SITE SPECIFIC ADDENDUM
TO RAMS GENERAL WORK PLAN AND
SITE SAFETY AND HEALTH PLAN
North Fork of Clear Creek Mine Waste Sampling
Gilpin County, Colorado
29 August 2002

1.0 INTRODUCTION

1.1 RAMS Program
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.

1.2 Partnering Strategy
USACE will coordinate 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. In most instances, the stakeholders will provide assistance to the Corps by obtaining any necessary right of entry (ROE) or other access agreements to the identified locations. If the stakeholders have any previous reports and/or data regarding the project site, the stakeholders would be requested to provide a copy of each report to the Corps and burden the cost of reproducing and shipping the copy or copies. Individuals from the USACE Omaha and Albuquerque Districts will perform the field work. Additional stakeholders providing input or exhibiting interest in this project include, but are not limited to, Colorado Division of Minerals and Geology and the Bureau of Land Management.

1.3 Work Plan and the Site-Specific Addendum
This document is prepared as the Site-Specific Addendum (SSA) to the Restoration of Abandoned Mine Sites Work Plan (USACE, 2002). The RAMS Work Plan was written to encompass all investigative activities to be accomplished by various districts of the USACE under the RAMS program. The purpose of this SSA is to present methods and procedures for conducting a site characterization of the North Fork of Clear Creek drainages involving limited surface soil and sediment sampling.

This SSA describes the media, locations, analyses, frequencies, and techniques associated with surface soil and sediment sampling outlined above and will be used in conjunction with the RAMS Work Plan. The RAMS Work Plan contains a more complete discussion of the RAMS program, along with a thorough discussion of the following: sampling requirements; field quality control; chemical data quality objectives; project organization and quality control responsibility; laboratory analytical and preparation procedures; sample collection, handling and documentation procedures; preventative maintenance procedures; calibration procedures and frequency; corrective action; and data reduction. This document references the RAMS Work Plan for the current field activities and contains site-specific information not included in the RAMS Work Plan.

2.0 PROJECT INFORMATION

2.1 Site Description

The North Fork of Clear Creek encompasses approximately 90% of Gilpin County in north-central Colorado near Central City, Colorado. Gilpin County is one of the most intensely mined counties in Colorado, particularly from Central City south to the county line. Three major tributaries to the North Fork of Clear Creek drain this heavily mined area, which are Chase Gulch, Nevada/Gregory Gulch, and Russell Gulch. Within these three drainages, there are an estimated 2,000 mine waste piles.

The North Fork of Clear Creek is within the Clear Creek Superfund study area. Superfund characterization activities within this basin have focused on mine drainages. Very few of the mine waste rock and mill tailing piles have been characterized in Gilpin County. The numerous waste rock and mill tailing piles contain acid forming materials (e.g. pyrite, chalcopyrite, etc.) and contain high levels of leachable zinc, copper, manganese, lead, and iron.

2.2 Project Goals

The areas of potential contamination seem to be quite large, and sampling efforts may need to be continued for years; however, the project goals have been established based on a watershed approach. The goal of this initial phase is to identify potential contaminant sources throughout a watershed. A site visit was conducted on 23 July 2002 to perform a cursory survey of project area to identify and prioritize waste piles. Due to the vast number of waste piles and limited funds, it is anticipated that approximately 40 of the 43 identified highest priority waste piles will be sampled and up to four sediment sample locations for total metals of the soil and leaching potential of metals from the soil as well as soil parameters such as conductivity, pH, and acidity of the soil. The primary target gulches for this initial surface and sediment sampling effort are Chase Gulch, Packard Gulch, and lower Gregory Gulch. See Table 1 for list of potential sampling locations.

3.0 FIELD INVESTIGATION

3.1 Visual Reconnaissance

A visual reconnaissance will be performed on each of the sampled waste piles. The latitude/longitude, approximate distance from a defined drainage channel, degree of erosion, volumetric measurements, presence and approximate size of vegetation kill zone, presence of vegetation on the waste piles, texture of waste pile, degree of cementation of the waste pile, and equipment access description will be documented. If time permits, un-sampled waste piles from Chase Gulch will measured. See Attachment 1 for an example of the reconnaissance data sheet.

3.2 Surface Soil and Sediment Sampling

Sampling locations will be determined in the field and are contingent on a Right-of-Entry (ROE) access agreement. The following Standard Operating Procedures (SOPs), located in Appendix A of the RAMS Work Plan, will be adhered to during the course of this field investigation: A1 (Surface Soil/Rock Sampling Equipment and Procedures); A4 Soil/Rock Homogenization Equipment and Procedures, A7 (Investigative Derived Waste Procedures); A12 (Equipment Decontamination Procedures); A13 (Sample Handling, Documentation, and Tracking Procedures); and A14 (Field

Documentation). Since the gulches are expected to be dry, the sediment sampling will follow surface soil procedures- not the procedures outlined in A11 (Surface Water and Sediment Sampling Equipment and Procedures). The following paragraphs provide site-specific information not found in the RAMS Work Plan/SOPs or changes to these documents.

3.3 Surface Soil Sampling Equipment and Procedures

3.3.1 Sample Locations

Forty-three (43) potential surface soil sampling locations have been identified (See Figure 1 for surface sample locations.) as candidates for sampling; however, up to forty of the highest priority-ranked locations will be sampled due to access, budget, or time constraints for this phase. For each waste pile sampled, the observed center of the pile will be recorded as the sample location and for later reference. If the estimated center of the waste pile is located on an unstable slope or if the waste pile's extent is very large, the down-gradient center of the toe of the waste pile shall be recorded. The sampling location coordinates obtained from a hand-held Global Positioning Satellite (GPS) device will be recorded in the field logbook in longitude and latitude. The device has an approximate accuracy of plus-or-minus 20 feet.

3.3.2 Soil Sampling Procedure

Surface sampling will be accordance with SOPs A1 and A4 except that 10-30 sub-sampling locations (depending on the waste pile size) will be composited for one sample from each waste pile. If the waste pile is observed to be composed of layers of different materials, then a representative number of sub-samples will be collected from the various materials to be composited into the sample from the pile. If the material is naturally re-cemented, a rock hammer shall be used to break-up the material for sampling.

3.4 Sediment Sampling Equipment and Procedures

3.4.1 Sample Locations

It is anticipated that up to four sediment samples from Chase Gulch (one up-gradient of the Gold Cup/Keystone waste piles, one down-gradient of the Tucker/Hayseed waste piles, one up-gradient of Centennial/Centre Tunnel waste piles, and one down-gradient of the Bonanza Tunnel/Aetna waste piles) for a total of four sediment sample locations. The observed center of the gulch where water could flow will be recorded as the sample location and for later reference. The sampling location coordinates obtained from a hand-held Global Positioning Satellite (GPS) device will be recorded in the field logbook in longitude and latitude. The device has an approximate accuracy of plus-or-minus 20 feet.

3.4.2 Soil Sampling Procedure

Due to dry drainages, the sediment sampling will be similar to surface soil procedures (i.e. SOPs A1 and A4), except that five sub-sampling locations (one in the center and four samples 3-5 feet radially from the center- e.g. two side-gradient, one down-gradient, and up-gradient) will be composited for one sample.

3.5 Sample Identification Scheme

The sample ID scheme presented in SOP A13 will be modified to the following designation.

UU-VVV/VVV02-XXXX-ZZ

where:

UU = Project designation will be replaced with **CO** (for Colorado RAMS)
VVV/VVV = Designation of sampling area location will be replaced with

- **NCC/LGG** for Clear Creek- Lower Gregory Gulch
- **NCC/CHG** for Clear Creek-Chase Gulch
- **NCC/PAG** for Clear Creek-Packard Gulch

02 = Year of sampling
XXXX = **SS** (surface soil) 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
03 = Trip Blank (if used)
04 = Confirmation Sample (if used)
05 = Water Supply Blank (if used)

An example of a surface soil sample #3 collected from Chase Gulch of the North Fork of Clear Creek site is:

CO-NCC/CHG02-SS03-01

The QC duplicate sample would have the sample designation of:

CO-NCC/NGG02-SS03-02

4.0 CHEMISTRY REQUIREMENTS

Laboratory sample analysis and handling requirements are given in this section of the SSA Work Plan. Reference to the Final Restoration of Abandoned Mine Sites General Work Plan, July 2002 will be given.

4.1 Data Quality Objectives

The data quality objectives are based on that given in the General Work Plan, 2002. The analytical results will be used to gain information about the extent of metals contamination and leaching of various metals from the associated mine wastes. 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 Samples Obtained

Up to 40 primary composite surface soil samples and five sediment samples will be obtained from this area for chemical analysis. A portion of the composite soil sample will be analyzed for metals, and from another portion a water leachate will be analyzed for pH, acid concentration, conductivity, and metals. Sample requirements are given in the following table:

SAMPLE REQUIREMENTS

Parameter*	Primary Field	Quality Control Duplicate	MS/MSD**	Total
Surface Soil Sample	40	3		43
Sediment Sample	4	1		5

* Total metals of the soil and the water leachate can all be obtained from the one sample from each area.
** Required MS/MSD can be obtained from samples above and no additional samples are required.
NOTE: Each bottle and the COC must include the **LIMS # 6695.**

4.3 Preservation, Holding Time, and Shipment

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES FOR COMPOSITE SOIL SAMPLES

Parameter	Container	Preservation	Maximum Holding Times	
			Digestion	Analysis
Composite Soil Sample*				
Metals[1]	1 x 8 oz Glass	(Ice Temperature - **optional**[2])	6 months (Mercury - 28 days)	6 months (Mercury - 28 days)
Water Leachate**				
Leachate metals[1]			6 months (Mercury - 28 days)	6 months (Mercury - 28 days)
Leachate pH				ASAP***
Leachate Acid concentration				ASAP***
Conductivity				ASAP***

* One 8 oz jar obtained in the field from each area is sufficient for all analyses.
** The water leachate process is performed in the laboratory.
*** ASAP in this instance means as soon as possible after leachate is obtained.
[1] Al, As, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, K, Ag, Zn
[2] Cooling samples for metal analysis to 4°C is recommended- but not required.

There are no set holding times for these composite soil samples, however the samples must be kept in a known place so sample tracking and security can be assured. (Sample coolers should have security seals when not in the physical presence and control or the sampler.) The samples may be batched (held on site) before shipping, but should be sent to the laboratory at least once a week. The sample/samples will be analyzed and the sensitivity and quality control samples acceptance criteria will meet that set by the Environmental Chemistry Branch Laboratory criteria and/or as per the Draft General Work Plan, Restoration of Abandoned Mine Sites, June 2002.

4.4 Labeling and Shipment Procedures.

The filled sample bottles and jars will be labeled as specified in the General Work Plan, 2002. The Laboratory Identification Management System (LIMS) number is: **LIMS # 6695**

The labeled bottles will be placed in the cooler with the appropriate chain-of-custody. The cooler will be shipped by overnight mail to the laboratory:

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

4.5 Sample Analysis

The following analytical methods will be used for the field samples and appropriate required quality control samples for this site:

Parameter	Method	Matrix
Metals	EPA Method 3050B/6010C	soil
Leachate Procedure	*	
Metals	EPA Method 3005/6010C	water
pH	USDA 8C	water
Acidity	EPA 305.1	water
Conductivity	9050A	water

* The deionized water leachate is obtained by the following method: 150 ml (dry volume) of sample is mixed with 300 ml of deionized water. This is then vigorously mixed for 15 seconds, plastic wrap is placed over the top, then left to settle for 90 minutes. This time is the time it generally takes for the clay fraction to settle to the bottom of the beaker. The liquid is filtered through a very fine grade filter (approximately 2 micron). A portion of the filtrate is used to measure the total acidity, pH, and specific conductance. The remainder is used for total metals analysis.

5.0 SAFETY REQUIREMENTS

Information on health and safety issues associated with this field effort may be found in the RAMS Site Safety and Health Plan (SSHP), July 2002. For this field effort, a Modified Level D will be used for PPE. PPE will consist of steel-toed, steel-shank safety boots or appropriate hiking boots if additional traction is required for the terrain, safety glasses, and latex or nitrile gloves during sample collection.

6.0 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.

- **Field Quality Control**

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

sectional area calculations, and discharge calculations will be reviewed for completeness and accuracy by the project technical team.

7.0 REPORT REQUIREMENTS

The report for this field effort will consist of:

- A brief summary of field activities;
- A map of final sampling locations;
- A table of sampling location coordinates in latitude/longitude, approximate distance from a defined drainage channel, degree of erosion, volumetric measurements, presence and approximate size of vegetation kill zone, presence of vegetation on the waste piles, texture of waste pile, and equipment access description will be documented;
- A brief summary of data quality based on data evaluation; and
- Recommendations for future investigation, if any, in the drainages.

Table 1: List of Potential Sampling Locations

ID No*	Waste Pile Name	Drainage	Map Location**	Owner	Notes***
1.	Keystone	Chase Gulch	CII 5	??	Near the breccia pipe, high potential for contamination
2.	Two Sisters	Chase Gulch	CII 8	Jerome Martinets /Dean Messer	
3.	Ellery	Chase Gulch	DII 1	Bonanza Land	
4.	Belden Tunnel	Chase Gulch	DII 2	Bonanza Land	Located at the end of the road
5.	Allie	Chase Gulch	DII -	Bonanza Land	Wrong on map- located SW of map #DII-3.
6.	Sans Souci	Chase Gulch	DII 3	Bonanza Land	Labeled "Allie" (#DII-3) on map
7.	Castle Rock	Chase Gulch	DII 4	Bonanza Land	Not a high priority
8.	Sarah E	Chase Gulch	DII 5	??	Poor access- hard to get in
9.	Advance Tunnel	Chase Gulch	DII 8	Bonanza Land?	
10.	Hayseed Tunnel	Chase Gulch	DII 12	George Nelson	Lead deposits, lower threat for contamination
11.	Tucker	Chase Gulch	DII 13	George Nelson	Lead deposits
12.	Gold Cup	Chase Gulch	DII 16	??	Near the breccia pipe
13.	Centre Tunnel	Chase Gulch	EII 2	Bonanza Land	
14.	Centennial	Chase Gulch	EII 3	Bonanza Land	Two piles- an upper and a lower one near drainage
15.	Robert Emmet	Chase Gulch	EII 5	Bonanza Land	
16.	Virginia Discovery	Chase Gulch	EII 6	Bonanza Land	Labeled "#6- Sans Souci" on map.
17.	Bates	Gregory Gulch	EIII 14	Bonanza Land??	Labeled "#14- Baxter Bates" on map
18.	Bates	Chase Gulch	EIII 15-16	Bonanza Land	Labeled "#15- Nagel & Whiting" and "#16- Sayre-Bates" on map
19.	Gettysburg	Chase Gulch	EIII 18	Lee J. Droege	
20.	Bonanza Tunnel	Chase Gulch	EIII 24	Bonanza Land	
21.	Aetna	Chase Gulch	EIII 25	Bonanza Land	
22.	Boston	Gregory Gulch	DIII 2	Bonanza Land	#DIII-2 is labeled "Rialto Extension" on map
23.	Coeur d'Alene	Gregory Gulch	DIII 5	Gilpin County Historical Society	
24.	Buckley	Gregory Gulch	DIII 10	??	
25.	Humboldt	Gregory Gulch	DIII 13	Bonanza Land??	Bill Russell previous owner
26.	Winnebago	Gregory Gulch	DIII 15	Bonanza Land	
27.	Hunter-Gold Extension	Gregory Gulch	DIV 17-18	Bonanza Land	
28.	Gregory	Gregory Gulch	EIII -	Norman Blake	Not labeled on map

ID No*	Waste Pile Name	Drainage	Map Location**	Owner	Notes***
29.	Parole	Gregory Gulch	EIII 1	??	Not a priority site
30.	O'Neil	Gregory Gulch	EIII 2-3	Norman Blake	#EIII-3 is labeled "Ontario & Colorado" on map
31.	Next President	Gregory Gulch	EIII 4	Bonanza Land	
32.	Hartford	Gregory Gulch	EIII 5	Bonanza Land	
33.	Maine-Hamlet	Gregory Gulch	EIII 7	Bonanza Land	
34.	Vasa-Levant	Gregory Gulch	EIII 8	Bonanza Land	Labeled "Vasa Shaft" on map
35.	Freedom	Gregory Gulch	EIII 21	??	
36.	O.K. (Epizootic)	Gregory Gulch	EIV 1	Bonanza Land	
37.	German	Gregory Gulch	EIV 2	George Otten	
38.	Waterbury	Packard Gulch	EIV 3	??	
39.	Fisk	Gregory Gulch	EIV 5	Norman Blake	
40.	Cook	Gregory Gulch	EIV 6	Norman Blake	
41.	Great Mammoth	Packard Gulch	EIV 7	Norman Blake?	
42.	Empress	Packard Gulch	EIV ??	??	Not labeled on map
43.	Bobtail	Gregory Gulch	FIV 1-3	Norman Blake	

* ID Number will be used to identify samp ling location in the sample numbering system. See Figure 1 for locations

** The Map referenced is to the USGS "Map of the Central City District, Colorado, Showing Locations of Mines and Distribution of Veins and Igneous Rocks of Tertiary Age", 1955.

*** All map coordinates are in reference to the USGS map referenced in the preceding note.

ATTACHMENT 1: NORTH FORK OF CLEAR CREEK WASTE ROCK SAMPLING

Sampling Site_____ Drainage_____

Latitude N39° _____' _____" Average of _____ Readings

Longitude W105° _____' _____"

Mineralogy (1= present, 2= abundant) Pyrite _____

Sphalerite _____ Chalcopyrite _____

Galena _____ Other, (specify) _____

Country Rock _____ Secondary Sulfides _____

Approximate Distance from Drainage Channel _____

Erosion (0= none, 1= sheet wash, 2= rills less than 6" deep, 3= rills over 6-12" deep, 4= gullies over 12" deep) _____

Average top width _____ Average top length _____

Average bottom width _____ Average bottom length _____

Average height _____ Estimated Volume _____

Vegetation Kill Zone Present (Y or N) _____ Approximate Size (l x w) _____

Vegetation on Pile (Y or N) _____ Texture (fine, coarse) _____

Equipment Access (describe) _____

Reclamation Measures (check if feasible) Run-on Diversion _____

Removal _____ In-Situ Cementation _____

Cap-in-place _____ Amend and Revegetate _____

Comments_____

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