IRONTON PARK/CALHOON PROPERTY
RESTORATION OF ABANDONED MINE SITES PROJECT

FINAL REPORT

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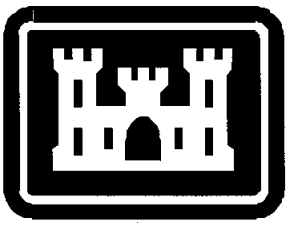

December 2002

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1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) has been provided authority for Restoration of Abandoned Mine Sites (RAMS) through the Water Resource Development Act (WRDA) 1999 Section 560. This program is a regionally focused and stakeholder responsive program for the restoration of abandoned and inactive non-coal mines where water resources (ecosystem/habitat) have been degraded by past mining practices. This authority is intended to allow the USACE to provide support to agencies that manage lands impacted by past mining.

USACE coordinated in advance to obtain stakeholder buy-in on all work proposed to be performed by Corps Districts to ensure that the proposed work is supportive of stakeholders efforts in the area. The U.S. Forest Service (USFS) obtained the necessary right of entry (ROE) or other access agreement to the identified locations. Individuals from the USACE Omaha District and USFS Grand Mesa Uncompaghre Gunnison (GMUG) National Forest performed the field work from August 19th to the 21st.

The purpose of this report is to submit documentation of the field activities and analytical results to the USFS. This document includes methods and procedures used for conducting a site characterization of the Ironton Park/Calhoon Property involving surface water quality, mine waste, and sediment sampling, including:

- sampling
- field quality control
- analytical results
- data quality evaluation

2 PROJECT INFORMATION

2.1 Site Description

Ironton Park/Calhoon Property is located in Ouray County, Colorado. It is located along two miles of highway frontage on US Highway 550. The project area consists of approximately 815 acres and contains a 400 acre "iron-fen" wetland to the west of the highway. The project is under consideration for acquisition for the USFS GMUG National Forest.

The site is located within the Red Mountain Historic Mining District in a setting of steep mountain slopes, precipitous peaks, and "U-shaped" glacially carved valley floors. Most ore deposits are located in the mineral belt associated with the San Juan volcanic field and the Silverton Caldera complex. Ironton Flats separates the Red Mountain Historic Mining District from the Ouray Historic Mining District.

The Red Mountain Historic Mining District is located in the center of a structural basin that is termed the "Red Mountain Sag". This basin is bounded on the north by Ironton Park, on the south by Red Mountain Pass, on the west by Red Mountain and North Mineral Creeks, and on the east by the lower slopes of Red Mountains No. 2 and 3. Most of the mines in the district are located within or adjacent to the Silverton Caldera, and ore was produced mainly from the Henson and Burns Formations. Localized quartz latite prophyritic intrusions were emplaced within the two formations. Both these formations and the San Juan Formation are composed primarily of rhyodacitic flows, breccias, and tuffs. The San Juan Formation also contains the Gilpin Peak quartz latite tuff.

Chimneys and veins in igneous intrusions hosted significant ore deposits. These intrusions are a series of isolated volcanic pipes, centered mainly along a belt of layered and fractured rock in a zone of ring faults. The faults lie along the west and northwest sides of the Silverton Caldera. Igneous breccia pipes were also extensively mined. Ore shoots within the pipes and chimneys occur as irregularly shaped lenses and pods. They are composed of massive sulfides that were formed by open space filling in the upper cavernous parts of the pipes and by hydrothermal replacement at depth. Vertical zoning of mineralization occurred in and around the pipes. Increasing with depth, mineral assemblages are lead-rich to copper-silver rich to pyretic copper-arsenic ores.

Principal sulfide minerals found in the deposits include pyrite (FeS_2), enargite (Cu_3AsS_4), chalcopyrite ($CuFeS_2$), covellite (CuS), bornite (Cu_5FeS_4), sphalerite [(Zn,Fe)S], and galena (PbS). Associated economic minerals are pyrargyrite (Ag_3SbS_3), prousite (Ag_3AsS_3), stromeyerite (AgCuS), tennantite [$(Cu,Ag,Fe,Zn)_{12}As_4S_{13}$], and free gold (Au). Gangue minerals include alunite [$K_2A_{16}(SO_4)_4(OH)_{12}$], barite ($BaSO_4$), fluorite ($CaF_2$), zunyite [$Al_{13}Si_5O_{20}<OH,F)_{18}Cl$], diaspore AlO(OH), and pyrophyllite [$Al_2Si_4O_{10}(OH)_{2]}$.

Silicified rocks grade to argillic rocks and then to quartz-illitic rocks with increasing depth within the pipes.

Lead, iron, and zinc sulfides and sulfates, silver sulfosalts, and sulfobismuthates were concentrated within the faults and fracture zones. Rich veins containing these minerals were mined on the northwest side of the caldera. Typically, iron-bearing minerals such as marcasite (FeS_2), pyrite (FeS_2), chalcopyrite ($CuFeS_2$),, pyrrhotite [$Fe_{1-x}S$ (x=0-0.17)], pentalandite [$(Fe,Ni)_9S_8$], cobaltite (CoAsS), enargite (Cu_3AsS_4), tetrahedrite [$(Cu,Fe,Ag,Zn)_{12}Sb_4S_{13}$], and arsenopyrite (FeAsS) are more abundant in Red Mountain mining district than in surrounding districts. Some of these minerals are more reactive to chemical, physical, and biological weathering than other base metal sulfides.

2.2 Project Goals

The USFS goal of the investigation is to identify potential contaminant sources and collect environmental samples to determine whether or not significant contamination exists for the purpose of determining whether or not the USFS GMUG National Forest should acquire the property. This report is a summary of the data and the data validation and was prepared in support of the USFS project goal. Project sampling locations were identified by the USFS on 30 July 2002. See Table 1 for list of sampling locations and media.

3 FIELD INVESTIGATION

3.1 Field Investigation Activities

All chemical analytical samples were collected at the approximate locations identified in the Site Specific Addendum (SSA). Coordinates for the sampling locations are provided in Table 1. Sampling location coordinates obtained from a hand-held Global Positioning Satellite (GPS) device were recorded in the field logbooks in longitude and latitude, as well as elevation in feet above mean sea level (msl). The device has an approximate accuracy of plus-or-minus 20 feet.

All Standard Operating Procedures (SOPs) identified in the SSA were adhered to during the course of this field investigation: A1 (Surface Soil/Rock Sampling Equipment and Procedures); A4 (Soil/Rock Homogenization Equipment and Procedures), A5 (Lithologic Description of Surface and Subsurface Soil Samples), A7 (Investigative Derived Waste Procedures); A11 (Surface Water and Sediment Sampling Equipment and Procedures), A12 (Equipment Decontamination Procedures); A13 (Sample Handling, Documentation, and Tracking Procedures); and A14 (Field Documentation).

3.2 Surface Water Samples

The surface water sampling locations were located upgradient and downgradient from potentially contaminated areas and were designed to determine whether or not stream degradation is occurring as a result of these areas. Field measurements of pH, specific conductance (milliSiemens/centimeter) [mS/cm], turbidity (Nephelometric Turbidity Units) [NTU], dissolved oxygen (DO) (milligrams/liter) [mg/L], temperature (°C), and salinity (%) were obtained with a Horiba U-10 water quality meter and are also included on Table 1. Probes for all of these specified parameters are housed in a single unit.

Surface water samples were collected directly into the sample container, or, if flow rate is too low for this method or the water was too shallow, the samples were collected with a disposable plastic cup and poured into the sample container. All excess water was disposed of by pouring gently out on the stream bank adjacent to the sampling location. A total of 16 surface water samples (water quality samples) plus one Quality Control (QC) sample were collected by the Corps of Engineers at the locations identified in Table 1. The QC sample was collected at sampling location SW-31. The water quality samples were analyzed for:

Target Constituent	Analytical Method
Metals	
Antimony, dissolved	EPA 6010 ICP-Trace
Arsenic, dissolved	EPA 6010 ICP-Trace

Target Constituent	Analytical Method
Cadmium, dissolved	EPA 6010 ICP-Trace
Chromium, dissolved	EPA 6010 ICP-Trace
Copper, dissolved	EPA 6010 ICP-Trace
Iron, total	EPA 6010 ICP
Lead, dissolved	EPA 6010 ICP-Trace
Manganese, dissolved	EPA 6010 ICP
Mercury, dissolved	EPA 7470 CVAA
Nickel, dissolved	EPA 6010 ICP-Trace
Selenium, dissolved	EPA 6010 ICP-Trace
Silver, dissolved	EPA 6010 ICP-Trace
Zinc, dissolved	EPA 6010 ICP-Trace
Chloride	EPA M325.2
Sulfate	EPA M375.3
Hardness as $CaCO_3$	EPA SM2340B
Residue, Filterable (TDS) @ 18°C	EPA M160.1
pH	EPA M150.1
Conductivity @ 25°C	EPA M120.1

Cyanide samples were to be analyzed by the free Cyanide method (EPA M335.3), however, due to pH values less than 6.0 in the surface water samples, a technical decision was made to use the total Cyanide method (EPA M) for an aliquot of the sample. If the pH of the sample was less than 6.0, no free Cyanide analysis would be performed. If the pH of the sample was greater than 6.0 and total Cyanide was detected in the sample, a free Cyanide analysis was to be performed on another aliquot of the sample.

In addition due to the redness of the surface water in many locations, a technical decision was made to report the concentration of dissolved iron by EPA 6010 ICP for comparison with the total iron concentration. This will permit a determination of the amount of iron present in the sample that is due to particulates.

3.2.1 Mine Waste Samples

A total of 3 mine waste samples (surface rock/soil samples) plus one QC sample was collected at the locations identified in Table 1. The QC sample was collected at WR-17. Mine waste samples were analyzed for:

Target Constituent	Analytical Method
Total Metals (total digestion)	EPA 3051
Antimony	EPA 6010, ICP Trace
Arsenic	EPA 6010, ICP Trace
Cadmium	EPA 6010, ICP Trace

Target Constituent	Analytical Method
Copper	EPA 6010, ICP Trace
Lead	EPA 6010, ICP Trace
Manganese	EPA 6010, ICP Trace
Mercury	EPA 7470, CVAA
Nickel	EPA 6010, ICP Trace
Selenium	EPA 6010, ICP Trace
Silver	EPA 6010, ICP Trace
Zinc	EPA 6010, ICP Trace
SPLP Extraction	EPA 1312 – West
Antimony	EPA 1312/6010, ICP Trace
Arsenic	EPA 1312/6010, ICP Trace
Cadmium	EPA 1312/6010, ICP Trace
Copper	EPA 1312/6010, ICP Trace
Lead	EPA 1312/6010, ICP Trace
Manganese	EPA 1312/6010, ICP Trace
Mercury	EPA 1312/7470, CVAA
Nickel	EPA 1312/6010, ICP Trace
Selenium	EPA 1312/6010, ICP Trace
Silver	EPA 1312/6010, ICP Trace
Zinc	EPA 1312/6010, ICP Trace

3.2.2 Sediment Samples

A total of 14 sediment samples plus one QC sample were collected at the locations identified in Table 1. The QC sample was collected at SD-02. The sediment samples were analyzed for:

Target Constituent	Analytical Method
Total Metals (total digestion)	EPA 3051
Antimony	EPA 6010, ICP Trace
Arsenic	EPA 6010, ICP Trace
Cadmium	EPA 6010, ICP Trace
Copper	EPA 6010, ICP Trace
Lead	EPA 6010, ICP Trace
Manganese	EPA 6010, ICP Trace
Mercury	EPA 7470, CVAA
Nickel	EPA 6010, ICP Trace
Selenium	EPA 6010, ICP Trace
Silver	EPA 6010, ICP Trace
Zinc	EPA 6010, ICP Trace

3.3 Stream Discharge Equipment and Procedures

Flow rate measurements will be obtained using an FP201 Global Flow Probe hand-held flow meter with a 3 to 6-foot expandable handle. The flow meter has a 2-inch propeller sensor that rotates freely on a bearing shaft with no mechanical interconnections. Magnetic material in the propeller passes a pickup coil in the housing, thereby producing electrical impulses. The electrical impulses are then carried by wire to a readout display located on top of the handle, which amplifies and converts the signal into velocity readings measured in feet per second. Instantaneous, average and maximum velocity readings are displayed. The range of the flow meter is 0 to 25 feet per second, with accuracies of plus-or-minus 0.1 feet per second for instantaneous velocity, and plus-or-minus 0.01 feet per second for average and maximum velocity.

At each surface water sampling location, the stream channel was subdivided into 1 to 5 segments of approximately equal length depending on the width of the stream channel. The depth of the stream were measured in the middle of each segment. In general, the average stream depth and the stream width at the sampling location were recorded in the field logbook, and the approximate cross-sectional area of the stream channel was calculated for the sampling location. In some instances, flow rates were too low to measure with the probe. At these locations, the plastic cup fill rate (x number of seconds/ 9 ounces) was measured and converted to cubic feet per second (cfs).

Velocity measurements were obtained from each stream segment. The flow meter handle was extended to the appropriate length, and the flow probe placed in the middle of each stream segment for a minimum of 1 minute. The flow probe was moved slowly back and forth from top to bottom during the 1-minute timeframe in order to obtain a vertical flow profile. The average and maximum flow velocities for each sampling location was recorded in the field logbook. For each stream segment, the average velocity was multiplied by the cross-sectional area in order to determine the flow for that segment. The calculated cross-sectional area (Channel Area) in square feet (sq.ft.), the Average Flow Rate in feet per second (ft./sec.), and the Discharge Rate in cfs are provided in Table 1.

3.4 Sample Identification Scheme

The sample ID scheme presented in the SSA utilized the following designation.

UU-VVVV-XXXX-ZZ
where:

UU = Project designation was replaced with **CO** (for Colorado RAMS)
VVVV = Designation of sampling area location was replaced with **IPCP** (For Ironton Park – Calhoon Property)

XXXX = **WR** (waste rock/mine waste sample), **SW** (surface water sample) or **SD** (sediment sample) plus the two-digit sample location number
ZZ = 2 Character Designation for Samples, where:

01 = Normal Field Sample
02 = QC Duplicate

4 ANALYTICAL RESULTS

4.1 Project and Data Quality Objectives

4.1.1 Project Objectives

Surface water, sediment, and mine waste samples from Ironton Park/Calhoon Property were collected for chemical analysis. For this project 16 surface water samples, 3 mine waste samples, and 14 sediment samples plus the associated QC samples were collected and analyzed by USACE.

4.1.2 Data Quality Objectives

The data quality objectives are based on that given in the General Work Plan, 2002. The analytical results were used to gain information about the extent of mine-related contamination. The criteria in order to attain these goals are given in the General Work Plan, 2002 and/or given in this section. The MDL, MRL, and Quality Control criteria that will meet the data objectives for metals are given in Tables 6-5 and 6-6 of the General Work Plan, 2002. The MDL, MRL, and Quality Control criteria of the water leachate that will be analyzed for pH, acid concentration, conductivity, and metals are given in Table 6-7 of the General Work Plan, 2002.

4.2 Chemical Analytical Samples

Sample requirements are given in the following table:

SAMPLE REQUIREMENTS

Parameter	Field	Quality Control Duplicate	MS/MSD**	Total
Surface Water	16	1		17
Mine Waste Sample*	3	1		4
Sediment Sample	14	1		15

* Total metals of the soil and the SPLP leachate were all obtained from the one sample from each area.
** Required MS/MSD were obtained from samples above and no additional samples were required.
NOTE: Each bottle and the COC included the **LIMS # 6717**

4.3 Preservation, Holding Time, and Shipment

All samples were collected first and shipped daily so they would be shipped to the lab within holding times. All samples were held at the laboratory and analyzed in the same sample analytical batch. All sample bottles for Cyanide

analyses were preserved in the field to a pH greater than 12, using approximately 40 drops of NaOH per bottle.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES FOR SURFACE WATER SAMPLES

Parameter	Container	Preservation	Maximum Holding Times	
			Extraction	Analysis
Metals* (dissolved/total)	500 ml plastic			6 months Hg 28 days
Chloride	1 liter plastic			28 days
Sulfate				28 days
Hardness as $CaCO_3$				28 days
PH				24 hrs
Conductivity @ 25^0C				28 days
Residue, Filterable (TDS) @ 18^0C				7 days
Cyanide, free	500 ml plastic	NaOH to pH >12		14 days

* Dissolved metals: Sb, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Zn. Total metals: Fe. One sample was sent in for metals, but it was noted on the COC and sample label that an aliquot for total Fe needed removed before filtering.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES FOR MINE WASTE SAMPLES

Parameter	Container	Preservation	Maximum Holding Times	
			Extraction	Analysis
Metals* **	1 x 8 oz glass	-		6 months Hg 28 days
Metals (SPLP)* **		-		6 months Hg 28 days

* Metals: Sb, As, Cd, Cu, Pb, Mn, Hg, Ni, Se, Ag, Zn.

** One sample can be sent in for metals and SPLP Extraction metals, but it must be written on the Chain of Custody and sample label that part of the soil must be used for the SPLP Extraction.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES FOR SEDIMENT SAMPLES

Parameter	Container	Preservation	Maximum Holding Times	
			Extraction	Analysis
Metals*	8 oz glass	-		6 months Hg 28 days

- Metals: Sb, As, Cd, Cu, Pb, Mn, Hg, Ni, Se, Ag, Zn.

4.4 Labeling and Shipment Procedures

The filled sample bottles and jars were labeled as specified in the General Work Plan, 2002. The Laboratory Identification Management System (LIMS) number was **LIMS # 6717.**

The labeled bottles were placed in the cooler with the appropriate chain-of-custody. Although no preservation with ice was required for any of the samples, double-bagged ice was included in the cooler in lieu of other packing materials. The coolers were shipped by overnight mail to the laboratory:

US Army Corps of Engineers
Environmental Chemistry Branch (ECB) Laboratory
ATTN: WES-EE-Q (Sample Custodian)
420 South 18th Street
Omaha NE 68102
Telephone: (402) 444-4314

4.5 Analytical Results

The analytical results for this project are provided in Table 2 (Water Quality Samples), Table 3 (Mine Waste Samples), and Table 4 (Sediment Samples). These tables include the Method Reporting Limit (RL), the analytical results with units specified, and any data qualifiers. Data qualifiers are defined on the appropriate table and are described in the Chemical Data Quality Assurance Report (provided separately).

5 QUALITY CONTROL REVIEW

Quality control review consists of an evaluation of the field procedures and analytical procedures and a review of the data to ensure appropriate QC compliance were met.

5.1 Field Quality Control

All documentation in field logbooks were reviewed by the project team for completeness. A review of the placement or coordinates of the sample was performed to ensure that this correlates to sample nomenclature. Placement and frequency of the quality control samples were reviewed to ensure compliance to set criteria. Location coordinates, flow rate measurements, cross-sectional area calculations, and discharge calculations were reviewed for completeness and accuracy by the project technical team.

5.2 Laboratory Quality Control

Laboratory Quality Control is provided in the Chemical Data Quality Assurance Report (CDQAR) (provided separately).

5.3 Data Validation

Data valadiation information is provided in the CDQAR (provided separately).

5.4 Data Quality Summary

The CDQAR presents, in specific terms, the quality control practices utilized to achieve the goals of the site investigation at Ironton Park/Calhoon Property, CO. Samples were also collected and analyzed in accordance with ASTM and EPA methods and laboratory specific QA/QC procedures were used. These procedures were followed to generate high quality data.

The quality issues addressed in the CDQAR do not impact the usability of the data. The required qualifications have been applied to the data in Tables 2, 3, and 4. The reviewed data are usable and are suitable for addressing the overall objectives of this investigation.

6 SUMMARY

The project was executed in accordance with the General RAMS Work Plan and the Site Specific Addendum for Ironton Park/Calhoon Property in Colorado. Samples were also collected and analyzed in accordance with ASTM and EPA methods and laboratory specific QA/QC procedures were used. These procedures were followed to generate high quality data. The quality issues addressed in the CDQAR do not impact the usability of the data. The reviewed data are usable and are suitable for addressing the overall objectives of this investigation.

Table 1
Sample Location, Sample Identification Number, Location Coordinates,
Flow Rate Parameters, and Water Quality Parameters
August 2002

Sample Location	Sample ID No.	Latitude	Longitude	Elevation (feet above MSL)	Channel Area (sq.ft.)	Average Flow Rate (ft/sec)	Discharge (cfs)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)
SW-01	CO-IPCP-SW01-01	N 37° 56' 21.198"	W 107° 40' 17.385"	9699	3.6	2.1	7.56	3.32	1.22	280	12.29	9.6	0.05
SD-02	CO-IPCP-SD02-01 & -02	N 37° 56' 21.333"	W 107° 40' 14.767"	9753	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-03	CO-IPCP-SD03-01	N 37° 56' 23.345"	W 107° 40' 13.863"	9733	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-04	Collected by USFS	N 37° 56' 59.545"	W 107° 39' 51.806"	9575	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-05	CO-IPCP-SW05-01	N 37° 56' 16.819"	W 107° 40' 05.379"	9663	1.2	1.37	1.64	6.27	0.775	13	12.5	9.0	0.03
SW-06	CO-IPCP-SW06-01	N 37° 56' 33.248"	W 107° 40' 01.140"	9690	1.02	1.52	1.55	6.08	0.766	7	11.8	11.7	0.03
SW-07	CO-IPCP-SW07-01	N 37° 56' 34.538"	W 107° 40' 02.628"	9737	7.2	0.56	4.03	3.34	1.05	73	7.35	13.9	0.04
SD-08	CO-IPCP-SD08-01	N 37° 56' 53.022"	W 107° 40' 00.482"	9626	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-09	CO-IPCP-SW09-01	N 37° 56' 40.334"	W 107° 40' 03.116"	9667	2.0	0.75	1.50	4.05	0.98	0	8.79	10.3	0.04
SW-10	CO-IPCP-SW10-01	N 37° 56' 42.658"	W 107° 40' 03.060"	9605	8.4	0.96	8.06	3.31	1.13	392	7.90	14.4	0.05
SD-11	CO-IPCP-SD11-01	N 37° 56' 45.715"	W 107° 39' 55.363"	9716	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-12	CO-IPCP-SD12-01	N 37° 56' 46.318"	W 107° 39' 57.154"	9687	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-13	CO-IPCP-SD13-01	N 37° 56' 48.128"	W 107° 39' 51.317"	10049	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-14	CO-IPCP-SD14-01	N 37° 56' 47.417"	W 107° 39' 50.579"	9762	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-15	CO-IPCP-SD15-01	N 37° 56' 48.325"	W 107° 39' 50.019"	9910	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-16	CO-IPCP-SD16-01	N 37° 56' 47.581"	W 107° 39' 50.324"	9807	NA	NA	NA	NA	NA	NA	NA	NA	NA
WR-17	CO-IPCP-WR17-01 & -02	N 37° 56' 44.878"	W 107° 39' 41.251"	10007	NA	NA	NA	NA	NA	NA	NA	NA	NA
WR-18	CO-IPCP-WR18-01	N 37° 56' 21.198"	W 107° 40' 17.385"	9998	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-19	CO-IPCP-SW19-01	N 37° 56' 45.248"	W 107° 39' 47.759"	9846	0.25	0.53	0.133	3.25	0.528	1	8.46	14.1	0.02
SW-20	CO-IPCP-SW20-01	N 37° 56' 34.706"	W 107° 39' 57.102"	9654	NR	NR	NR	7.44	0.843	6	7.01	16.2	0.03
SW-21	Collected by USFS				NR	NR	NR	8.2	0.61	NR	NR	11.4	NR
SW-22	CO-IPCP-SW22-01	N 37° 47' 45.881"	W 107° 39' 46.518"	9580	24.65	0.6	14.79	3.49	1.00	35	9.53	11.4	0.04
WR-23	CO-IPCP-WR23-01	N 37° 57' 07.726"	W 107° 40' 10.933	9763	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-24	CO-IPCP-SW24-01	N 37° 57' 07.726"	W 107° 40' 10.933	9763	0.02	0.088	0.00176	6.18	0.282	142	14.69	7.5	0.01
SW-25	CO-IPCP-SW25-01	N 37° 56' 46.796"	W 107° 40' 19.383"	9686	0.9	0.37	0.333	7.38	0.204	2	9.40	12.2	0.00
SD-26	CO-IPCP-SD26-01	N 37° 56' 58.251"	W 107° 40' 15.423"	9693	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-27	CO-IPCP-SD27-01	N 37° 56' 59.460"	W 107° 40' 16.314"	9630	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-28	CO-IPCP-SW28-01	N 37° 56' 59.976"	W 107° 40' 15.544"	9631	NA	NA	NA	3.65	0.621	2	6.03	15.1	0.02
SD-29	CO-IPCP-SD29-01	N 37° 57' 03.927"	W 107° 40' 12.092"	9640	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-30	CO-IPCP-SD30-01	N 37° 57' 03.930"	W 107° 40' 12.377"	9652	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Sample Location, Sample Identification Number, Location Coordinates,
Flow Rate Parameters, and Water Quality Parameters
August 2002

Sample Location	Sample ID No.	Latitude	Longitude	Elevation (feet above MSL)	Channel Area (sq.ft.)	Average Flow Rate (ft/sec)	Discharge (cfs)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)
SW-31	CO-IPCP-SW31-01 & -02	N 37° 57' 03.774"	W 107° 40' 12.626"	9659	NA	NA	NA	3.58	0.359	5	1.72	13.7	0.01
SW-32	CO-IPCP-SW32-01	N 37° 57' 36.570"	W 107° 39' 50.236"	9610	1.5	0.9	1.35	7.03	0.503	3	9.00	14.3	0.02
SW-33	CO-IPCP-SW33-01	N 37° 57' 24.739"	W 107° 39' 49.635"	9619	0.12	0.18	0.0216	8.30	0.508	2	10.23	18.0	0.02
SW-34	CO-IPCP-SW34-01	N 37° 57' 35.094"	W 107° 39' 45.575"	9612	NA	NA	NA	7.98	0.509	0	7.57	17.3	0.02
SD-35	CO-IPCP-SD35-01	N 37° 57' 30.689"	W 107° 39' 58.254"	9620	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-36	Collected by USFS	N 37° 56' 57.924"	W 107° 40' 02.151"	9622	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-37	Collected by USFS	N 37° 57' 12.493"	W 107° 39' 56.915"	9603	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD-38	Collected by USFS	N 37° 57' 37.150"	W 107° 39' 45.826"	9616	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA – Not Applicable
NR – Not Recorded

Table 2
Summary of Analytical Results for Water Quality Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SW-01			SW-05			SW-06			SW-07			SW-09		
FIELD ID		CO-IPCP-SW01-01			CO-IPCP-SW05-01			CO-IPCP-SW06-01			CO-IPCP-SW07-01			CO-IPCP-SW09-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Dissolved Metals (ug/L)																
Antimony	6	<6	20		<6	20	U	<6	20	U	<6	20	U	<6	20	U
Arsenic	3	<3	15		<3	15	U	<3	15	U	<3	15	U	<3	15	U
Cadmium	0.5	8.4	2.5		<0.5	2.5	U	<0.5	2.5	U	5.9	2.5		8.5	2.5	
Chromium	2	8	10		<2	10	U	<2	10	U	4	10	J	<2	10	U
Copper	2	1300	10		<2	10	U	5	10	J	994	10		125	10	
Iron	40	19100	120		70	120	J	60	120	J	7760	120		330	120	
Lead	2	81	10		<2	10	U	<2	10	U	68	10		<2	10	U
Manganese	1	2340	4		601	4		558	4		1900	4		5030	4	
Mercury	0.02	<0.02	0.1		<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U
Nickel	3	52	10		<3	10	U	<3	10	U	37	10	U	26	10	
Selenium	4	<4	20		<4	20	U	4	20	J	<4	20		<4	20	U
Silver	1	<1	5		<1	5	U	<1	5	U	<1	5	U	<1	5	U
Zinc	3	2240	10		62	10		56	10		1670	10		2660	10	
Total Metals (ug/L)																
Iron	40	61200	120		4500	120		2200	120		32400	120		360	120	
Cyanide (mg/L)	*	<10	10		<10	10	U	<10	10	U	<10	10	U	<10	10	U
Water Quality Parameters																
Hardness (mg equivalent CaCO3/L)	0.04	316	1.2		462	1.2		455	1.2		370	1.2		449	1.2	
Conductivity (umohs/cm)		1380			942			940			1290			1030		
Chloride (mg/L)	1	1	5		<1	5	U	<1	5	U	1	5	J	<1	5	U
Sulfate (mg/L)	6	660	20		480	20	D	490	20	D	620	20	D	560	20	D
TDS	5	910	10		710	10		700	10		840	10		780	10	
pH		3.05			6.75			6.76			3.18			4.23		

Qual - Qualifier
RL - Reporting Limit
B - Blank Contamination
D - Dilution
J - Estimated
U - Nondetect
mg/kg - milligram per kilogram
mg/L - milligrams per liter
* Non detects were reported as <RL

Table 2
Summary of Analytical Results for Water Quality Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SW-10			SW-19			SW-20			SW-22			SW-24		
FIELD ID		CO-IPCP-SW10-01			CO-IPCP-SW19-01			CO-IPCP-SW20-01			CO-IPCP-SW22-01			CO-IPCP-SW24-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Dissolved Metals (ug/L)																
Antimony	6	<6	20	U	<6	20	U	<6	20	U	<6	20	U	<6	20	U
Arsenic	3	<3	15	U	<3	15	U	<3	15	U	<3	15	U	<3	15	U
Cadmium	0.5	6	2.5		2	2.5	J	0.6	2.5	J	4.6	2.5		<0.5	2.5	U
Chromium	2	5	10	J	<2	10	U	<2	10	U	2	10		<2	10	U
Copper	2	946	10		276	10		3	10	J	661	10		<2	10	U
Iron	40	7300	120		1500	120	U	60	120	J	3220	120		1450	120	
Lead	2	67	10	U	96	10		<2	10	U	44	10		<2	10	U
Manganese	1	1960	4		2130	4		1150	4		1790	4		468	4	
Mercury	0.02	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U
Nickel	3	37	10		5	10	J	<3	10	U	27	10		<3	10	U
Selenium	4	<4	20	U	<4	20	U	<4	20	U	<4	20		<4	20	U
Silver	1	<1	5	U	2	5	J	<1	5	U	<1	5		<1	5	U
Zinc	3	1690	10		689	10	U	20	10		1370	10		60	10	
Total Metals (ug/L)																
Iron	40	31500	120		1480	120		1760	120		17300	120		1810	120	
Cyanide (mg/L)	*	<10	10	U	<10	10	U	<10	10	U	<10		U	<10	10	U
Water Quality Parameters																
Hardness (mg equivalent CaCO3/L)	0.04	368	1.2		108	1.2		508	1.2		346	1.2		122	1.2	
Conductivity (umohs/cm)		1280			620			1010			1070			309		
Chloride (mg/L)	1	<1	5	U	<1	5	U	<1	5	U	1	5	J	<1	5	U
Sulfate (mg/L)	6	600	20	D	180	20		500	20	D	530	100	D	110	20	
TDS	5	820	10		250	10		720	10		720	10		210	10	
pH		3.22			3.25			8.19			3.48			6.65		

Qual - Qualifier
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B - Blank Contaminatior
D - Dilution
J - Estimated
U - Nondetect
mg/kg - milligram per kilogram
mg/L - milligrams per liter
* Non detects were reported as <RL

Table 2
Summary of Analytical Results for Water Quality Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SW-25			SW-28			SW-31			SW-31 (dup)			SW-32		
FIELD ID		CO-IPCP-SW25-01			CO-IPCP-SW28-01			CO-IPCP-SW31-01			CO-IPCP-SW31-02			CO-IPCP-SW32-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Dissolved Metals (ug/L)																
Antimony	6	<6	20	U	<6	20	U	<6	20	U	<6	20	U	<6	20	U
Arsenic	3	<3	15	U	<3	15	U	4	15	JB	<3	15	U	<3	15	U
Cadmium	0.5	<0.5	2.5	U	<0.5	2.5	U	<0.5	2.5	U	<0.5	2.5	U	<0.5	2.5	U
Chromium	2	<2	10	U	<2	10	U	<2	10	U	<2	10	U	<2	10	U
Copper	2	<2	10	U	<2	10	U	<2	10	U	<2	10	U	<2	10	U
Iron	40	<40	120	U	5400	120		5450	120		5450	120	U	50	120	J
Lead	2	<2	10	U	3	10	J	<2	10	U	3	10	J	<2	10	U
Manganese	1	5.9	4		636	4		537	4		542	4		368	4	
Mercury	0.02	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U	<0.02	0.1	U
Nickel	3	<3	10	U	4	10	J	9	10	J	9	10	J	<3	10	U
Selenium	4	<4	20	U	<4	20	U	<4	20	U	<4	20	U	<4	20	U
Silver	1	<1	5	U	<1	5	U	<1	5	U	<1	5	U	<1	5	U
Zinc	3	<3	10	U	117	10		209	10		221	10		13	10	
Total Metals (ug/L)																
Iron	40	190	120		6470	120		5410	120		5450	120		30	120	
Cyanide (mg/L)	*	<10	10	U	<10	10	U	<10	10	U	<10	10	U	<10	10	U
Water Quality Parameters																
Hardness (mg equivalent CaCO3/L)	0.04	101	1.2		271	1.2		93.8	1.2		94.6	1.2		268	1.2	
Conductivity (umohs/cm)		244			750			444			456			611		
Chloride (mg/L)	1	<1	5	U	<1	5	U	<1	5	U	<1	5	U	<1	5	U
Sulfate (mg/L)	6	66	20		340	20	D	180	20		180	20		290	60	D
TDS	5	150	10		540	10		270	10		280	10		430	10	
pH		8.12			3.75			3.66			3.66			7.66		

Qual - Qualifier
RL - Reporting Limit
B - Blank Contaminatior
D - Dilution
J - Estimated
U - Nondetect
mg/kg - milligram per kilogram
mg/L - milligrams per liter
* Non detects were reported as <RL

Table 2
Summary of Analytical Results for Water Quality Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SW-33			SW-34		
FIELD ID		CO-IPCP-SW33-01			CO-IPCP-SW34-01		
	MDL	Result	RL	Qual	Result	RL	Qual
Dissolved Metals (ug/L)							
Antimony	6	<6	20	U	<6	20	U
Arsenic	3	<3	15	U	<3	15	U
Cadmium	0.5	<0.5	2.5	U	<0.5	2.5	U
Chromium	2	<2	10	U	<2	10	U
Copper	2	<2	10	U	<2	10	U
Iron	40	<40	120	U	<40	120	U
Lead	2	<2	10	U	<2	10	U
Manganese	1	12	4		29	4	
Mercury	0.02	<0.02	0.1	U	<0.02	0.1	U
Nickel	3	<3	10	U	<3	10	U
Selenium	4	<4	20	U	<4	20	U
Silver	1	<1	5	U	<1	5	U
Zinc	3	<3	10	U	4	10	J
Total Metals (ug/L)							
Iron	40	220	120		80	120	J
Cyanide (mg/L)	*	<10	10	U	<10	10	U
Water Quality Parameters							
Hardness (mg equivalent CaCO3/L)	0.04	273	10		273	1.2	
Conductivity (umohs/cm)		618			618		
Chloride (mg/L)	1	<1	5	U	<1	5	U
Sulfate (mg/L)	6	290	60	D	290	60	D
TDS	5	430	430		410	10	
pH		9.12	9.12		8.62		

Qual - Qualifier
RL - Reporting Limit
B - Blank Contamination
D - Dilution
J - Estimated
U - Nondetect
mg/kg - milligram per kilogram
mg/L - milligrams per liter
* Non detects were reported as <RL

Table 3
Summary of Analytical Results for Waste Rock Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		WR-17			WR-17 (dup)			WR-18			WR-23		
FIELD ID		CO-IPCP-WR17-01			CO-IPCP-WR17-02			CO-IPCP-WR18-01			CO-IPCP-WR23-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Total Metals (mg/kg)													
Antimony	1	3	4	J	2	4	J	10	4	J	<1	4	J
Arsenic	0.6	40.4	3		34.7	3		302	3		6.5	3	
Cadmium	0.1	3.8	0.5		3.3	0.5		<0.1	0.5		<0.1	0.5	
Copper	0.4	2010	8		1820	8		1030	2		37.9	2	
Lead	0.4	5860	8		5570	8		1080	2		808	2	
Manganese	0.2	2330	3.2		2800	3.2		41.5	0.8		289	0.8	
Mercury	0.002	0.23	0.01		0.24	0.01		0.06	0.01		0.13	0.01	
Nickel	0.6	19	2		16	2		15	2		2.3	2	
Selenium	0.8	10	4		12	4		16	4		2	4	
Silver	0.2	97.4	1		86	1		243	1		9	1	
Zinc	0.6	1950	8	B	1700	8	B	356	2	B	72.6	2	B
SPLP Metals (mg/kg)													
Antimony	0.004	<0.04	0.12		<0.04	0.12		<0.04	0.12		<0.04	0.12	
Arsenic	0.006	<0.006	0.03		<0.006	0.03		0.032	0.03		<0.006	0.03	
Cadmium	0.001	0.02	0.005		0.02	0.005		<0.001	0.005		<0.001	0.005	
Copper	0.005	4.0	0.02		4.22	0.02		0.57	0.02		<0.001	0.02	
Lead	0.01	0.37	0.05		1.58	0.05		3.8	0.05		<0.01	0.05	
Manganese	0.002	6.24	0.008		5.59	0.008		0.1	0.008		0.07	0.008	
Mercury	0.0004	<0.0004	0.002		<0.0004	0.002		<0.0004	0.002		<0.0004	0.002	
Nickel	0.006	0.04	0.04		0.04	0.04		<0.006	0.04		<0.006	0.04	
Selenium	0.01	<0.01	0.05		<0.01	0.05		<0.01	0.05		<0.01	0.05	
Silver	0.002	<0.002	0.01		0.002	0.01	J	0.002	0.01		<0.002	0.01	
Zinc	0.006	4.0	0.02		4.1	0.02		0.2	0.02		0.06	0.02	

MDL - Method Detection Limit
RL - Reporting Limit
Qual - Qualifier
B - Contamination in Blank
J - Estimated Values between MDL and RL or data qualification
mg/kg - milligram per kilogram

Table 4
Summary of Analytical Results for Sediment Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SD-02			SD-02 (dup)			SD-03			SD-08		
FIELD ID		CO-IPCP-SD02-01			CO-IPCP-SD02-02			CO-IPCP-SD03-01			CO-IPCP-SD08-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Total Metals (mg/kg)													
Antimony	1	1	4	J-	<1	4	UJ-	<1	4	UJ-	2	4	J-
Arsenic	0.6	148	3		156	3		20	3		109	3	
Cadmium	0.1	<0.1	0.5	J	0.2	0.5	J	0.5	0.5	J	0.78	0.5	
Copper	0.4	57.4	2		50.9	2		644	2		314	2	
Lead	0.4	685	2	B	734	2		358	2		619	2	
Manganese	0.2	823	0.8		857	0.8		314	0.8		315	0.8	
Mercury	0.002	0.05	0.01		0.05	0.01		0.08	0.01		0.15	0.01	
Nickel	0.6	1	2	J	1	2	J	3.1	2		3	2	
Selenium	0.8	1	4	JB	2	4	J	<0.8	4	U	3	4	J
Silver	0.2	5.4	1		5.7	1		0.7	1	J	7.9	1	
Zinc	0.6	137	2	B	130	2	B	154	2	B	385	2	B

MDL - Method Detection Limit
RL - Reporting Limit
Qual - Qualifier
B - Contamination in Blank
J - Estimated Values between MDL and RL or data qualification
J- - Estimated values with low bias
U - Nondetect
mg/kg - milligram per kilogram

Table 4
Summary of Analytical Results for Sediment Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SD-11			SD-12			SD-13			SD-14		
FIELD ID		CO-IPCP-SD11-01			CO-IPCP-SD12-01			CO-IPCP-SD13-01			CO-IPCP-SD14-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Total Metals (mg/kg)													
Antimony	1	8.3	4	J-	10	4	J-	28	4	J-	64.3	4	J-
Arsenic	0.6	126	3		190	3		176	3		823	3	
Cadmium	0.1	0.7	0.5		1.7	0.5		0.2	0.5	J-	<0.1	0.5	U
Copper	0.4	689	2		946	2		1870	2		2980	20	
Lead	0.4	3060	2	B	5930	2		8210	2	B	25900	20	B
Manganese	0.2	7560	0.8		1790	0.8		80.3	0.8		217	0.8	
Mercury	0.002	0.089	0.01		0.2	0.01		0.292	0.01		0.039	0.01	
Nickel	0.6	9.4	2		6.6	2		11	2		4.8	2	
Selenium	0.8	7.1	4	B	17	4		19	4	B	27	4	U
Silver	0.2	43.3	1		127	1		226	1		189	1	
Zinc	0.6	1040	2	B	956	2	B	1840	20	B	725	2	

MDL - Method Detection Limit
RL - Reporting Limit
Qual - Qualifier
B - Contamination in Blank
J - Estimated Values between MDL and RL or data qualification
J- - Estimated values with low bias
U - Nondetect
mg/kg - milligram per kilogram

Table 4
Summary of Analytical Results for Sediment Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SD-15			SD-16			SD-26			SD-27		
FIELD ID		CO-IPCP-SD15-01			CO-IPCP-SD16-01			CO-IPCP-SD26-01			CO-IPCP-SD27-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Total Metals (mg/kg)													
Antimony	1	12	4	J-	10	4	J-	<1	4	UJ-	2	4	J-
Arsenic	0.6	128	3		165	3		4.9	3		2	3	J-
Cadmium	0.1	0.97	0.5		<0.1	0.5	J	0.5	0.5	J	<0.1	0.5	J-
Copper	0.4	828	2		438	2		15	2		7.4	2	
Lead	0.4	4080	2	B	3850	20	B	46	2	B	13	2	B
Manganese	0.2	608	0.8		251	0.8		489	0.8		42.7	0.8	
Mercury	0.002	0.071	0.01		0.08	0.01		0.064	0.01		0.02	0.01	
Nickel	0.6	5.5	2		2.1	2		5.7	2		2.3	2	
Selenium	0.8	4	4	JB	15	4	B	1	4	JB	<0.8	4	U
Silver	0.2	79.8	1		124	1		<0.2	1	U	<0.2	1	U
Zinc	0.6	467	20	B	249	2	B	172	2	B	342	2	B

MDL - Method Detection Limit
RL - Reporting Limit
Qual - Qualifier
B - Contamination in Blank
J - Estimated Values between MDL and RL or data qualification
J- - Estimated values with low bias
U - Nondetect
mg/kg - milligram per kilogram

Table 4
Summary of Analytical Results for Sediment Samples
Ironton Park/Calhoon Property
August 2002

SAMPLE LOCATION		SD-29			SD-30			SD-35		
FIELD ID		CO-IPCP-SD29-01			CO-IPCP-SD30-01			CO-IPCP-SD35-01		
	MDL	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Total Metals (mg/kg)										
Antimony	1	<1	4	J-	<1	4	UJ-	<1	4	UJ-
Arsenic	0.6	3.4	3		3	3	JB	2	3	J
Cadmium	0.1	<0.1	0.5	J-	<0.1	0.5	U	0.1	0.5	J
Copper	0.4	7	2		9.6	2		6.8	2	
Lead	0.4	15	2	B	5.8	2	B	6.8	2	B
Manganese	0.2	151	0.8		42.2	0.8		370	0.8	
Mercury	0.002	0.036	0.01		0.06	0.01		0.036	0.01	
Nickel	0.6	65	2		8.4	2		2.7	2	
Selenium	0.8	<0.8	4	U	4.3	4	JB	13	4	B
Silver	0.2	<0.2	1	U	<0.2	1	U	<0.2	1	U
Zinc	0.6	131	2	B	57	2	B	50.2	2	B

MDL - Method Detection Limit
RL - Reporting Limit
Qual - Qualifier
B - Contamination in Blank
J - Estimated Values between MDL and RL or data qualification
J- - Estimated values with low bias
U - Nondetect
mg/kg - milligram per kilogram