



Southwest Sites Consulting
Engineering and Environmental Services

WORK PLAN

RED CLOUD MINE

Prepared for

Eric Zielske, PE, Environmental Engineer, Bureau of Land Management

By

Dani Halloran
Kelsey Hammond
Haley Michael
Taylor Oster
Robert Reny

December 7, 2015

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
2.0 PROJECT MANAGMNET	1
2.1 PROJECT MANAGEMENT APPROACH	1
2.2 PROJECT PROCEDURES	1
2.3 QUALITY MANAGEMENT	1
2.4 SUB-CONTRACT MANAGEMENT	1
3.0 SITE BACKGROUND INFORMATION	1
3.1 SITE LOCATION.....	2
3.2 SITE DESCRIPTION	4
3.3 PREVIOUS OPERATIONS INVESTIGATION.....	4
4.0 INVESTIGATIVE APPROACH.....	5
4.1 SITE INVESTIGATION OBJECTIVE	5
4.2 SITE INVESTIGATION GENERAL APPROACH	5
5.0 FIELD INVESTIGATION METHODS AND PROCEDURES.....	6
6.0 INVESTIGATIVE-DERIVED WASTE MANAGMENT.....	6
7.0 SAMPLE COLLECTION AND ANALYSIS	6
7.1 SAMPLE CONTAINERS, PRESERVATION, AND STORAGE	6
7.2 SAMPLE DOCUMENTATION AND SHIPMENT	6
7.3 FIELD QUALITY ASSURANCE AND QUALITY CONTROL	6
8.0 DEVIATIONS FROM THE WORK PLAN	7
9.0 PA/SI REPORTING	7
10.0 REFERENCES.....	8
APPENDIX A: SAMPLING AND ANALYSIS PLAN	9
1.0 INTRODUCTION.....	10
2.0 SAMPLING RATIONALE.....	10
2.1 SELECTION OF SAMPLING LOCATIONS	10
2.2 SELECTION OF SAMPLES FOR LABORATORY ANALYSIS	11
2.3 SELECTION OF TARGET METALS	11
3.0 REQUEST FOR ANALYSIS.....	12
3.1 ANALYSIS NARRATIVE	12
3.1.1 DRYING AND SIEVING	12
3.1.2 X-RAY FLORESCENCE (XRF).....	12
3.1.3 ATOMIC ABSORPTION (AA) PREPARATION	12
3.1.4 ATOMIC ABSORPTION	13

3.2 ANALYTICAL LABORATORY	13
4.0 FIELD METHODS AND PROCEDURES.....	13
4.1 FIELD EQUIPMENT	13
4.1.1 LIST OF FIELD EQUIPMENT	13
4.1.2 CALIBRATION OF FIELD EQUIPMENT	14
4.2 SOIL SAMPLE COLLECTION AND PREPARATION	14
4.3 SOIL SAMPLE LOCATION IDENTIFICATION AND MEASUREMENT	14
4.4 FLORA AND FAUNA DATA COLLECTION	14
4.5 DECONTAMINATION.....	15
5.0 DISPOSAL OF RESIDUAL MATERIAL	15
6.0 SAMPLE CONTAINERS, PRESERVATION, AND STORAGE	16
6.1 PACKAGING AND SHIPPING	16
7.0 SAMPLE DOCUMENTATION AND SHIPMENT	16
7.1 FIELD NOTES	16
7.1.1 FIELD LOGBOOKS.....	16
7.1.2 PHOTOGRAPHS AND LOCATOR MARKING.....	17
7.2 SAMPLE LABELS	18
7.3 SAMPLE CHAIN-OF-CUSTODY PROCEDURES	18
8.0 QUALITY CONTROL.....	19
8.1 FIELD QUALITY CONTROL	19
8.2 LABORATORY ANALYSIS QUALITY CONTROL	19
9.0 REFERENCES.....	20
APPENDIX B: HEALTH AND SAFETY PLAN	21
1.0 INTRODUCTION.....	22
2.0 DIRECTIONS TO HOSPITAL FROM RED CLOUD MINE	22
3.0 SITE SUPERVISOR.....	23
4.0 HAZARD TRAINING.....	24
5.0 TRAINING PROGRAM	27
6.0 CONTAMINATION CONTROL.....	27
7.0 EMERGENCY RESPONSE PLAN	27
9.0 REFERENCES.....	28

LIST OF FIGURES

3.1 LOCATION OF RED CLOUD MINE IN ARIZONA..... 2
3.2 LOCATION OF RED CLOUD MINE, QUARTZITE, AND YUMA..... 3
3.3 LOCATION OF RED CLOUD MINE, BLACK ROCK WASH, AND THE COLORADO RIVER 3

APPENDIX A: SAMPLING AND ANALYSIS PLAN

A2.1 MAP OF GRID SAMPLING LOCATIONS 11
A7.1 SAMPLE LABEL 18
A7.2 CHAIN OF CUSDODY RECORD 19

APPENDIX B:

B2.1 MAP OF DIRECTIONS FROM RED CLOUD MINE TO HOSPITAL 23

LIST OF TABLES

3.1 CONTAMINATE CONCENTRATIONS FROM 2003 INVESTIGATION..... 4
3.2 ARIZONA SOIL REMEDIATINO STANDARDS..... 5

APPENDIX A: SAMPLING AND ANALYSIS PLAN

A4.1 FIELD AND SAMPLING EQUIPMENT 13

APPENDIX B:

B1.1 SITE WORKERS NAMES AND INFORMATION 22
B1.2 NEAREST HOSPITAL TO JOB SITE..... 22
B4.1 JOB HAZARD ANALYSIS WORKSHEET..... 24
B4.2 AN OVERVIEW OF THE ISSUES CONSIDERED 25

1.0 INTRODUCTION

Southwest Sites Consulting has prepared this Work Plan for site characterization activities to take place at the Red Cloud Mine. This Work Plan has been prepared in accordance with the criteria established under the National Contingency Plan (NCP). The purpose of this document is to provide the U.S. Bureau of Land Management, Arizona State Office information on the procedures the team will use to successfully meet the BLM's needs.

2.0 PROJECT MANAGMENT

2.1 Project Management Approach

Dani Halloran will serve as the client contact for all communications. Dr. Bridget Bero will serve as the NAU supervisor. Eric Zielske will be the BLM supervisor for site work.

2.2 Project Procedures

Project procedures will be performed according to the Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP), found in Appendix A and B respectively.

2.3 Quality Management

Quality management for all site work will be performed according to the SAP in Appendix A Sections 4.0 and 8.0.

2.4 Sub-contract Management

Northern Arizona University's chemistry laboratory services will be subcontracted for wet chemistry analyses.

3.0 SITE BACKGROUND INFORMATION

The Red Cloud mine originally opened in 1878, and was mainly used to mine silver ore until it's closing in the 1890s. After the 1890s the mine's ownership became complex, seeing many different owners until the start of World War I when a high demand for lead arose. This need ultimately prompted the United States government to subsidize mine activities during the war due to the mines high lead content (BKERSHAW, 2003). Since the 1950's, the site has been closed and reopened as a specimen mine for wulfenite crystals, a lead molybdate. During this time, the tailings have also been reworked for lead, zinc and silver. Wayne Thompson owned the mine in 1995 but today a man from Kansas owns the mine and is keeping it open for mineral collectors.

For the purpose of this project it is important to note that the Red Cloud Mine is on private mineral patented land. However, mine tailings have migrated onto BLM-administered public land. The migrated ore tailings were consolidated in a tailings pond located south of the mine site [2]. The main contaminants of concern (COC) located in the tailings pond are lead, zinc, molybdenum, and iron.

3.1 Site Location

The Red Cloud Mine is located in La Paz County, which is North of Yuma County in Southern Arizona, as seen in Figure 3.1 below. Currently, the mine consists of 20.66 acres of land encompassing the mine itself, and several hundred tons of mine tailings. These tailings, and their respective contaminants and hazardous materials, have been washed down Black Rock Wash, which is on land managed by the Bureau of Land Management (BLM). The mine itself however is located on private land and is currently not being mined by the current owner, but instead kept open for mineral collectors.

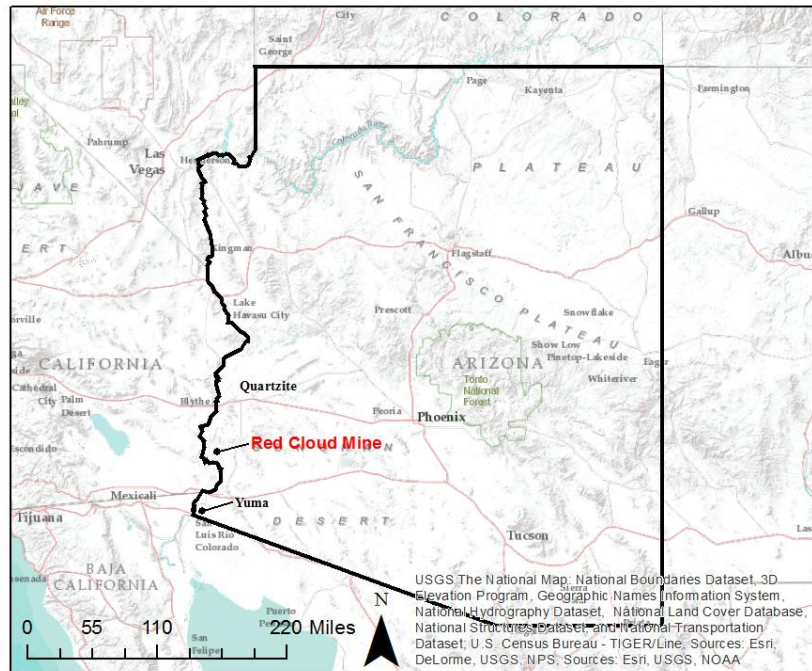


Figure 3.1: Location of Red Cloud Mine in La Paz County, AZ. (USGS)

The site is approximately 50 miles south of Quartzsite and 23 miles north of Yuma. The site can be accessed by Red Cloud Road, a rough but maintained dirt road, off of Highway 95 in Yuma. The Colorado River is 5 miles south of the site and the Yuma Proving Ground military reserve is 2 miles west. Images showing the location of the mine in relation to nearby cities can be seen in Figure 3.2 and Figure 3.3 [1]

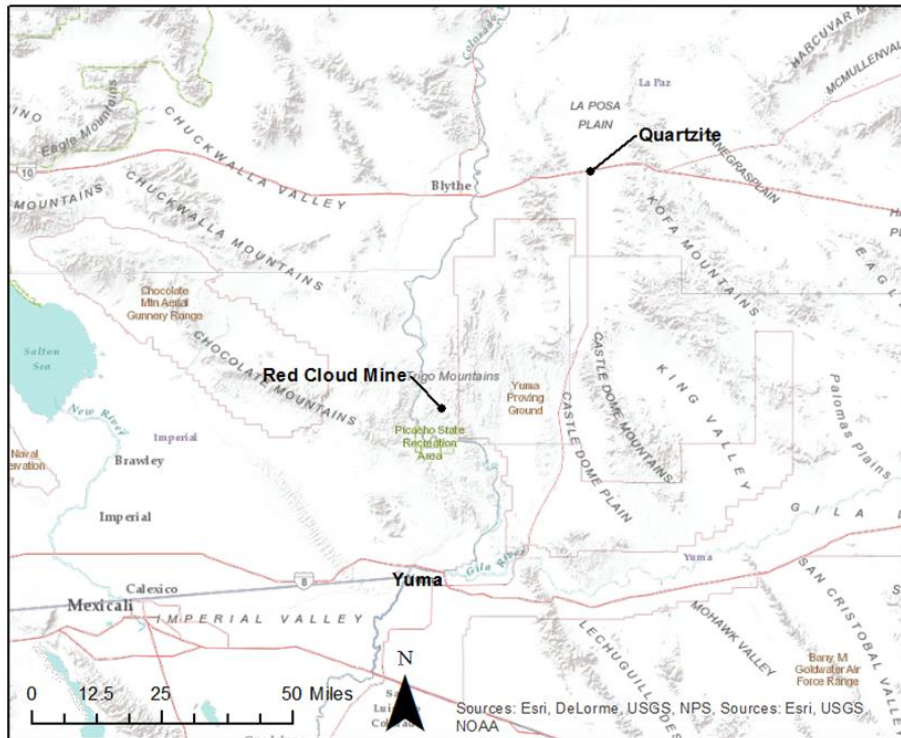


Figure 3.2: Red Cloud Mine is association to Quartzite and Yuma Arizona (USGS)

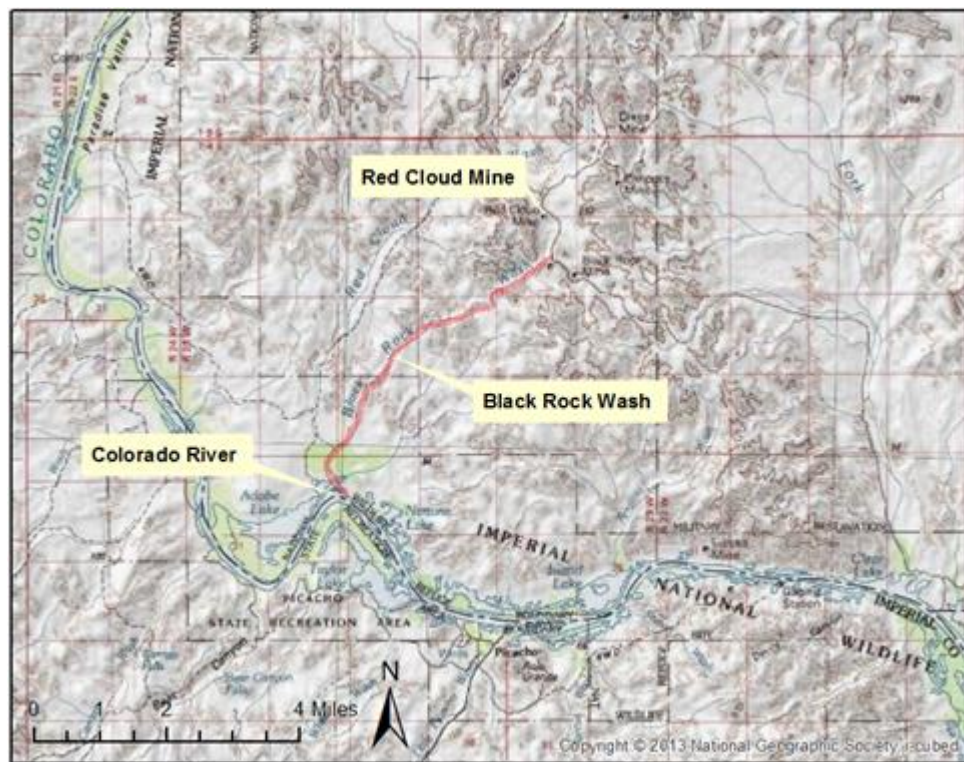


Figure 3.3: Map of Black Rock Wash feeding into the Colorado River and Red Cloud Mine (National Geographic)

3.2 Site Description

The public uses this BLM land, where Black Rock Wash is located, and tailings continue to disperse and migrate in the area. These tailings and possible contaminants pose a threat to the safety and health of humans, the environment, and other flora and fauna. In order to characterize the extent of the risk associated with the contaminants at Red Cloud Mine, it is necessary to perform a preliminary assessment (PA) and site inspection (SI). Based on the sampling results, the team will evaluate potential contaminant exposure to recreational users (hikers, campers, off-highway vehicles). If the risk is deemed unacceptable, the team will evaluate options to reduce the risk, such as consolidating and capping the tailings in an on-site repository.

3.3 Previous Operations and Investigation

Several investigations by the BLM have been conducted at Red Cloud Mine and have provided background information on the tailings, with respect to location, size, characteristics, and the compaction of the mine tailings. Additionally, investigative information was provided by the BLM for the minerals and estimates of heavy metal concentrations on site. The only metals tested for were lead and zinc. These concentrations can be seen in Table 3.1.

Table 3.1: Concentration a level of contaminants from samples taken in 2003.

Contaminant	Concentration in tailings pile (mg/kg)	Concentration in Black Rock Wash (mg/kg)	Background Concentrations (mg/kg)
Lead	8,090 - 12,397	4,428	99
Zinc	37,197 - 62,259	24,794	215

Previous work at the site in 2003 indicates that the tailings piles contain high concentrations of heavy metals including lead, iron, and zinc. The tailings themselves are highly compacted and are a fine to medium grained bright red material. The tailings pond has been documented to be a rough trapezoidal shape spanning a 1.3-acre area. The tailings piles get deeper as they get closer to the wash, where they appeared, at the time of the investigation, to be 10-12 feet deep. The Black Rock Wash follows the tailing pile on the north-northeastern side of the wash for 376 feet. The previous investigations also showed there was significant water migration from the tailings pile into the wash [1].

Table 3.2: Arizona Soil Remediation Standard

Contaminant	Residential Risk (Non-carcinogen) (mg/kg)	Non-residential Risk Non- carcinogen (mg/kg)
Lead	400	800
Zinc	23,000	310,000
Silver	390	5100
Molybdenum	390	5100

A reconnaissance geochemical survey was completed at the Red Cloud Mine in order to determine the mineral potential of the area. Soil was collected in washes around the mine, and the samples were tested for heavy metal concentrations, which were determined to be the following: silver (up to 70 mg/kg), lead (up to 5,000 mg/kg), zinc (up to 7,000 mg/kg), and molybdenum (up to 200 mg/kg). Table 3.2 details the concentration standards which must be met for each contaminant set forth by the Arizona Department of Environmental Quality (ADEQ) for a BLM site to be deemed safe for human use. The BLM has been delegated under the Comprehensive Environmental Response, Compensation, and Liability act (CERCLA) to respond to hazardous substances on public land. Therefore ADEQ is not responsible for the tailings on public land. The BLM uses the non-residential risk to determine screening levels for the investigation of contaminants on public land. The BLM would evaluate safe concentration levels of the contaminant, based on site exposure assumptions parallel with the public land use.

As seen from comparing the sampling results with Table 3.2, the lead concentrations are exceeded.

4.0 INVESTIGATIVE APPROACH

In order to properly perform an inspection of the Red Cloud Mine, an investigation to determine the extent and the toxicity of the mine tailings will be conducted in Black Rock Wash. A map showing the planned sampling grid is found in the SAP, Figure 2.1 (Appendix A).

4.1 Site Investigation Objectives

The objective of sampling will be to determine possible migration of the tailings into Black Rock Wash. The sampling will take place on January 30th to February 1st, 2016. The samples will then be taken from the field to Northern Arizona University where analyses will be completed to determine the toxicity of the contaminants present in the soil samples.

4.2 Site Investigation General Approach

A grid approach will be used to ensure spatial variation of the data. Samples from obvious hot spots will also be obtained. All samples will be surface samples. No cores will be obtained. A more detailed sampling explanation is given in the SAP located in Appendix A.

5.0 FIELD INVESTIGATION METHODS AND PROCEDURES

Field investigation methods and procedures will be performed in accordance with the SAP in Appendix A, Section 4.0.

6.0 INVESTIGATIVE-DERIVED WASTE MANAGEMENT

Investigative-derived wastes (IDW) are wastes that are produced during a site investigation and cannot be easily disposed of without creating a health hazard to the environment or people. All IDW produced will be disposed of in accordance to the SAP, Appendix A, Section 5.0.

7.0 SAMPLE COLLECTION PROCEDURES AND ANALYSIS

Procedures for sample collection and analysis will be performed according to the procedures detailed in the SAP in Appendix A. Analyses will consist of x-ray fluorescence (XRF) sample testing, followed by Atomic Absorption (AA) testing of subsets. These tests will be performed in order to obtain correlation curves to evaluate XRF accuracy.

7.1 Sample Containers and Storage

Samples will be put in labeled containers for storage from the Red Cloud Mine site to Northern Arizona University for analysis. The procedures for sample containers and storage will be followed in accordance with Section 6.0 in the SAP in Appendix A.

7.2 Sample Documentation and Shipment

Samples will be documented by field notes, logbooks, and photographs. Additionally, all samples will be explicitly labeled and chain of custody will be documented. All sample documentation and shipment procedures will be followed in accordance with Section 7.0 in the SAP in Appendix A.

7.3 Field Quality Assurance and Quality Control

Quality Assurance and Quality Control will be maintained in the field by subdividing the work into sampling, recording data, identifying sample locations, and decontaminating. Background sampling will take place and compared to known background concentrations to ensure the sampling technique did not introduce COC's. Additional quality assurance and control procedures will be followed in accordance with Section 8.0 of the SAP in Appendix A.

8.0 DEVIATIONS FROM THE WORK PLAN

It is likely that deviations from the work plan will occur in the field as unexpected situations or constraints may occur. Any and all deviations, discussed with the client, will be documented in the field noted in accordance with the SAP, Appendix A. Section 7.1.1

9.0 PA/SI REPORTING

A detailed report of the Preliminary Assessment and Site Inspection will be provided as outlined in Section 7.0 of the SAP (see Appendix A). The PA/SI report will also include the results of the lab analysis which will provide the concentration levels of lead in each sample. With this information, a risk assessment will be performed.

10.0 REFERENCES

- [1] BKERSHAW, "Bureau of Land Management Protection and Response Information System Live Site Summary Report," Bureau of Land Management, Yuma, Arizona, 2003
- [2] "Arizona's Classic Red Cloud Mine," Treasure Mountain Mining. November 30, 2011.
From: <http://www.treasuremountainmining.com/index.php?route=pavblog/blog&id=20>
- [3] Environmental Protection Agency. (1994) *Investigation Derived-Waste Guidance*. Twinsburg, Ohio. [Online]. Retrieved from <http://www.epa.ohio.gov/portals/30/rules/RR-011.pdf>

APPENDIX A
SAMPLING AND ANALYSIS PLAN
RED CLOUD MINE

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) is for site sampling and characterization activities to be performed for the Red Cloud Mine tailings project. This SAP will identify the work needed to perform a site investigation; this includes identifying the extent of contamination, as well as collecting additional data and making observations that will determine whether removal action is necessary.

2.0 SAMPLING RATIONAL

Due to the unknown nature of the exact areas of contamination a combination of grid and hot spot sampling methods will be used. Only soil sampling will be performed for this project. Prior sampling work has been done in the Red Cloud Mine area but the samples fail to reference where they were taken. Utilizing a grid will allow effective characterization of the wash and immediate surrounding areas. Background samples will be taken from undisturbed areas where minimal contamination should be present in order to obtain data on background contaminant levels. Hot spot samples will also be included to assure data is collected where obvious tailings exist. Approximately 80 grid samples, 30 hot spot, and 10 background samples will be collected.

2.1 Selection of Sampling Locations

No samples can be taken at Red Cloud Mine due to the fact that it is located on private land. The BLM owns the land around Red Cloud Mine, including Black Rock Wash which runs adjacent to the tailings pond where the mine tailings were consolidated in the past. The wash is the primary zone of concern for this project as it is on public land and sampling by the BLM in 2003 showed high concentrations of lead and zinc in and around the wash [1]. In order to comprehensively characterize the contamination in the wash a sampling grid will be overlaid on the wash. Samples will be taken at each corner of the squares within and around the grid. The grid will be located as close to the tailing pond as possible and will cover the wash and the immediate soils around the wash. The background samples and hot spot samples will be selected visually. Figure 2.1 below shows the grid sampling locations on a map of Black Rock Wash. The first point will be found using the long./lat. coordinates of the top right corner sampling location to the west and south as needed to find the other sampling locations.

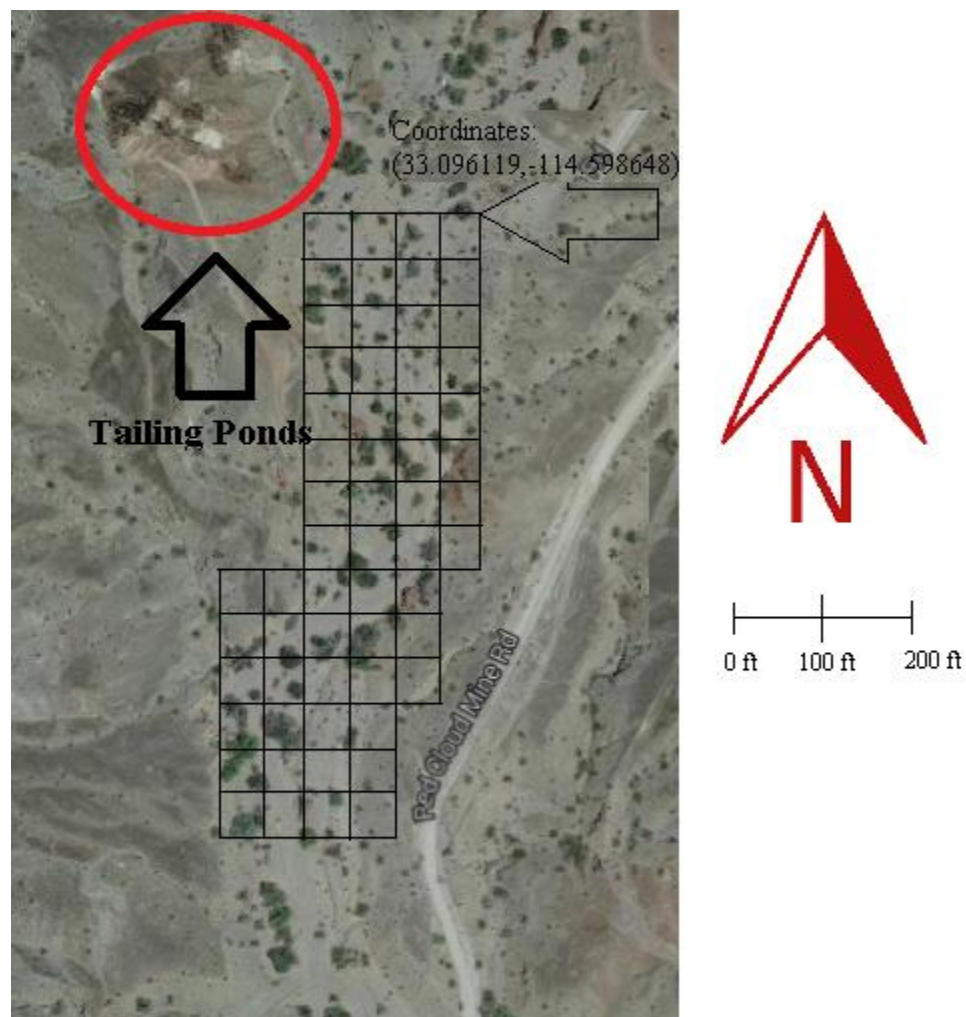


Figure 2.1 Map of Grid Sampling Locations

2.2 Selection of Samples for Laboratory Analysis

Thirty percent of the samples will be sent to the NAU Chemistry Lab for atomic absorption spectrometry analyses. These samples will be selected based on the range of contaminant levels observed via XRF analysis.

2.3 Selection of Target Metals

The target metals are lead, zinc, molybdenum and iron. High levels of lead and zinc were measured in and around the wash by the BLM in 2003 [1]. Molybdenum and iron are also expected to have high concentration levels as Red Cloud was mined for molybdenum compounds and iron in the past.

3.0 REQUEST FOR ANALYSIS

The following section will discuss the analytical support for the project. The analyses requested, analyses of concern, turnaround time, and available resources will all be outlined.

3.1 Analysis Narrative

Analysis will include X-ray fluorescence (XRF) and atomic absorption (AA). All necessary sample preparation will be done prior to testing. This includes drying and sieving of the samples, labeling, and acid digestion. XRF analysis will take place in the NAU Environmental Engineering Lab. Thirty percent of these will undergo acid digestion and sent to the NAU chemistry lab for AA analysis.

3.1.1 Drying and Sieving

Drying and Sieving for XRF analysis will be done in accordance to EPA method 6200. Soil samples will be removed from their gallon bags and placed on a large tray. The soil will be crushed by mortar and pestle and placed in ceramic pots for 2-4 hours of heating at 150 degrees C. These portions of soil will then be poured onto the #60 sieve. The sieve will be placed in the sieve shaker for 10 minutes [3]. All soil that passes to the bottom container will then be collected and placed in a new gallon bag until the whole soil sample has been processed. This process will assure better homogenization of the sample. Guidance in Section 6.0 of EPA Method 3050b will be followed for cleaning procedures to prevent cross-contamination. [4]

3.1.2 X-ray Fluorescence (XRF)

XRF sampling will be performed according to BLM protocol. The bag will be sub-divided into 9 quadrants by marker with each quadrant undergoing XRF testing. The high and low readings will be excluded and the remaining readings will be averaged to obtain an average for each specific sample. EPA Method 6200 Section 9.0 provides all quality control procedures required during XRF operation [3].

3.1.3 Atomic Absorption (AA) Preparation

Each soil sample sent to the NAU Chemistry Lab for AA analysis must first undergo acid digestion by EPA method 3050b. Only reagent grade chemicals shall be used which conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society [4]. One gram of dry soil will be collected from the chosen sample. Five mL of hydrochloric acid and 10 mL of deionized water are pre-added to the sample. The sample is then be heated to 95 C in reflux for five minutes. Reflux refers to heating the solution with an attached condenser to prevent reagents from escaping. The digestate will then be

filtered through Whatman No. 41 filter paper or equivalent and collected in a 100 mL volumetric flask. The flask will be filled with deionized water and sent to the NAU Chemistry Lab for testing [4].

3.1.4 Atomic Absorption

Atomic Absorption will be sub-contracted to the NAU chemistry lab.

3.2 Analytical Laboratory

The NAU Chemistry Lab is located in building 17–Science Lab Facility, on the NAU campus. A trained lab technician provides all analytic services for the AA analysis. The NAU chemistry lab QA/QC protocols for AA will be compared to EPA method 7000 section 9.0 (Quality Control) to ensure confidence in their laboratory results [5]. All measurements will be recorded by the team in a log.

4.0 FIELD METHODS AND PROCEDURES

4.1 Field Equipment

4.1.1 List of Field Equipment

Table 4.1 presents all of the equipment to be used in the field for documentation, sampling, transport, and decontamination.

Table 4.1: Field and Sampling Equipment

Equipment	Description	Quantity	Purpose
Digital Camera	document sampling	1	Documentation
Camera Extra Battery	document sampling	1	Documentation
Field Notebook	sampling notes	1	Documentation
Disposable Gloves	to take samples	4 boxes (100/box)	Sampling
Trowels	to take samples	8	Sampling
Gallon Ziplock Bags	to contain samples	150	Sampling
Shovels	to take samples	2	Sampling
Tape roller	locating samples	2	Sampling
Dust masks	to take samples	8	Sampling
GPS	ID location	1	Sampling
Flags	ID location	30	Sampling
Boxes	store samples	4	Transport
Heavy Duty Tape	seal samples	4 rolls	Transport
Bubble Wrap	protect samples	1 roll	Transport
Sharpies	permanent, black	4	Transport
Backpacks	50L or more	5	Transport
Distilled Water	for cleaning	30 gallons	Decontamination
Plastic Bags	for disposable equipment	20	Decontamination
Water containers	hold water	30 gallons	Decontamination
Cleaning Brushes	for cleaning	4	Decontamination
Paper Towels	for cleaning	3	Decontamination

Biodegradable soap	for cleaning	3	Decontamination
5-gallon Buckets	for cleaning	3	Decontamination

4.1.2 QA/QC of Field Equipment

Before on site sampling, the team will be familiar with all the operations and trouble-shooting procedures of the GPS equipment. The GPS will be calibrated and prepared and tested for functionality. All electronics including the digital camera and GPS will be charged prior to the site visit. Additional batteries will also be included for back up.

4.2 Soil Sample Collection and Preparation

Approximately 9” x 9” areas of surface soil will be collected as grab samples (independent, discrete samples) from the ground surface. Surface soil samples will be collected using a stainless steel hand trowel. Samples will be collected in gallon Ziploc™ bags and will be filled to approximately 75% full. See Section 6.0 for shipping procedures and Section 7.0 for labeling samples.

4.3 Soil Sample Location Identification and Measurement

At each sampling location, all samples will be labeled according to procedures (Section 7.2). Additionally, locations will be documented through field notes, GPS locations, and photography of each sample site (Section 7.1).

Soil sampling location will be determined before sampling based on a grid mapping, provided in the work plan. Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

Additional soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., visible tailings), and topographical features which may indicate the location of hazardous substance disposal or “hotspots.” Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

4.4 Flora and Fauna Data Collection

In sampling locations, data will be collected on any present plant or animal species. All details of visible flora or fauna will be recorded in the logbook with reference to its location and description of the plant or animal.

4.5 Decontamination

Decontamination procedures of sampling equipment must be conducted consistently to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur after each use of a piece of equipment. All sampling devices used, including trowels, will also be cleaned and decontaminated. The following, to be carried out in sequence, is a recommended procedure for the decontamination of sampling equipment

- Non-phosphate detergent and tap water wash, with brushes as needed
- Tap-water rinse
- Deionized/distilled water rinse

Equipment will be decontaminated in a predestinated area, and clean bulky equipment will be stored in 5- gallon buckets for transport to other sampling locations. Cleaned small equipment will be stored in plastic bags.

5.0 DISPOSAL OF RESIDUAL MATERIAL

In the process of collecting environmental samples, the sampling team will generate different types of potentially contaminated investigation-derived wastes (IDW) that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that should be followed for handling the IDW. The procedures have enough flexibility to allow the sampling team to use its professional judgment as to the proper method for the disposal of each IDW sample generated at the location.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill.
- Decontamination fluids that will be generated in the sampling event will consist of distilled water, residual contaminants, and water with biodegradable detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow

disposal at the site or sampling area. The water, and the water with biodegradable detergent, will be poured onto the ground or into a storm drain. All cleaning will take place over plastic sheeting.

6.0 SAMPLE CONTAINERS, PRESERVATION, AND SHIPMENT

The types and number of sampling containers can be seen in Table 4-1. This section will discuss the sample containers, preservation, and storage of all soil samples obtained in the field. Soil samples will not be chilled and no preservatives will be used.

6.1 Packaging and Shipping

All Ziploc™ bags containing sample will be placed in strong outside plastic boxes for shipment. Five large plastic boxes will be brought to hold all the samples. The following outlines the packaging procedures that will be followed for all samples.

1. The bottom of the plastic boxes will be lined with bubble wrap to prevent breakage during shipment.
2. Heavy-duty gallon Ziploc™ bags will be secured with clear tape to ensure a tight seal.
3. Samples will be labeled with Sharpie™ directly onto the bag. Clear tape will be applied on top of the label to ensure the label will not rub off of the bag.
4. Empty space in the plastic boxes will be filled with bubble wrap to prevent movement and breakage during shipment.
5. Each plastic box will be securely taped shut with heavy-duty tape.

7.0 SAMPLE DOCUMENTATION AND SHIPMENT

7.1 Field Notes

Record keeping will be performed in the field through a combination of logbooks, preprinted forms, photographs, sample labels, and chain-of-custody documentation.

7.1.1 Field Logbooks

Field logbooks will be used to document where, when, how, and from whom any vital project information was obtained. Logbook entries should be complete and accurate enough to permit reconstruction of field activities. A separate logbook for each sampling event or project will be maintained. Logbooks should have consecutively numbered pages. All entries should be legible, written in black ink, and signed by the individual making the entries. Factual and objective language will be utilized.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Type of sample (soil, sediment or water)
- Field instrument readings and calibration
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Lot numbers of the sample containers, sample identification numbers and any explanatory codes, and chain-of-custody form numbers

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling.

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with tribal, contractor, or federal agency personnel
- Deviations from sampling plans and site safety plans
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Field observations of all plant life in area
- Field notes of any observed wildlife

7.1.2 Photographs and Locator Marking

Photographs and GPS coordinates will be obtained at all sampling locations and at other areas of interest on the site or sampling area. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in a separate field photography log:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph
- GPS coordinates

7.2 Sample Labels

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A copy of the sample label is included in

Figure 7-1. The samples will have identifiable and unique numbers. At a minimum, the sample labels will contain the following information: sample ID number, sample type, time of collection, name of sampler, site name and sample location. The site ID number format for node samples will be: RC- month- day- GR- year-node location # - duplicate # (if necessary). One sample will be taken at each node and labeled accordingly. The site ID number format for hot spot samples will be: RC- month- day- year- HS- sample #- duplicate # (if necessary).

Figure 7-1 Sample Label
Southwest Sites Consulting

Site ID NO:	
RC -	_____ - _____ - _____ - _____ - _____ - () (MO.) (DAY) (YEAR) (GR or HS) (NODE # or sample #) (DUPLICATE #)
Sample Type:	_____
Time Collected:	_____ Site Location: _____
Sampler:	_____

7.3 Sample Chain-of-Custody Procedures

All sample shipments for analyses will be accompanied by a chain-of-custody record. A copy of the form is found in Figure 7-2. Form(s) will be completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler. The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone’s custody if it is either in someone’s physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of Southwest Sites Consulting. The sampling team leader or designee will sign the chain-of-custody form in the “relinquished by” box and note date and time. A self-adhesive custody seal will be placed across the lid of each sample. The shipping containers in which samples are stored be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

REFERENCES

- [1] Person, Carl, "Field Sampling Plan and Quality Assurance Project Plan, Red Cloud Mine Tailings," U.S Department of Interior Bureau of Land Management., Yuma., AZ. Feb, 2009.
- [2] National Statistical Service. *Sample Size Calculations*. [Online]. Retrieved from <http://www.nss.gov.au/nss/home.nsf/pages/Sample+size+calculator>
- [3] Environmental Protection Agency, "Method 6200," in *Test Methods for Evaluating Solid Waste, Physical/Chemical Method*, Alexandria, VA: NTIS, 2007, pp. 6200-1-6200-32
- [4] Environmental Protection Agency. *Method 3050b Acid Digestion of Sediments, Sludges, and Soils*. [Online]. Retrieved November 13, 2015 from: <http://www3.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/3050b.pdf>
- [5] Environmental Protection Agency. *Method 7000B Flame Atomic Absorption Spectrophotometry*. [Online]. Retrieved October 3, 2015 from: <http://www3.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/7000b.pdf>
- [6] Environmental Protection Agency. *Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry*. [Online]. Retrieved October 3, 2015 from: <http://www2.epa.gov/sites/production/files/documents/6010b.pdf>

APPENDIX B
HEALTH AND ANALYSIS PLAN
RED CLOUD MINE

1.0 INTRODUCTION

The Health and Safety Plan will go over safety protocol and procedures for the Red Cloud Mine site inspection. Table 1.1 below indicates the names and contact information of all team members and supervisors that will be performing the site inspection. Table 1.2 shows the address of the nearest hospital to the job site.

Table 1.1: Site Workers names and information

Emergency Contact			
Title	Name	Organization	Phone Number
<i>Site Supervisor</i>	Bridget Bero	Northern Arizona University Capstone Advisor	928-607-2516
<i>Client Contact</i>	Eric Zielske	Bureau of Land Management AZ State Office	602-417-9223
<i>Emergency Response</i>	Police		911
<i>Student</i>	Kelsey Hammond	Northern Arizona University Capstone Team	805-256-4735
<i>Student</i>	Dani Halloran	Northern Arizona University Capstone Team	602-762-1149
<i>Student</i>	Taylor Oster	Northern Arizona University Capstone Team	928-853-5838
<i>Student</i>	Robert Reny	Northern Arizona University Capstone Team	626-652-8762
<i>Student</i>	Haley Michael	Northern Arizona University Capstone Team	602-501-802

Table 1.2: Nearest Hospital to job site.

Emergency Medical Facility		
<i>Yuma Regional Medical Center</i>	2400 S Avenue A, Yuma, AZ 85364	See Figure 1 for location details

2.0 DIRECTIONS TO HOSPITAL FROM RED CLOUD MINE

The nearest hospital is Yuma Regional Medical Center, 51 miles away in Yuma, AZ. Directions from the sampling site are as follows:

- Head **southeast** on *Red Cloud Mine Road*. Turn **left** to stay on *Red Cloud Mine Road*. Continue onto *Wildlife Refuge Road*. Turn **left** onto *Martinez Lake Road*. Turn **right** onto *US-95S*. Turn **left** onto *S. Pacific Ave*. Turn **Right** onto *E. 24th Street*. Turn **left** onto *S. Avenue A*.

Figure 2.1 shows the directions from the sampling site to the Yuma Regional Medical center explicitly.

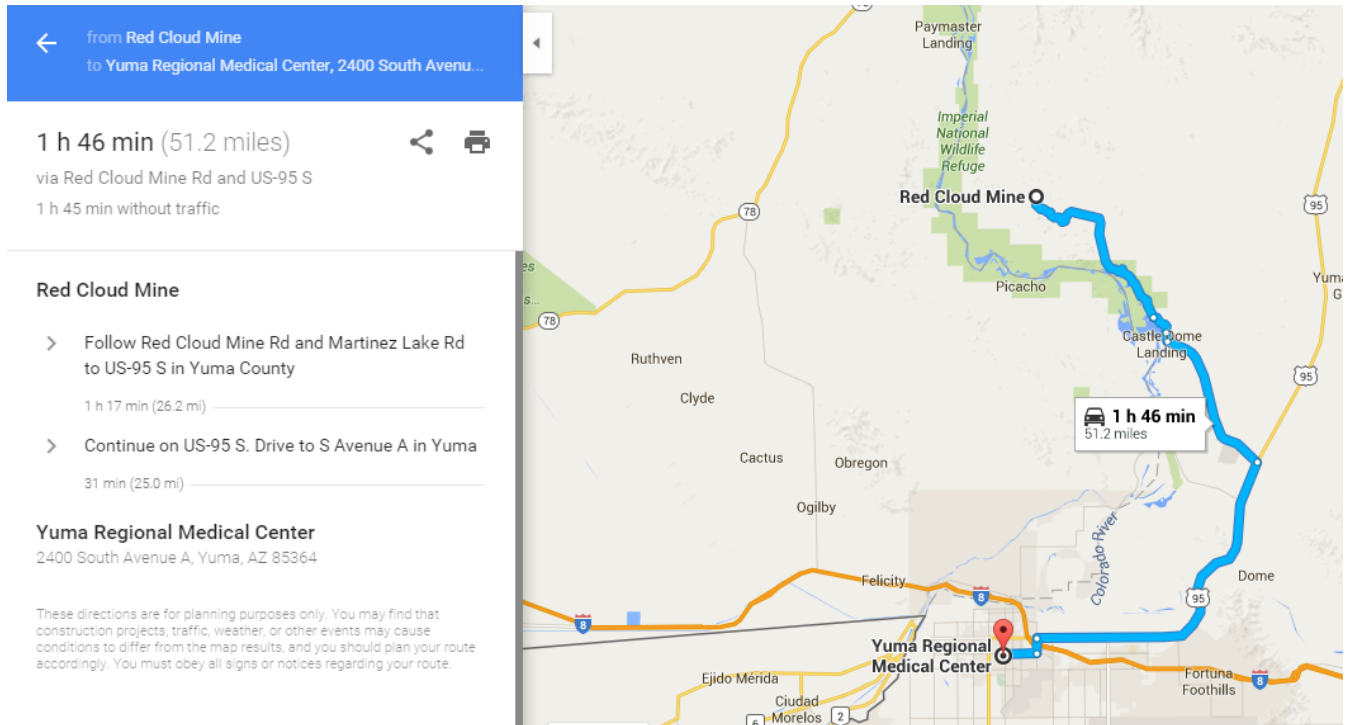


Figure 2.1: Directions from Red Cloud Mine to Yuma Regional Medical Center.

3.0 SITE SUPERVISOR

As required by 29 CFR 1910.120(b)(2)(i)(A), Bridget Bero and Eric Zielske are the Site Supervisors and are responsible for directing all hazardous waste operations. All other site personnel report directly to the Site Supervisor unless otherwise noted. The site supervisor is directly responsible for:

- Ensuring the pre-entry briefing and/or tailgate-safety meeting held prior to initiating any site activity, and the such other times as necessary to ensure that employs are apprised of site hazards
- Ensuring that all work activities conducted with this Health And Safety Plan (HASP) and making any modifications as necessary
- Verifying all Job Hazards Analyses and ensuring that ongoing Hazard Analysis is conducted at this site
- Overseeing the training program and ensuring that employees are trained for all tasks or operations they are asked to perform
- Updating the Site Control Program as needed
- Granting site workers site and zone access approval
- Registering all site visitors

- Establishing and maintaining security measures for this site
- Directing how each work zone is adjusted
- Notified when any hazardous-substance spill occurs
- Monitoring site activities as they pertain to health and safety at this site
- Stopping any unsafe acts that pose an immediate or imminent health and safety hazard to anyone at this site
- Ensuring that all elements of this HASP are followed and correctly implemented
- Ensuring all personnel are apprised of their responsibilities and are fulfilling their requirements
- Updating the Site Health and Safety Supervisor and other applicable personnel as to changes or work progress reports that may pertain to health and safety functions at this site

4.0 HAZARD ANALYSIS

Table 4.1 below outlines the job hazard analysis of the aforementioned Red Cloud Mine Site Inspection. Table 4.2 provides additional information.

Table 4.1: Job Hazard Analysis Worksheet

Job Hazard Analysis			
Phase Description	Site Characterization		
Task or Operation	Sampling surface soil		
Specific Location	Red Cloud Mine tailings pile and Black Rock Wash, La Paz County, AZ		
Task or Operation Start Date	January 29-31 2016	Task or Operation Duration	3 days
Job Hazard Analysis Developed by	Kelsey Hammond		
Job Hazard Analysis Reviewed by	Bridget Bero and Eric Zielske		
Potential Hazards During this Operation			
Chemical	Physical	Biological	Radiological
Lead Contamination	Dehydration	Insects	
	Fatigue		
	Sunburn		
	Scratches		
	Falls		
Hazard Measure Controls Used During this Operation			
Administrative Controls	Team safety meeting prior to going in field. The buddy system will be used		
Engineering Controls	Secured decontamination area		

PPE Description	Boots		
	Long Pants, Long Sleeves		
	Gloves, Hats		
Required Permits	None		

Table 4.2: Additional Hazard Analysis

Item	Issues	These Issues Have Been Considered Before Work	What additional Actions are Necessary Before Beginning Work?
Personnel Management			
1	Has an effort been made to secure at least a two-person team for this fieldwork? If only one person is making the field visit has that decision been approved by the project Principal or Partner?	Yes	
2	Has someone been designated as the field crew leader to supervise the field activity?	Yes	
3	Does the team have instructions on where to park safely and is the most appropriate location for site entry determined?	No	Parking will be determined upon arrival at site per BLM instruction
4	Has Southwest Sites Consulting notified the site that an Southwest Sites representative will be on site so that entry and security issues are addressed and a site map is provided, if available?	Yes	
5	Is there a system in place to ensure that Southwest Sites Consulting is informed of any unique hazards of this site, to supplement the types of risks mentioned in Southwest Sites Consulting's Task Hazardous Analysis Sheet?	Yes	
Field Communication			
1	Do team members have a reliable means of contacting another Southwest Sites Consulting team member in event of an emergency? (such as cell phone, two-way radio)	Yes	

2	Is there a system in place to ensure that the team leader contacts each field team member at least at mid-day and communicate that all team members have safely left the site at the end of the day?	Yes	
3	Has a plan been developed on how to address or deal with any unauthorized people encountered on or near the site?	Yes	
Field Safety			
1	<p>Are the required PPE determined and their use planned? At least:</p> <ul style="list-style-type: none"> -Sturdy Work Boot (Steel toed shoes if crushing or puncture wound potential) -Long pants: (Long sleeves to combat poison or pest bite/sunburn) -Safety glasses (if potential for physical damage or windblown particulate) -Chemical resistant gloves if specifically required -Hard hat, when working on an industrial site or if any head injury from falling objects or other agents as possible 	<p>Not Required</p> <p>Required</p> <p>Required</p> <p>Nitrile gloves required</p> <p>Not Required</p>	
2	Is there a process in place to ensure awareness of need for foul weather gear?	Yes	
3	Have plans been made to have extra water available while on site?	Yes	
4	Have you considered and addressed the need for a first aid kit? If the site is remote from available medical support, then a first aid kit should be taken in the car or personal backpack.	Yes	
5	Is the team aware of any local plants or pests that could carry disease or cause harm? Have applicable repellents, netting, clothing, and other protections been acquired?	No	

In order to avoid getting lost, the buddy system will be used. No student will leave the group unless accompanied by another student. Sunscreen and long sleeved shirts and pants will be

worn to avoid sunburn. If someone falls, the severity of the injury will first be accessed by the site supervisor, who will determine if the wound can be properly cleaned and bandaged with the supplied first aid kit.

5.0 TRAINING PROGRAM

The Training Program is consistent with the requirements of 29 CFR 1910.120(e) and addresses the following site-specific information:

- Initial HAZWOPER training will be completed by every team member prior to the site visit.
- Required Supervised Field Experience will be handled by the site supervisor who is skilled in this field of inspection.

6.0 CONTAMINATION CONTROL

The soil containing the primary hazardous chemical at this site (lead) will be properly contained in plastic bags. The bags will be wiped and kept in a cooler with the lid closed to ensure no contamination of the vehicle or workers. PPE that can be washed will be kept in a bag after use, all other PPE will be disposed of in a proper manner. PPE will be removed before entering the vehicle and put on before entering the contaminated area. Decontamination of the team members clothing and containers holding the sample will take place before leaving the hazardous area. Fresh clothes will be worn each day. Work boots will be stored in a box to avoid contaminating the vehicle.

7.0 EMERGENCY RESPONSE PLAN

None of the team members that are working at this hazardous site have any pre-existing health conditions. No specific emergency response will be necessary. Sufficient amounts of food and water will be brought to the site to ensure no one gets dehydrated or faints. The nearest hospital, Yuma Regional Medical Center, is where anyone who experiences an injury will be taken. A first aid kit will be available on site. Bridget Bero will be immediately contacted if anything goes wrong as she is the Site Supervisor.

For an exposed worker, treatment will take place at the hospital where the doctor will decide the severity of contamination and if treatment is necessary.

8.0 REFERENCES

- [1] HASP Online “Health and Safety Plan.” Agoura Hills, CA From:
http://www.hasponline.com/HASP_Online_Example.pdf