling Station: COP-00 (Copley Lake outflow) Sampling Crew: ACP

Facility/Site: Standard Mine Date/Time: 9/18/2007/1647

Velocity Area

Distance Units: ☒ ft ☐ m ☐ cm — Depth Units: ☒ ft ☐ m ☐ cm — Velocity Units: ☒ ft/s ☐ m/s

Total Stream Width: 0.7 ft — Meter Type: Marsh McBirney

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
~~5.7~~		~~0.1~~	~~0.1~~	~~0.0~~	
~~5.6~~		0.1	~~0.2~~ 0.4	0.1	
1.1		0.1	0.1	0.00	0
1.2			0.1	0.17	0.0017
1.3			0.2	0.16	0.0032
1.4			0.2	0.03	0.0006
1.5			0.2	-0.04	-0.0008
1.6			0.2	-0.13	-0.0026
1.7			0.2	0.21	0.0042
1.8			0.2	0.29	0.0058
		Total Discharge:			0.0121

Timed Filling

Volume Units: ☐ l ☐ qt ☐ gal — Time Units: ☐ sec ☐ min

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate CFS	Flow Rate GPM
1 Inch	$0.50\ h_a^2$	$225\ h_a^2$
2 Inch	$1.02\ h_a^2$	$458\ h_a^2$
4 Inch	$2.08\ h_a^2$	$932\ h_a^2$
8 Inch	$4.22\ h_a^2$	$1900\ h_a^2$
Total Flow (cfs & gpm)		

USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

Just above confluence w/ Elk Creek
10 meters

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Stream Discharge Form

Sampling Station: Elk-10 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-19-07/9:58am

☑ Velocity Area

Distance Units ☑ ft ☐ m ☐ cm | Depth Units ☑ ft ☐ m ☐ cm | Velocity Units ☑ ft/s ☐ m/s

Total Stream Width: Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
1.1		0.05	0.2	-0.07	-0.0007
1.2			0.2	1.24	0.0124
1.3			0.2	1.07	0.0107
1.4			0.2	1.25	0.0125
1.5			0.2	1.55	0.0155
1.6			0.2	1.60	0.0160
1.7			0.3	1.42	0.0213
1.8			0.2	1.26	0.0126
1.9			0.3	1.11	0.01665
2.0			0.3	1.07	0.01605
2.1		↓	0.2	0.80	0.0080
//	//	//	//	//	//
1.15			0.2	-0.03	-0.0003
1.25			0.2	1.20	0.0120
1.35			0.2	1.25	0.0125
1.45			0.2	1.35	0.0135
1.55			0.2	1.51	0.0151
1.65			0.2	1.55	0.0155
1.75			0.2	1.33	0.0133
1.85			0.2	1.15	0.0115
1.95			0.3	1.19	0.01785
2.05		↓	0.3	1.02	0.0153
Total Discharge:					0.26725

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal | Time Units ☐ sec ☐ min

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

* Right below old tailings impoundment; on-going construction immediately above station; silt fences + erosion control upstream
* Added more half stations to achieve necessary 20+ readings.

Page 1 of 1

Stream Discharge Form

Sampling Station: Elk-29 Sampling Crew: A. Poponi, J. Slavick

Facility/Site: Standard Mine Date/Time: 9-19-07 / 11:13am

☑ Velocity Area

Distance Units	Depth Units	Velocity Units
☑ ft ☐ m ☐ cm	☑ ft ☐ m ☐ cm	☑ ft/s ☐ m/s

Total Stream Width: Meter Type:

Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
2.6		0.05	0.2	-0.03	-0.0003
2.65			0.3	-0.02	-0.0003
2.7			0.3	0.03	0.00045
2.75			0.3	0.26	0.0039
2.8			0.3	0.28	0.0042
2.85			0.3	0.17	0.00255
2.9			~~0.3~~ 0.4	0.49	0.0098
2.95			0.4	0.25	0.0050
3.0			0.4	0.46	0.0092
3.05			0.4	0.54	0.0108
3.1			0.4	0.61	0.0122
3.15			0.4	0.66	0.0132
3.2			0.4	1.00	0.0200
3.25			0.4	0.92	0.0184
3.3			0.4	1.07	0.0214
3.35			0.3	0.98	0.0147
3.4			0.3	0.72	0.0108
3.45			0.3	0.62	0.0093
3.5			0.3	0.27	0.00405
3.55			0.3	0.09	0.00135
3.6		↓	0.3	-0.01	-0.00015
Total Discharge:					0.16315

☐ Timed Filling

Volume Units	Time Units
☐ l ☐ qt ☐ gal	☐ sec ☐ min

Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (Inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet =

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments

Page 1 of 1

Stream Discharge Form

Sampling Station: SM-00 Sampling Crew: D. Wall

Facility/Site: Standard Mine Date/Time: 9-19-07 / 11:20 am

☐ Velocity Area

Distance Units ☐ ft ☐ m ☐ cm		Depth Units ☐ ft ☐ m ☐ cm		Velocity Units ☐ ft/s ☐ m/s	
Total Stream Width:			Meter Type:		
Tape Measure Reading	Distance To Opposite Bank	Width (A)	Depth (B)	Velocity (C)	Discharge (A*B*C)
Total Discharge:					

☐ Timed Filling

Volume Units ☐ l ☐ qt ☐ gal		Time Units ☐ sec ☐ min	
Trial	Volume	Time	Notes
1			
2			
3			
4			
5			
6			
	Total Volume:	Total Time:	Total Discharge (Vol/Time):

☐ Flumes

Throat Width (inches): ☐ 1 ☐ 2 ☐ 4 ☐ 8

h_a = Upstream gauge height in feet = 0.13'

h_b = Downstream gauge height in feet =

Throat Width	Flow Rate	
	CFS	GPM
1 Inch	0.50 h_a^2	225 h_a^2
2 Inch	1.02 h_a^2	458 h_a^2
4 Inch	2.08 h_a^2	932 h_a^2
8 Inch	4.22 h_a^2	1900 h_a^2
Total Flow (cfs & gpm)		

Gauge = 0.13'

☐ USGS Staff Gauge

Staff Gauge Reading:

Notes/Comments