WORK PLAN AND SAMPLING AND ANALYSIS PLAN

Kelly Camp Mine

Summer 2009 Site Inspection

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1.0 INTRODUCTION

This document serves as the Work Plan and Sampling and Analysis Plan (WPSAP) for the field investigation needed to support the completion of a streamlined Engineering Evaluation/Cost Analysis (EE/CA) at the Kelly Camp Mine (site). This document describes specific activities, methods, and procedures that will be used during the field tasks at the work site. Standard operating procedures (SOPs) in this document govern all aspects of field measurements, sample collection, and documentation efforts to ensure that samples collected are representative of conditions in the field, measurements and observations are clearly and concisely documented, and the information obtained is valid. The WPSAP in conjunction with the site-specific Health and Safety Plan (HASP) developed for the 2007 Site Inspection (SI), are considered the Project Plan for the summer 2009 field effort.

The tasks described in this WPSAP are being conducted by URS in accordance with the Scope of Services (URS, 2009) provided to the United States Department of Agriculture Forest Service (Forest Service) to address data gaps revealed during the SI conducted by URS in 2007 (URS, 2008) and to establish the most appropriate remedial alternative for the Kelly Camp Mine. The tasks described in this WPSAP include the collection of site soil samples for chemical analysis, inspection of potential off-site aggregate sources, collection aggregate source soil samples for chemical analysis, and inspection of potential repository sites. These tasks will take place during the summer of 2009.

1.1 Background

In 2007, URS conducted an SI of the Kelly Camp Mine Site. The SI included the collection of numerous soil samples from the site's upper waste rock pile (UWRP) and one sample from the site's lower waste rock pile (LWRP). The SI identified the UWRP as a hot spot, with concentrations of copper, lead, and silver significantly exceeding screening criteria for ecological receptors. Based on these observations, the SI concluded that a removal action at the UWRP was justifiable. The single sample collected from the LWRP had lower concentrations of metals than samples collected from the UWRP, but had the highest concentration of chromium detected on the site. Since a single sample is not representative of metal concentrations for the entire LWRP, the lack of additional samples constituted a data gap.

In addition to sampling at the UWRP and LWRP, URS collected 21 soil samples outside of identified waste rock pile areas. Four of these samples had elevated concentrations of metals that exceeded the most conservative applicable screening criterion or background concentrations. It was unclear why these sample locations had elevated metals concentrations, as they did not appear to be associated with any obvious waste rock piles.

To address the data gaps identified during the 2007 SI and to provide recommendations for remediation of the site, URS' Scope of Services includes three tasks to complete an EE/CA for the mine site. Scope tasks 1 and 2 comprise the field investigation necessary to address data gaps and are the subject of this WPSAP.

The main goals of field work to be completed during the summer of 2009 are to:

- Collect additional soil samples in the LWRP to characterize the magnitude and extent of metals in the waste rock and determine if a removal action is warranted.
- Evaluate if samples taken outside of identified waste rock piles are affected by or associated with waste rock from the mine site, and collect samples if needed.
- Identify potential sources of aggregate for capping waste rock and collect aggregate samples for laboratory analysis.
- Examine possible repository sites for waste rock disposal as part of a removal action at the Kelly Camp Mine Site.

2.0 SCOPE OF WORK

The summer 2009 field work will include the following specific tasks:

- Collect 10 soil samples from the LWRP for laboratory analysis to assess the magnitude and extent of metals.
- Observe and describe the soil profile at four 2007 SI sample locations with elevated metals concentrations that do not appear to be associated with obvious mining-related disturbances. Characterize the soil and evaluate whether the profile is native or associated with mine wastes or other mining-related disturbances.
- Collect up to eight soil samples for laboratory analysis from the four soil profile locations (two samples from each location) if the soil profile examination reveals that these locations are associated with mine wastes or other mining-related disturbances.
- Collect soil samples from potential aggregate sources for laboratory analysis of metals.
- Observe and document the physical conditions of the potential repository sites.

The data obtained as a result of the field effort will be communicated to the Forest Service informally via email and formally in the EE/CA report. A description of each WPSAP task is provided in the following subsections.

2.1 Soil Collection

At each soil sample location, surface soils (0 to 3 inches) will be scraped away to remove oxidized surface layers and/or organic debris. Using a shovel and/or pick axe, in-situ homogenization will be performed by loosening and stirring the soil in the hole. This method will homogenize the soil prior to placement in multiple sample containers. All soil samples will be near-surface, from 3 to 6 inches below ground surface (bgs).

Soil samples collected for chemical analysis will be collected using a dedicated spoon to scoop soil into the laboratory-provided containers. Larger rocks will not be removed from this sample. Soil samples will be sent to TestAmerica Laboratories, Incorporated in Spokane, Washington, for the analyses detailed on Table 1. The soil sample container size and preservation requirements are listed in Table 2.

2.1.1 Soil Collection from the Lower Waste Rock Pile

A total of 10 near-surface waste soil samples and one duplicate sample will be collected from the LWRP. Based on the findings of prior investigations, the “waste soil” is comprised of gravel- to cobble-sized rock with a mixture of finer soil material. To verify the presence of waste soil, the field geologist will dig a hole through soil and rocks to assess the soil profile for the presence of natural soil layers or mining-related disturbance. If the soil profile demonstrates evidence of mining disturbance, the location will be considered suitable for sample collection.

Major site features and proposed soil sampling locations are illustrated by Figure 2. Exact sample locations will be determined in the field. Actual sample locations and site features will be documented by field personnel and recorded with a Global Positioning System (GPS) unit. All waste soil samples will be analyzed for total metals and mercury. The laboratory will be instructed to composite a portion of each sample and analyze the single composite sample for speciation of arsenic (As^{+3}/As^{+5}) and chromium (Cr^{+3}/Cr^{+6}).

2.1.2 Soil Collection from Areas Outside of Identified Waste Rock Piles

Up to eight soil samples (two samples from four locations) and one duplicate sample will be collected from the vicinity of four 2007 SI samples. The four locations selected are near 2007 SI samples RS-12, S-18, S-21, and S-34, and all had elevated metal concentrations. Sampling from these locations will be dependent upon the soils' classification as background or waste soils. Background soil is soil collected from areas where no mining disturbance is evident, based on the geologist's assessment of the soil profile. As with soil collection in the LWRP, the field geologist will dig through the soil and rocks to assess the soil profile for natural soil layers or mining-related disturbance. If the observed soil profile is characterized by native soil with no apparent site-related disturbance, then URS will conclude that the analytical results for the SI sample at this location were representative of background concentrations. No further laboratory analysis will be conducted. If evidence of mining related disturbance is found (e.g. placement of waste rock), up to two soil samples will be collected from the upper 3 to 6 inches of the soil profile in the vicinity of the SI sample location to asses the extent of disturbance. These samples will be sent to the analytical laboratory.

Major site features and proposed soil sampling locations are generally illustrated by Figure 2. Exact sample locations will be determined in the field. Actual sample locations and site features will be documented by field personnel and recorded with a GPS unit. All soil samples will be analyzed for total metals and mercury.

2.1.3 Soil Collection from Potential Aggregate Sources

URS will identify up to two potential sources of aggregate material near the site. These sources may be commercial sources or other sources on Forest Service lands. At each source, five grab samples will be collected from areas representative of the source. The five grab samples will be composited in the field into a singe sample, and the composite sample will be analyzed for total metals and mercury. If present, oxidized surface layers and/or organic debris will be removed prior to sample collection.

2.2 Observation for Repository Sites

In order to recommend a preferred removal alternative in the EE/CA, URS will inspect up to three potential repository locations for mine waste rock. Characteristics such as capacity, access, slope, drainage, existing vegetation, adjacent land uses, and proximity to surface water features or wetlands will be observed and recorded in the field notebook.

2.3 Data Submittal

Field data and laboratory analytical data collected during the summer 2009 field investigation will be evaluated by the URS field personnel, project chemist, and EE/CA author. Field observations and analytical data will be summarized in the EE/CA report. The analytical data will be screened against applicable human health and ecological screening criteria. The analytical data and the results of the data screening will be considered and discussed in the EE/CA report relative to selecting the appropriate remedial alternatives for the site. Chemical data will also be reviewed in accordance with Section 5.7 of this WPSAP and summarized in tabular form.

The analytical laboratory will attempt to achieve method reporting limits (MRLs) at or below the applicable human health and ecological screening levels. The predicted success of these efforts is described in Table 3. If an undetected sample has a method MRL that exceeds applicable screening levels, this uncertainty and its implication on selection of remedial alternatives will be discussed in the EE/CA report.

3.0 SAMPLE DESIGNATION

Sample designation procedures are described in the following subsections for field QA/QC and soil samples.

3.1 Field QA/QC Samples

Field QA/QC sample will include blind field duplicate samples. For each soil sample, field duplicates will be collected by splitting each spoonful of sample material into two jars. Field notes documenting where each duplicate was collected will allow QA/QC analysis of the results.

LWRP
One field duplicate will be collected from the LWRP. The duplicate sample location will be determined in the field.

Areas Outside of Identified Waste Rock Piles
One field duplicate will be collected near one of the four 2007 SI sample locations discussed in Section 2.1.2, in the event that mining-related disturbance is discovered. Duplicate sample locations will be determined in the field.

3.2 Sample Naming

All soil samples will be labeled according to soil sample type and location. Samples taken from within the LWRP will begin with the alphabetical notation "L." Samples taken outside of areas formally recognized as waste rock piles will begin with "O." Samples collected from potential aggregate sources will begin with "A." These notations will be followed by a number indicating a sample location number (e.g. 1 through 10). Any changes to the sample nomenclature will be clearly recorded in the field log.

Field duplicates will be designated by a sample name indicating a sample location that does not exist. For example, the 10 soil samples at the LWRP will be designated L-1 through L-10. The duplicate will be labeled L-11.

3.3 Sample Collection for Laboratory Quality Control

Field personnel will collect additional sample volume to facilitate analysis of a matrix spike/matrix spike duplicate (MS/MSD) for each sample matrix. For each selected sample, field personnel will fill an extra set of sample containers labeled with the same sample name. The selected samples will be identified in the comments section of the chain-of-custody (COC) as MS/MSD. MS/MSD samples are discussed in Section 5.2.3.

4.0 STANDARD OPERATING PROCEDURES

SOPs for equipment decontamination, environmental sample collection, and sample handling and shipping are provided in the following subsections.

4.1 Equipment Decontamination

Most sampling equipment in contact with environmental samples will be dedicated as single-use during this field work. Soil samples will be collected with dedicated plastic spoons into clean laboratory-provided containers. All samples will be handled using clean, disposable nitrile gloves. Non-dedicated equipment, however, will be used to access some samples and are expected to include a shovel and pick axe.

This non-dedicated equipment will be decontaminated prior to use in the field and also during sampling to reduce the potential for the introduction of contamination and cross-contamination. These procedures are necessary to ensure quality control in decontamination of field equipment.

Decontamination of all non-dedicated field sampling equipment will be conducted in a thorough and step-wise manner. New disposable nitrile gloves will be worn when handling clean sampling equipment to ensure that the equipment is not contaminated. Decontamination procedures shall be documented in a field notebook.

Prior to initial uses, all non-dedicated sampling equipment used for sample collection will be decontaminated according to the following procedure:

- Rinse thoroughly with potable water.
- Scrub with Alconox and water to remove any visible dirt.
- Rinse with potable water.

During storage and transport, sampling equipment shall be covered with plastic wrap or plastic bags to prevent contamination. Between sample locations, non-dedicated sampling equipment will be cleaned of dirt and dust particles using a stiff brush until no visible dirt remains attached.

4.2 General Sampling Protocol

Field observations, notes, and measurements will be recorded daily in waterproof ink by the field personnel in all-weather field logbooks. Each field notebook page will be dated. Upon arrival at the site, the following procedures will be followed:

1. Record the date and time of arrival, general site conditions, and other applicable field observations related to the Site.
2. Record sample collection information and sample locations on the appropriate sampling form and/or in the field notebook.
3. Finalize field logs and check sample labels against field notebook. Complete COC forms as samples are packaged in coolers. The project name, location, station, date and time of collection, number of containers, type of analysis, and field team representative's signature and time will be completed on the COC form. Verify that the sample number, request for analyses, date, and time of collection labeled on the sample containers are the same as those entered on the COC form and in the field notebook.
4. All samples collected will be stored and sealed in ice-filled (or equivalent) coolers prior to transport to the laboratory. Once a sample is collected, it should remain in the possession of the field sampling team. Custody seals will be placed on the cooler to ensure that the cooler has not been tampered with during shipment.

4.3 Handling & Shipping of Environmental Samples

Data regarding sample collection and processing will be recorded by sampling personnel on the appropriate sampling report forms and/or in bound field books.

The COC program will be adequate to allow for the tracking and possession and handling of individual samples from the time of field collection through laboratory and field analysis. The laboratory-supplied COC form will be used by personnel responsible for ensuring the integrity of the samples and will be maintained in the project files as documentation of sample handling procedures.

4.3.1 Sample Packaging

Collected samples must be handled and shipped in a manner that will protect against any detrimental effects to the samples or the environment due to breakage, leakage, or spoilage. Sample handling procedures will be closely supervised and recorded to minimize the potential for loss, modification, or tampering during shipment of the analytical laboratory. Package labeling specification will depend on the type of materials being sent, and will be in accordance with Department of Transportation (DOT) regulations (49 CFR, Parts 171 through 177) and CLP guidance (EPA, 2003). Samples of hazardous materials will be stored and handled in accordance with all applicable Federal and State requirements.

4.3.2 Sample Container Preparation

All containers used for sample collection shall be laboratory cleaned. The container type and preservative requirements shall follow the specifications of Table 2.

4.3.3 Procedures to Prevent Cross-Contamination

Personnel collecting samples for chemical analyses will take the following precautions to minimize sample contamination or cross-contamination between samples:

- Nitrile gloves will be used while taking all samples and will be disposed of after non-dedicated equipment has been decontaminated.
- Sampling personnel will not touch the inside of the sampling container.
- Only equipment that has been properly decontaminated according to the procedures specified in Section 4.1 (Equipment Decontamination) will be used for environmental sample collection.

Immediately following the collection of the sample, the container will be sealed and the sample will be labeled and entered in the field notebook and/or appropriate sampling record forms.

4.3.4 Sample Identification and Labeling

Each sample shall be identified in the field notebook and on the sample container label. The label shall be filled out as follows:

- Client – URS
- Sample Name – use nomenclature described in Section 3.2
- Site – Kelly Camp Mine
- Date – date of sample collection
- Time – time of sample collection
- Sampler – sampler initials
- Analysis – test requested

- Comments – indication of preservation, sample volume limitations, etc.

4.3.5 Field Notebook and Field Report Form

A bound field notebook will be maintained by the sampler to provide a daily record of events. At the beginning of each entry, the following will be recorded:

- Date
- Time
- Meteorological conditions
- Field personnel present
- Level of personnel protection
- List of on-site visitors and the level of personal protection
- Signature of the person making the entry

Field notebook entries will be in as much detail as necessary so that essential information is properly documented. All documentation in field books will be in ink. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

If sample locations cannot be indicated on field maps, a simple drawing of the location (not to scale) will be included in the field notebook to provide an illustration of all sampling points.

Entries in the field notebook will include at a minimum the following for each field date:

- Site identification
- Location of sampling points (e.g., sketch)
- Description of sampling points
- Sample identification number
- Number of samples taken
- Time of sample collection
- Reference to sample location map
- Number of QA/QC samples taken
- Collector's names
- Field observations
- Sample distribution (e.g., split samples, analytical lab)

Documentation of sampling procedures will be made on the appropriate sampling report forms and/or field books.

4.3.6 Sample Chain-of-Custody Record Form

In order to maintain an accurate record of sample collection, transport, analysis, and disposal, the following methodologies will be used:

- Samples will be accompanied by a COC form at all times.

- The COC form will be used by personnel responsible for ensuring the integrity of samples from the time of collection until shipment to the laboratory.
- The record will be completed in the field to indicate project, sampling team, etc.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the record form as "Relinquished by _____."
- If the samples are shipped to the laboratory by commercial carrier, the COC form will be sealed in a watertight container, placed in the shipping container, and the shipping container sealed prior to being given to the carrier.
- If the samples are transported directly to the laboratory, the COC form will be kept in the possession of the person delivering the samples.
- For samples shipped by commercial carrier, the waybill will serve as an extension of the COC record between the final field custodian and receipt in the laboratory.
- Upon receipt in the laboratory, the Sample Receiving Supervisor will open the shipping containers, compare the contents with the COC record, ensure that document control information is accurate and complete, and sign and date the record. Any discrepancies will be noted on the COC form.
- In the event of discrepancies, the samples in question will be segregated from normal sample storage and the field personnel immediately notified.
- The COC form is completed upon receipt of the samples by the analytical service. The completed COC form will be returned to the Project Manager and maintained in the project file.

4.3.7 Sample Packaging

Samples will be immediately placed in the sample cooler. Once the cooler is filled with samples, the cooler will be sealed with two custody seals initialed and dated by the person packing the cooler. The following protocol will be used for packaging of samples:

- Only waterproof coolers will be used.
- Strapping tape and custody seals will be placed around the lid of all sample coolers.
- Samples will be packed so that the bottles will not dislodge and/or break during shipment.
- The sample containers will be placed upright in the cooler. In addition, all sample containers will be placed in clear, plastic, leak-proof bags. Care will then be taken to ensure that sample labels are legible through the bag.
- Additional packaging material will be placed in the cooler to partially cover the sample containers. Ice (or equivalent) will be placed in plastic bags and then around, among, and on top of the sample containers.
- The COC form will be placed in a waterproof plastic bag and taped on the inside of the lid of the cooler. Methodology of shipment, courier name(s), and other pertinent information will be recorded on the COC form.
- The completed shipping label will be attached to the top of the cooler.
- All records pertaining to the shipment of a sample will be retained.

5.0 QUALITY CONTROL

The overall quality assurance objectives for field sampling and laboratory analysis are to produce data of known and appropriate quality to support the project objectives. Appropriate procedures and quality control checks will be used so that known and acceptable levels of accuracy and precision are maintained for each dataset. Field quality control and laboratory quality control samples will be employed to evaluate data quality. Quality control samples are controlled samples introduced into the analysis stream whose results are used to review data quality and to calculate the accuracy and precision of the chemical analysis program. The purpose of each type of quality control sample, collection and analysis frequency, and evaluation criteria are described in this section. Laboratory quality control samples, as described in the referenced methods, will be followed.

The quality of field and laboratory measurements will generally be determined by the quality control requirements and quality criteria described in analytical methods. All quality control measurements and data assessment for this project will be conducted on project-specific samples when possible.

Quality control checks for sample collection will be accomplished by a combination of COC protocols, field quality control samples, and laboratory QA as described in the sampling and analytical methods sections of this document. In general, QC measures may include the following: rinsate and method blanks; matrix, surrogate, and laboratory control spikes; and field and laboratory duplicate samples. The laboratory will notify the URS Project Chemist of any quality control exceedances outlined in this WPSAP immediately.

5.1 Field Quality Control Samples

Field quality control samples are collected to evaluate the quality of the field sampling program. Specifically, field duplicate samples are collected to monitor the variability associated with sample collection techniques, equipment rinsate blank samples are collected to monitor the effectiveness of decontamination procedures, and field blanks are used to check for cross-contamination in the field. Field quality control samples collected by field personnel will be described in the field logbook.

5.1.1 Field Duplicates

Field duplicate samples are second samples of the environmental media of interest and measure the variability associated with the sample concentration or collection. Each field duplicate will consist of one sample collected from the same sampling point at the same date and time as an actual sample and will be sent to the same laboratory. One soil field duplicate will be collected at the LWRP and one will be collected from a location outside of the identified waste rock piles.

5.1.2 Rinsate Blanks

Rinsate blanks are water samples collected from the final rinsate at the end of decontamination procedures. Rinsate blanks monitor cross-contamination of samples by sampling equipment. No rinsate blank will be collected for this sampling event due to the use of dedicated sampling equipment.

5.1.3 Field Blank

Field blanks are containers filled with contaminant-free water that are carried into the field and are used to check for cross-contamination in the field. No field blanks will be collected.

5.2 Laboratory Quality Control Samples

Laboratory QC checks are accomplished by analyzing initial and continuing calibration samples, method blanks, surrogate spikes, laboratory control samples (LCS), and laboratory duplicate samples. Not all of these QC samples will be required for all methods.

5.2.1 Method Blanks

Method blanks are used to check for laboratory contamination and instrument bias. Laboratory method blanks will be analyzed at a minimum frequency of one per 20 samples or one per analytical batch.

Analytical results for each sample shall be clearly associated with a particular method blank. In order to evaluate low level determinations of target compounds in samples, the laboratory will report any detected concentration found in method blanks that exceed control criteria specified in this WPSAP.

5.2.2 Laboratory Control Samples

Laboratory control samples (LCS) are used to monitor the laboratory's day-to-day performance of routine analytical methods, independent of matrix effects. The LCS is prepared by spiking deionized water with standard solutions prepared independently of those used in establishing instrument calibration. The LCS are extracted and analyzed with each batch of samples. Results are compared on a per-batch basis to established control limits and are used to evaluate laboratory performance for precision and accuracy. LCS may also be used to identify any background interference or contamination of the analytical system that may lead to the reporting of elevated concentration levels or false positive measurements.

5.2.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

Matrix spikes are used to assess sample matrix interferences and analytical errors, as well as to measure the accuracy of the analysis. Known concentrations of analytes are added to environmental samples; the MS/MSD samples are then processed through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery of the known spiked amount. MS/MSD pairs will be analyzed at a minimum frequency of one per 20 samples or one per analytical batch. The MS/MSD samples will be analyzed for the same parameters as the associated field samples in the same analytical batch.

MS/MSD samples will be identified on the COC form, and additional sample volumes will be provided to the laboratory. MS/MSD analyses not meeting quality control criteria specified in this WPSAP will be reanalyzed once. If subsequent analyses result in out of control recoveries, both results will be reported by the laboratory and the corresponding data flagged.

Two soil samples will be analyzed as MS/MSD: one sample at the LWRP and one sample from a location outside of the identified waste rock piles.

5.2.4 Laboratory Duplicate Samples

Precision of the analytical system is evaluated by using laboratory duplicates. Laboratory duplicates are two portions of a single homogeneous sample analyzed for the same parameter. Laboratory duplicates with be analyzed at a minimum frequency of one in 20 samples or one per analytical batch.

5.3 Analytical Data Quality Indicators

Analytical data quality indicators of precision, accuracy (bias), representativeness, comparability, completeness, and sensitivity are defined below. Any data that fall outside of these criteria must be justified, and the effects on decisions must be assessed.

5.3.1 Precision

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures. Precision is related to analytical variability and can be expressed as a standard deviation, or as percentage of the mean of the measurements, by relative range or relative standard deviation (coefficient of variation). For this project, analytical variability will be measured as the relative percent difference (RPD) between results for laboratory duplicate pairs. Precision will be calculated as the RPD as follows:

$$\%RPD_i = \frac{2|O_i - D_i|}{(O_i + D_i)} \times 100\%$$

where:

$\%RPD_i$	=	Relative percent difference for compound *i*
O_i	=	Value of compound *i* in original sample
D_i	=	Value of compound *i* in duplicate sample

The resultant RPD will be compared to acceptance criteria specified in this WPSAP. If the criteria are not met, the laboratory will justify why the acceptability limits were exceeded and implement appropriate corrective actions. The RPD will be reviewed during data quality review, and the reviewer will note any deviations from the specified limits and comment on any effects on the data.

5.3.2 Accuracy

Accuracy is the amount of agreement between a measured value and the true value. Laboratory accuracy will be measured as the percent recovery of matrix spike samples and laboratory control samples. Additional potential bias will be quantified by the analysis of method blank samples. Accuracy shall be calculated as percent recovery of the target analyte as follows:

$$\%R_i = (Y_i \div X_i) \times 100\%$$

where:

$\%R_i$	=	percent recovery for compound *i*
Y_i	=	measured analyte concentration in sample *i*
X_i	=	known analyte concentration in sample *i*

The resultant percent recoveries will be compared to acceptance criteria as listed in analytical methods and laboratory in-house criteria. If the objective criteria are not met, the laboratory will justify why the acceptability limits were exceeded and implement appropriate corrective actions. Percent recoveries will be reviewed during data quality review, and the reviewer will note any deviations from the specified limits and comment on any effects on the data.

5.3.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a parameter that focuses primarily on the proper design of the sampling program or the sub-sampling of a given sample.

5.3.4 Comparability

Comparability is a qualitative parameter that expresses the confidence with which data from one study can be compared with data from another. This goal will be achieved by using standard techniques to collect and analyze representative samples and by reporting analytical results in appropriate units. Comparability will be evaluated during the data quality review.

5.3.5 Completeness

Completeness for usable data is defined as the percentage of usable data out of the total amount of planned data. Completeness for usable data shall be defined as 95% for each individual analytical method. Completeness will be calculated as follows:

$$\%C = \frac{A}{I} x100\%$$

where:

$\%C$	=	Percent completeness (analytical)
A	=	Measurements that are judged to be usable (based on project-specific requirements)
I	=	Intended number of measurements

Invalid data (i.e., data qualified as "R," rejected) will be identified during the data quality review.

5.3.6 Sensitivity

The sensitivity of the analytical methods (i.e., method reporting limits) identified for this project are sufficient to allow comparison of project results to decision criteria.

5.4 Equipment Maintenance

Laboratory instrumentation will be examined and tested prior to being put into service and will be maintained according to the manufacturer's instructions. All laboratory instruments will be maintained as specified in the project laboratory's QA plan and according to manufacturers' instructions. Manufacturer's instructions will be followed for any additional equipment that is required for this project.

5.5 Instrument Calibration

Laboratory instrument calibration will be conducted in accordance with the QC requirements identified in the manufacturers' instructions and the laboratory SOP. General requirements are discussed below.

5.5.1 Laboratory Instruments

As stated in EPA SW-846 and applicable laboratory SOPs, calibration of all analytical instrumentation is required to ensure that the analytical system is operating correctly and functioning at the sensitivity required to meet project objectives. Each instrument will be calibrated with standard solutions appropriate to the instrument and analytical method, in accordance with the methodology specified and at the QC frequency specified in the laboratory SOP.

The calibration and maintenance history of the fixed laboratory instrumentation is an important aspect of the project's overall QA/QC program. As such, all initial and continuing calibration procedures will be implemented by trained personnel following the manufacturer's instructions and in accordance with applicable EPA protocols to ensure the equipment is functioning within the tolerances established by the manufacturer and the method-specific analytical requirements.

5.5.2 Standard Solutions

A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical operations. To ensure the highest purity possible, all primary reference standards and standard solutions will be obtained from a reliable commercial source. The laboratories will maintain a written record of the supplier, lot number, purity/concentration, receipt and

preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information for all standards, standard solutions, and individual standard preparation logs.

Standard solutions will be validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard solution using another standard solution prepared at a different time or obtained from a different source. Stock and working standard solutions will be checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change of concentration. Care will be exercised in the proper storage and handling of standard solutions, and all containers will be labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation). Reagents will be examined for purity by subjecting an aliquot or subsample to the corresponding analytical method as well.

5.6 Data Management

5.6.1 Laboratory Data Deliverables

The laboratory data reports will consist of data packages containing the documentation necessary to complete an independent data review of analytical results. Each laboratory data report will include the following:

- Case narrative identifying the laboratory analytical batch number. The narrative shall be signed by the laboratory manager or their designee.
- Matrix and number of samples included.
- Analyses performed and analytical methods used.
- Description of any problems or exceedances of QC criteria and corrective action taken.
- Copy of COC records for all samples included in the analytical batch.
- Tabulated sample analytical results with units, data qualifiers, percent solids, sample weight or volume, dilution factor, laboratory batch and sample number, field sample number, and dates sampled, received, extracted, and analyzed all clearly specified. Surrogate percent recoveries will be included for all organic analyses.
- Blank summary results indicating samples associated with each blank.
- Matrix spike/matrix spike duplicate result summaries with calculated percent recovery and relative percent differences.
- Laboratory control sample results, when applicable, with calculated percent recovery.
- Electronically formatted data deliverable results (GISKey 3.1 preferred)

5.7 Data Review, Verification and Validation

The purpose of the data quality review is to eliminate unacceptable analytical data and to designate a data qualifier for any data quality limitation discovered. The data quality review will include a review of laboratory performance criteria and sample-specific criteria. The reviewer will determine whether the measurement quality objectives have been met, and will calculate the data completeness for the project. The following guidelines will be used for data validation of all analyses:

- Test Methods for Evaluating Solid Waste, SW-846, USEPA.
- USEPA "Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA 540-R-01-008, October 2004, where appropriate.

A "summary" validation will be performed on all data generated by the laboratory. A summary data validation review refers to conducting reviews that involve evaluating only the data summary and QA/QC summary sheets provided with all data packages. The summary reviews do not involve spot-checking the raw data packages and calculations.

If summary reviews indicate potential problematic areas within a data set, a standard data validation review may be conducted. A standard data validation review refers to conducting a data validation review that requires spot-checking the laboratory's raw data package and calculations in accordance with the EPA Functional Data Validation Guidelines (USEPA, 2004). The project chemist will contact the laboratory to discuss the problematic areas; however, if questions still exist, the project chemist may elect to conduct a standard review of the data. The summary review will include verification of the following:

- Compliance with this WPSAP
- COC records
- Case Narrative
- Proper sample collection and handling procedures
- Holding times
- Field QC results
- Laboratory blank analysis
- Method detection and reporting limits
- Laboratory duplicate precision
- MS recoveries
- LCS recoveries
- Surrogate compound recoveries
- Data completeness and format
- Data qualifiers assigned by the laboratory
- Verification of reported data in electronic data deliverable with the hard copy deliverable

Qualifiers will be added to data during the review as necessary. Qualifiers applied to the data as a result of the review will be limited to:

U The analyte was analyzed for but was not detected above the reporting limit.

J The analyte was detected at a concentration less than the laboratory reporting limit, and the result is therefore considered an estimated quantity.

UJ The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified. No associated value is reported.

Results of the data quality review will be included in a data quality review report that will provide a basis for meaningful interpretation of the data quality and evaluate the need for corrective actions and/or comprehensive data validation.

6.0 REFERENCES

URS, 2008. Final Site Inspection Report. Kelly Camp Mine, Colville National Forest. Prepared for U.S. Forest Service. February.

URS, 2009. Scope of Services. Re: Kelly Camp Mine Streamlined Engineering Evaluation/Cost Analysis Forest Service Master Solicitation R6-27-06-113 Kelly camp Mine, Republic, Washington. May.

USEPA, 1998. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), 3rd Ed., September 1986: Final Update I, July 1992; Final Update IIA, August 1993; Final Update II, September 1994; Final Update IIB, January 1995, Final Update IIIB, April 1998, Final Update IIIB, June 2005.

USEPA, 2003. Contract Laboratory Program Guidance for Field Samplers. Draft Final, EPA 540-R-00-003, April.

USEPA, 2004. USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review, October.

TABLES

TABLE 1
Soil Sample Chemical Analyses Summary

Sample Location	Analytes	Method	Number of Samples
Lower Waste Rock Pile	Total Metals[1]	6010/6020	10
	Total Mercury	7471A	10
	Chromium (Cr^{VI})[2]	7195/6010	1
	Arsenic (As^{III} and As^{V})[2]	Modified 7063	1
Areas Outside Identified Waste Rock Piles	Total Metals	6010/6020	8
	Total Mercury	7471A	
Aggregate Sources[3]	Total Metals	6010/6020	2
	Total Mercury	7471A	

Notes:

(1) Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Selenium, Silver, Zinc

(2) Arsenic and chromium speciation will be performed on a composite sample prepared from the 10 grab sample location.

(3) A single composite sample will be collected at each aggregate source. The composite sample will be prepared by collecting 5 grab sample at the source and compositing the 5 grabs into a single composite sample.

TABLE 2
Summary of Soil Sample Containers, Preservation and Hold Times

Sample Location	Analytes	Method	Containers	Preservation	Number of Analyses	Min. Volume	Hold Time
Lower Waste Rock Pile	Total Metals[1]	6010/6020	2x 8 oz Jar	None	11	10 g	6 months
	Mercury	7471A			11	10 g	28 days
	Chromium (Cr^{VI})	7195/6010			1	10 g	30 days
	Arsenic (As^{III} and As^{V})	Modified 7063			1	2 oz	28 days
Areas Outside Identified Waste Rock Piles	Total Metals	6010/6020	1x 8 oz Jar	None	9	10 g	6 months
	Mercury	7471A			9	10 g	28 days
Aggregate Sources	Total Metals	6010/6020	1x 8 oz Jar	None	2	10 g	6 months
	Mercury	7471A			2	10 g	28 days

Notes:
All samples will be cooled to < 4°C
(1)Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Selenium, Silver, Zinc

TABLE 3
Requested MRLs and Applicable Screening Levels

Analytical Method	Analyte	Eco Screening Levels (mg/kg)							Human Health Screening Levels (mg/kg)			Lowest Screening Level (mg/kg)	Soil (mg/kg)		Does MDL or MRL Exceed the Lowest Screening Criterion?
		MTCA Indicator Soil Concs.[1] (Table 749-3)			USEPA Eco-SSLs[2]				MTCA Method A Industrial Cleanup Levels[1]	MTCA Method A Soil Cleanup for Unrestricted Land Uses[1]	USEPA Regional Screening Levels -- Industrial[3]		MDL	MRL	
		Plants	Soil Biota	Wildlife	Plants	Soil Inverts.	Avian	Mammalian							
EPA Method 6010B/6020	Arsenic, total	--	--	--	18	--	43	46	20	20	1.6	1.6	0.01	0.5	No
	Arsenic III	--	--	7	--	--	--	--	--	--	--	7	0.056	0.4	No
	Arsenic V	10	60	132	--	--	--	--	--	--	--	10	0.042	0.4	No
	Barium	500	--	102	--	330	--	2,000	--	--	190,000	102	0.008	0.5	No
	Cadmium	4	20	14	32	140	0.77	0.36	2	2	800	0.36	0.02	0.2	No
	Chromium, total	42	42	67	--	--	--	--	--	--	1,400	42	0.01	0.5	No
	Chromium III	--	--	--	--	--	26	34	2,000	2,000	--	26		0.5	No
	Chromium VI	--	--	--	--	--	--	130	19	19	--	19	0.002	0.01	No
	Cobalt	20	--	--	13	--	120	230	--	--	300	13	0.02	0.5	No
	Copper	100	50	217	70	80	28	49	--	--	41,000	28	0.05	0.5	No
	Lead	50	500	118	120	1,700	11	56	1,000	250	800	11	0.08	0.5	No
	Manganese	1,100	--	1,500	220	450	4,300	4,000	--	--	--	220	0.03	0.5	No
	Mercury, inorganic	0.3	0.1	5.5	--	--	--	--	2	2	24	0.1	0.017	0.05	No
	Selenium	1	70	0.3	0.52	4.1	1.2	0.63	--	--	5,100	0.3	0.02	0.5	MRL only
	Silver	2	--	--	560	--	4.2	14	--	--	5,100	2	0.27	0.5	No
	Zinc	86	200	360	160	120	46	79	--	--	310,000	46	0.2	0.5	No

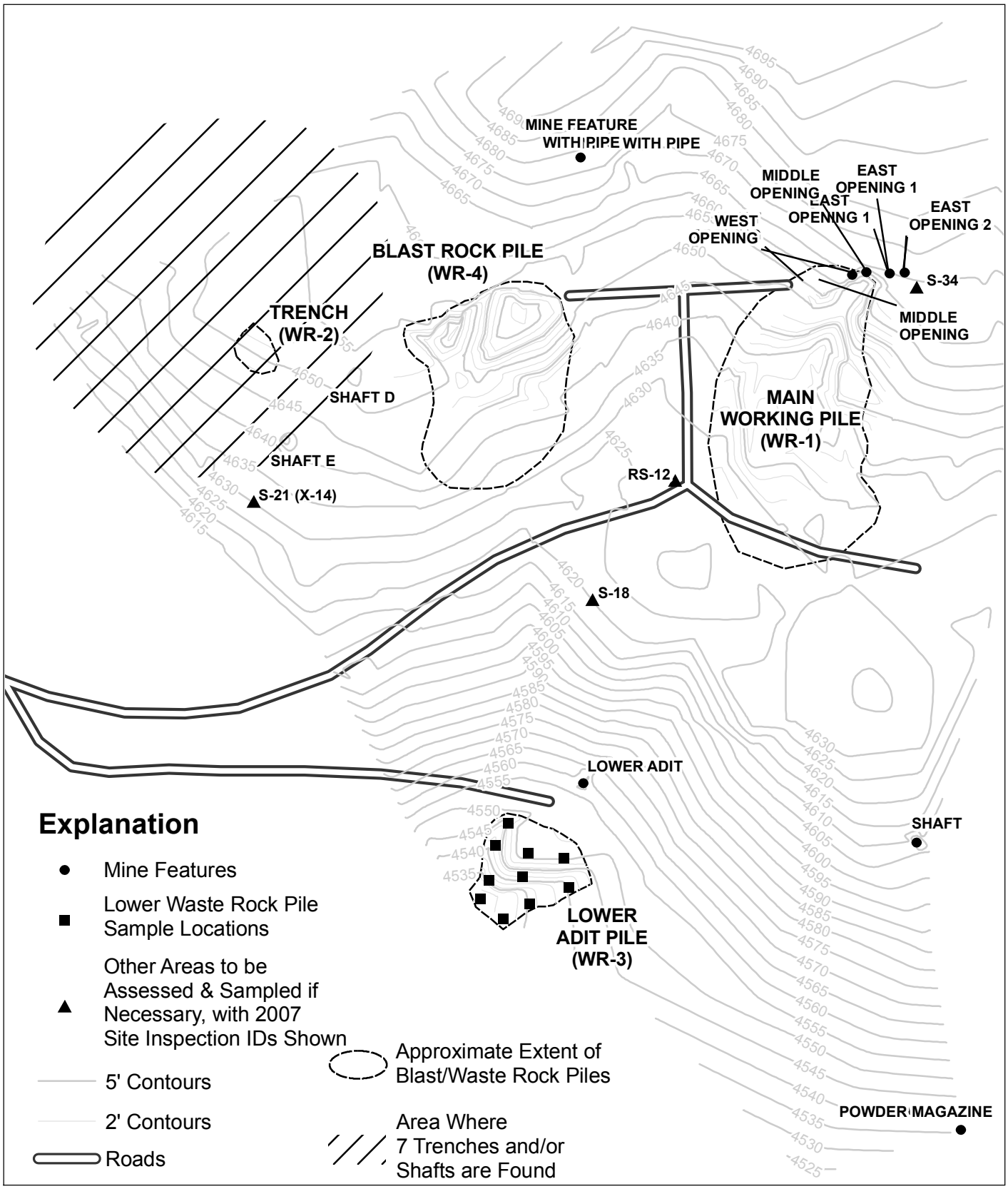
Notes:
-- = no information available
mg/kg = milligrams per kilogram
MRL = Method Reporting Limit
MDL = Method Detection Limit

[1] Ecology, 2007. Model Toxics Control Act Chapter 70.105D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised November 2007. Publication No. 94-06.

[2] USEPA, 2008. Ecological Soil Screening Levels (Eco-SSLs). Accessed October 2008 online at http://www.epa.gov/ecotox/ecossl/

[3] USEPA. 2008. Regional Screening Levels for Chemical Concentrations at Superfund Sites. U.S. Environmental Protection Agency. Accessed June 2009 at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

FIGURES



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007

0 110 220 Feet

URS

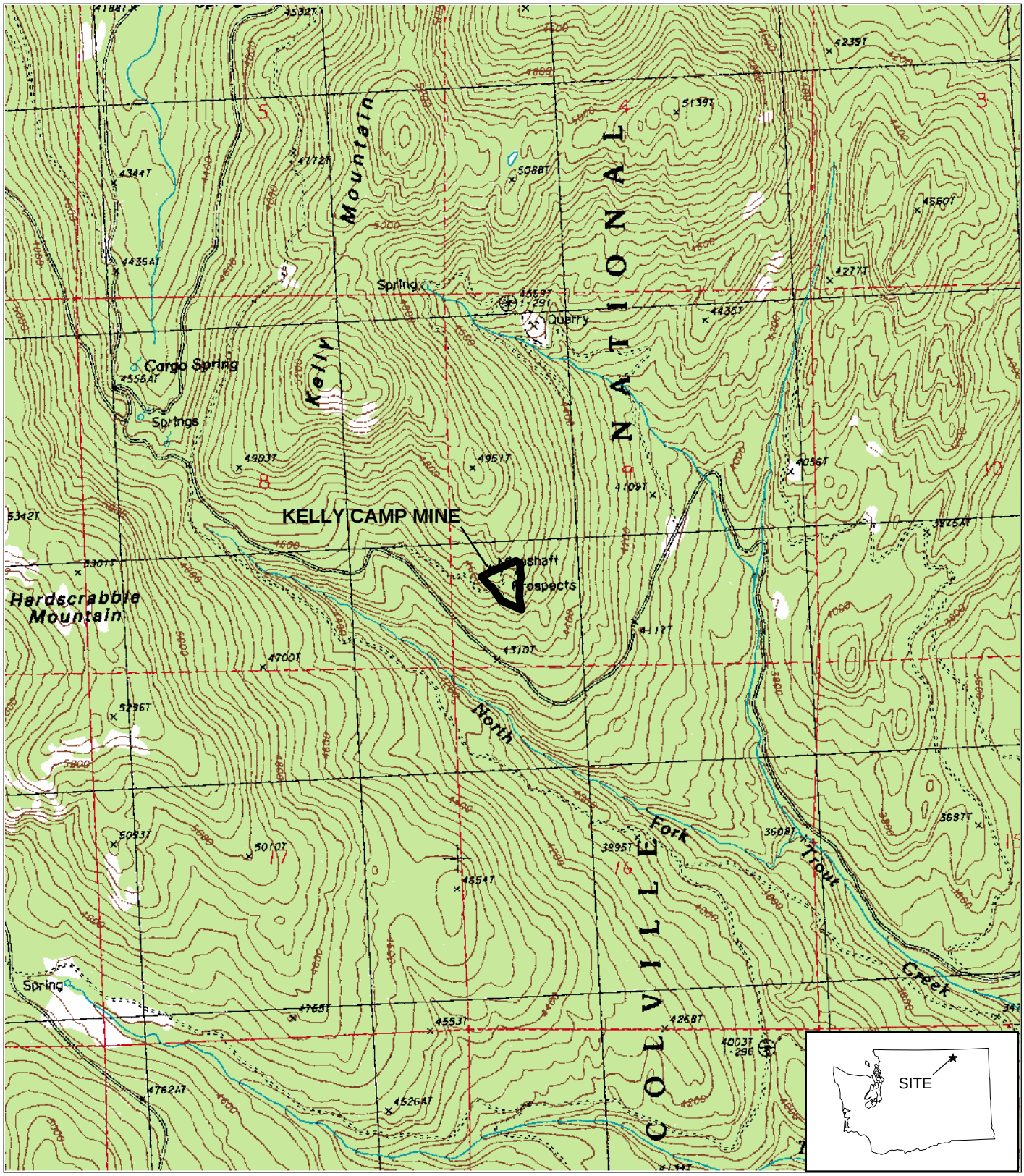
JUNE 2009
25697011

SOIL SAMPLE LOCATIONS

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 2

O:\25696513 Kelly Camp Mine\5000 Technical\GIS\MXD\Fig 3 Mine Site Map.mxd



Source: Bodie Mountain, Washington USGS 7.5' Topographic Quadrangle, 1992.

0 0.25 0.5 Miles

VICINITY MAP

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

JUNE 2009
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FIGURE 1

O:\25696513 Kelly Camp Mine\5000 Technical\GIS\MXD\Fig 1 Vicinity Map.mxd