

FINAL
TRAILS
2006 PRIORITY ACTION WORK PLAN
EMPIRE MINE STATE HISTORICAL PARK
JULY 2006

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1.0 PURPOSE

The purpose of this Trails 2006 Priority Action Work Plan is to implement, during the 2006 construction season, control measures on three trail segments within the Empire Mine State Historic Park (SHP) that have been identified by the California Department of Toxic Substances Control (DTSC) as posing a potential exposure pathway to the public and park employees due to the presence of mine/mill related materials at the surface. The 2006 priority actions will limit any potential exposure to mine/mill related metal constituents associated with these trail segments by effective management and control of the exposure pathway. In the interest of completing the prescribed priority actions during the 2006 field season, the control measure implemented will be to either cover the trail segment with a protective surface of borrow material, relocate the trail, or to close the trail to visitor use. The decision as to which measure to implement on a trail segment will be based on trail importance to the Park's mission and cost. This work plan includes the characterization of metal concentrations of surface soils along the three trail segments and along the entire trail network within the Empire Mine SHP. This work plan has been prepared by MFG, Inc. (MFG) for Newmont Mining Corporation (Newmont) and the California Department of Parks and Recreation (CDPR).

2.0 SCOPE OF WORK PLAN

This work plan includes a description of the three trail segments within the Empire Mine SHP identified for priority action and the details of the control measures. The plan also describes the process for determining which control measure is to be implemented and the characterization of metal concentrations of soils along the three trail segments identified for 2006 priority action as well as characterization of metal concentrations along the other trails within the SHP.

3.0 DESCRIPTIONS OF TRAIL SEGMENTS

Approximately 12 miles of designated trails have been established by the California Department of Parks and Recreation (CDPR) within the Empire Mine SHP for public access. Three trail segments have been identified as key use areas in which mine/mill related materials are potentially present. The locations of the trail segments are shown on Figure 1. A brief description of the trail segments and their respective settings is provided in the following sections.

3.1 WYOD Trail Segment

The WYOD Trail segment is made up of four sub-segments that traverse and provide access to the WYOD Mine area from the Hard Rock Trail. The sub-segments of the WYOD Trail segment are identified as sub-segment A, B, C and D on Figure 1. In total, the WYOD Trail segment is approximately 2,850 feet in length.

The WYOD Trail segment runs through and around the WYOD Mine area, a small accumulation of piled waste rock materials adjacent the Hard Rock Trail. These waste rock materials are composed of weathered bedrock materials which were removed from the WYOD Mine during mine development in the early 1900's. The materials range from weathered granitic geologic rock compositions to more durable rock types such as quartz and other host geologic formations. Materials around the WYOD range in size from cobbles to fine sands. The WYOD Trail segment surface is composed of a variety of materials including some mine material, particularly where the trail sub-segments pass over and through the mine surface workings.

3.2 Sand Dam Trail Segment

The Sand Dam Trail segment is the portion of the Hard Rock Trail west of the Sand Dam tailing area extending south from the junction of the Hard Rock Trail with sub-segment D of the WYOD Trail segment (see Figure 1) to the point where the trail intersects Little Wolf Creek. The length of the Sand Dam Trail segment is approximately 1,030 feet. A portion of the Sand Dam Trail segment extends along the Sand Dam embankment, which contains the Sand Dam tailing area. The Sand Dam embankment, which forms the surface of the trail, appears to have been constructed with waste rock. The waste rock appears to range from gravel to cobble in size, with little weathering. The Sand Dam tailing area contains historic tailing from the stamp mill and cyanide plant. The tailing is sand size and weathered. The tailing area has been closed to public access. Past transport of tailing materials from the Sand Dam tailing area to the trail surface is possible.

3.3 Conlon Mine Trail Segment

The Conlon Mine Trail segment accesses the Conlon Mine area and the area comprising the historic Conlon Mine workings (Figure 1). The trailhead is at the junction with the Osborne Hill Trail Loop and extends southeast into the historic mine workings area, ending at the Park boundary near Osborne Hill Road. Access to the Conlon Mine Trail segment from the road and the Park boundary is fenced. The length of the Conlon Mine Trail segment from the Osborne Hill Trail Loop to the historic Conlon Mine workings area is approximately 1,160 feet in length.

The Conlon Mine area consists of mine/mill related waste materials generated during the early development and operation of the mine during the early 1900s. The mine area includes several waste rock facilities and possible tailing material depositions.

4.0 EXPOSURE PATHWAY

The exposure pathway of concern for the designated trail segments is the inhalation and coincident ingestion of dust generated from fine-grained mine/mill related materials on the trail surface due to visitor use (walking, jogging, biking, or horseback riding) of the trail segments. The control measures, covering, relocation, or closure, will effectively manage and control this potential exposure pathway. The control measures are described in the following section.

5.0 CONTROL MEASURES

The control measures that will be implemented to limit the potential exposure pathway (dust generation/inhalation) associated with the designated trail segments are described in the following sections. The control measure to be applied to a trail segment will be determined based on importance to the Park's mission, and cost of implementation of the measure. The control measures consist of covering the trail surface, relocating the trail, or closing the trail.

5.1 Trail Cover

Trail sections found to pose potential airborne exposures as a result of dust generated from mine or mill-related materials may be covered. The trail surface will be covered with imported minus ¾-inch roadbase or similar material. The covering surface will be applied approximately 3 to 6 inches in depth depending on the topography of the exposed trail surface. The selection of the imported cover material will be compatible with the trail uses and will be consistent with the California Department of Toxic Substances Control's (DTSC) Information Advisory For Clean Imported Fill Material (October 2001). In some areas of the trail, it may be necessary to place some form of containment along the sides of the trail, such as landscaping timbers, to insure that the roadbase stays in place.

5.2 Trail Relocation

Trail segments or portions of a trail segment may be relocated in areas where the existing trail crosses over or adjacent to mine/mill related materials. The trail will be moved if the following can be achieved:

- The purpose of the trail can be maintained after relocation
- The relocated trail will continue to contribute to the SHP's mission and will not disturb other historic features of the Park
- The trail can be relocated away from the mine/mill related materials without causing unacceptable environmental impact to the surrounding area

After relocation of the trail section the "old" trail section will be closed in a manner consistent with the guidance set forth in the following section.

5.3 Trail Closure

Trail segments may be closed and excluded from current trail system use. Closure of a trail will take into account the following considerations:

- Closing the trail will not affect the SHP's mission.
- Closing the trail will not greatly inconvenience or otherwise detract from the public's use and experience.

- Closing a trail segment will not preclude access to other important park features. This consideration will include the relationship and relative importance of the trail in question as to access to other trails, features, or locations outside the park.
- Covering or relocating a trail is not practical or cost effective.

Trail sections selected for closure will be closed at primary entrances with main trail access points, thus eliminating possible dead-end trails. Grading of the “closed” sections of trail for a distance of 50 feet from the intersection with an open trail will also be used to help detour further public use. Rocks, dead tree limbs, and other natural barriers will be placed to “blur” the presence of an “old” trail. Fencing will be placed at the edge of the “blurred” trail section. The fencing will be composed of a material that is consistent with the design of the SHP. The fencing will be placed in such a manner as to block the opening of the “closed” trail section and extend a minimum of 200 feet on both sides of the trail or until a natural physical barrier is reached, whichever is obtained first. The fencing will be placed 50 feet away from the intersection between the “closed” segment and the open segment of trail. This will be done to minimize the visual presence of the “closed” segment of trail. It may be necessary to lengthen the fence section across the trail opening if the public is found to be passing around the fence to gain access to the “closed” trail.

Signs will be placed along closed trail sections in accordance with the following guidelines:

- Comply with applicable regulatory provisions
- Provide the public with useful information as to the specific reason for trail closure, the expected duration of closure, and the general nature of the potential health exposure that has been addressed
- Give the public general guidance about safe use of the park

Signage will be clearly visible, placed at the visitor center, major trailheads, and proximate to the location at which trails are closed.

6.0 TRAIL SURFACE CHARACTERIZATION

Characterization of the physical conditions and metal concentrations of the soil surface comprising the trails will be performed as described below for the three identified trail segments and the entire trail network within the Empire SHP. The field characterization activities will be performed by walking the entire length of the designated trails.

6.1 Three Identified Trail Segments

Prior to implementation of the control measure, a survey of the three trail segments (Sand Dam, WYOD, and Conlon Mine trails) will be performed to characterize:

- the metal concentrations of the existing soil surface at intervals along the trails
- the physical condition and configuration of the trails
- presence of potential historic features near the trails
- trail location with respect to visually identified mine/mill related materials.

In-situ field x-ray fluorescence spectrometry (XRF) analysis of metals concentrations of surface soils along the three trail segments will be performed using a portable XRF instrument. The XRF measurements will be performed at 100 foot intervals near the centerline of the trail. Additional field XRF measurements will be performed, if necessary at the discretion of the field team, along the trail segments where a visual difference in soil characteristics (color and/or texture) or the presence of mine/mill materials is observed that is not delineated at the 100-foot intervals. Metals measured by XRF will consist of arsenic, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

At 20 percent of the in-situ field measurements, a soil sample will be collected for intrusive XRF analysis and laboratory analysis. The laboratory analysis will be performed for the CAM-17 metal constituents. The soil samples will be collected at locations that represent the range of the lead and arsenic concentrations measured by the in-situ field XRF measurements. The intrusive XRF and laboratory analysis will provide metals concentration data to correlate with and confirm the in-situ XRF measurements, to evaluate detection limits of the in-situ XRF measurements, and to provide data for the CAM-17 metal constituents that can not be measured by the portable XRF instrument. The XRF measurements, soil sample collection, and laboratory analysis of the samples will be performed according to the Sampling and Analysis Plan provided in the attached Appendix A.

In addition to the XRF measurements, a visual survey will be performed to define the overall physical condition and configuration of the three trail segments. The visual survey will document the alignment, width, physical access, soil surface conditions, presence of defined stormwater drainage paths, and

vegetative conditions adjacent to the trails. The soil comprising the trail surface will be generally described based on visual observations of color and texture. The presence of mine/mill related materials (i.e. waste rock or tailings) comprising the trail surface or located adjacent to the trail will also be visually identified. The presence of potential mine/mill related historic features (e.g. shafts, building foundations, cribbing) located adjacent to the trails will also be identified.

6.2 Empire Mine SHP Trail Network

As shown on Figure 2, a trail network consisting of approximately 12-miles of defined trails have been designated and authorized by the CDPR for public access within the Empire Mine SHP. As part of this work plan, a survey will be performed of the entire network of trails designated and authorized for public access. The survey will be performed as described in Section 6.1 with the following modification: in-situ field XRF analysis of soils will be performed at 200 foot intervals along the trail surface changing to 100 foot intervals along the trail in areas where mine/mill related materials are visually identified to comprise the trail surface or are present immediately adjacent to the trail.

7.0 SELECTION OF APPROPRIATE PRIORITY ACTIONS TO BE IMPLEMENTED

The selection of the appropriate control measure for each trail segment will be based on consideration of the importance of the trail segment to the Park's mission and the cost to implement the measure taking into account the following:

- General trail use and location with respect to other park facilities and access
- Trail importance to Park mission
- Trail importance to public use
- Cost of implementation of alternative control measures

8.0 PRIORITY ACTION SPECIFICATIONS AND IMPLEMENTATION

The specifications for the control measure to be implemented for each trail segment (or portions of trail segments) will be developed in the detail and specification necessary to allow implementation and construction of the action. The specifications will include:

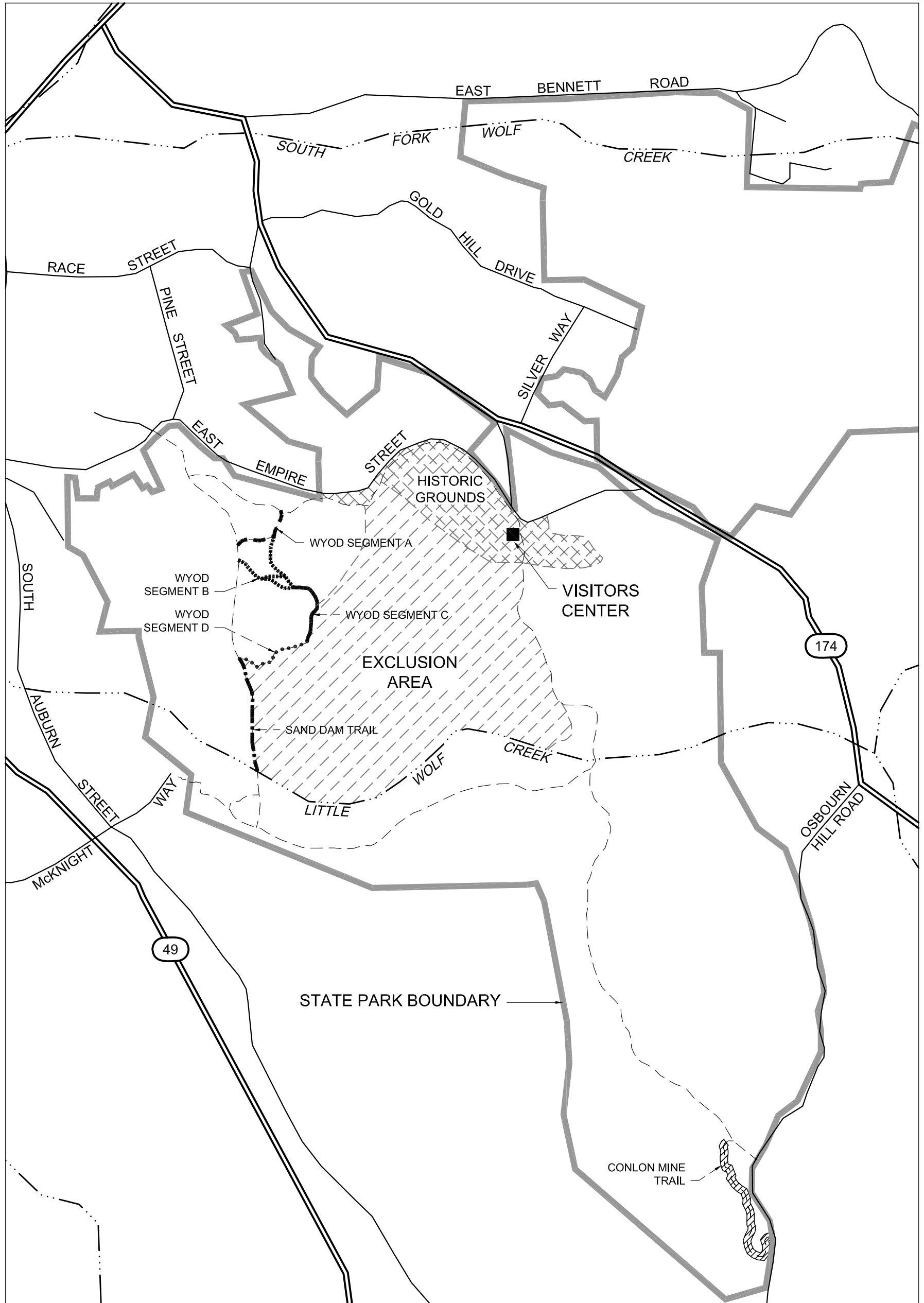
- Map location of the various actions
- Details regarding signage
 - Size
 - Shape
 - Number
 - Message
 - Color
- Details regarding trail closure
 - Education
 - Signage
 - Physical barriers (fencing)
- Details regarding trail relocation
 - Identification of trail segments (or portions of trail segments) to be relocated
 - Relocated trail alignment
 - Construction specifications
 - Construction BMPs
- Details regarding cover placement
 - Specification of trail areas to be covered
 - Material specifications
 - Construction specifications
 - Construction BMPs

In addition, an implementation plan will be developed for the specified control measure that includes:

- Schedule
- Contractor selection
- Health and Safety Plan (HASP)

9.0 COMPLETION REPORT

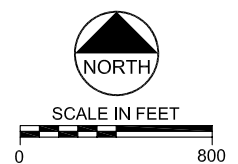
Within 60 days following completion of all 2006 Priority Action Trails Work Plan activities, a completion report will be prepared and submitted to the DTSC and the Central Valley Regional Water Quality Control Board (CVRWQCB). The completion report will fully document all aspects of trail work completed associated with the 2006 Priority Action Trails Work Plan, including the results of the trail surface characterization. Each portion of this work will be adequately recorded and supported by the applicable field logbook and will be represented on the SHP base working map. A maintenance plan will be provided in the completion report that specifies maintenance activities to be performed for the specific control measures implemented for the three trail segments.

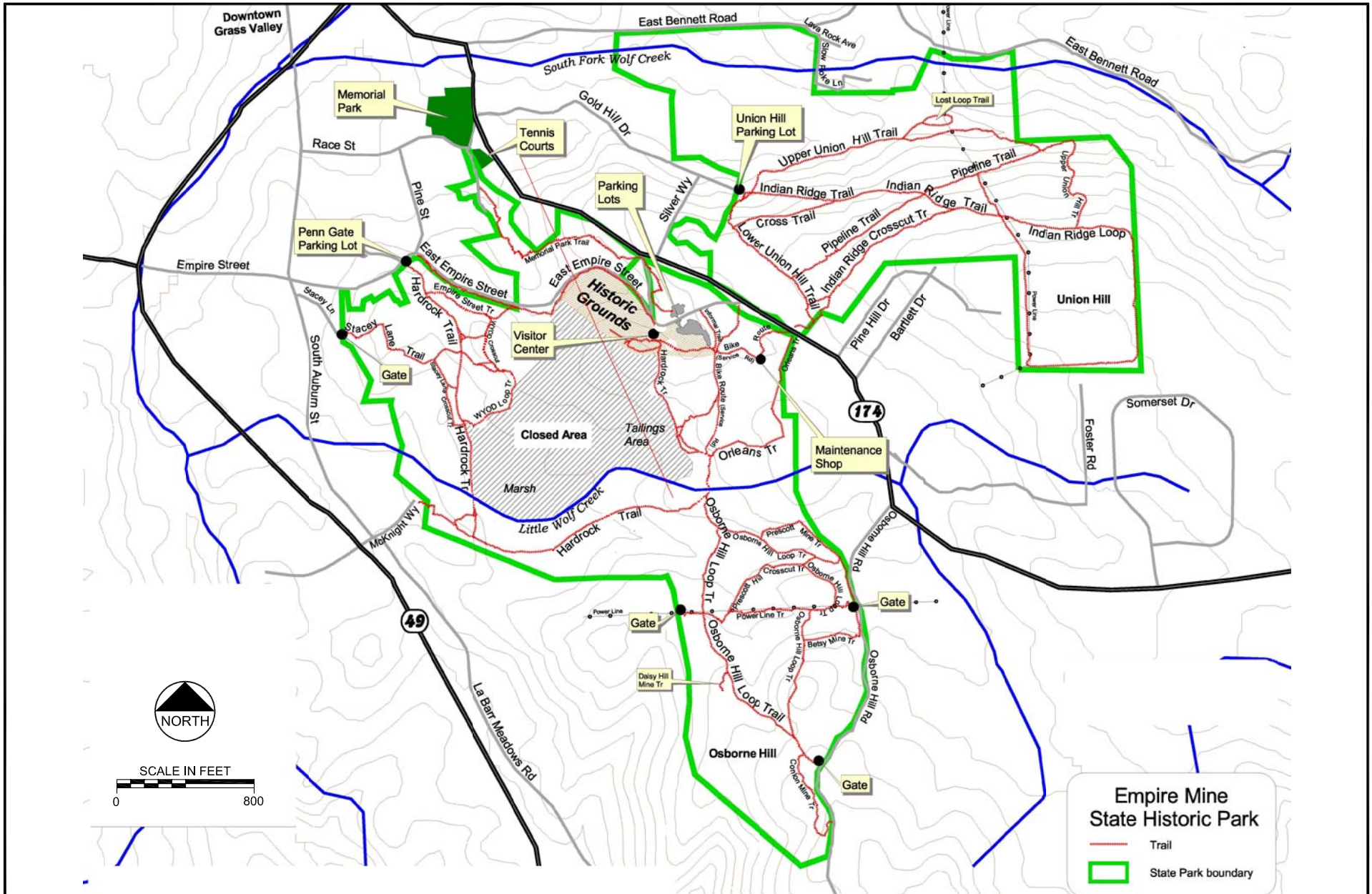


BASE MAP COURTESY OF EMPIRE MINE STATE HISTORIC PARK

LEGEND:

- WYOD SEGMENT A
- WYOD SEGMENT D
- WYOD SEGMENT B
- WYOD SEGMENT C
- SAND DAM TRAIL
- ////// CONLON MINE TRAIL





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FIGURE 2
EMPIRE MINE SHP TRAIL NETWORK
 (DRAWING PROVIDED BY C DPR)

Date: JUNE 2006
 Project: 180156
 File: FIG-SCAN-01.DWG

APPENDIX A
SAMPLING AND ANALYSIS PLAN

**SAMPLING AND ANALYSIS PLAN
EMPIRE MINE STATE HISTORIC PARK
TRAILS**

JULY 2006

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TABLE

Table 1 Soil Sample CAM-17 Parameters, Analysis Methods and Method Detection Limits

1.0 INTRODUCTION

The purpose of this Sampling and Analysis Plan (SAP) is to support the XRF measurements, soil sample collection and analysis, and visual survey activities described in the trail surface characterization of the Trails 2006 Priority Removal Action Work Plan. The field activities will be performed by walking the entire length of the designated trails.

In-situ field XRF analysis of metals concentrations of surface soils will be performed near the trail centerline at specified intervals along the length of the trails. For each of the three identified trail segments (Sand Dam, WYOD, and Conlon Mine trails), XRF measurements will be performed at 100 foot intervals. For the remainder of the approximate 12-mile long trail network that has been designated and authorized for public access within the Empire Mine SHP, in-situ field XRF analysis of soils will be performed at 200 foot intervals reducing to 100 foot intervals in areas where mine/mill related materials are visually identified to comprise the trail surface or are present immediately adjacent to the trail. Additional field XRF measurements will be performed, if necessary at the discretion of the field personnel, along the trail segments where a visual difference in soil characteristics (color and/or texture) or the presence of mine/mill materials is observed that is not delineated at the specified intervals. The in-situ XRF measurements are performed directly on the soil surface in the field to provide real-time analysis of metal concentrations. Metals measured by XRF will consist of arsenic, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

At 20 percent of the in-situ field XRF measurements, a soil sample will be collected for intrusive XRF analysis and laboratory analysis. The intrusive XRF measurements are performed on prepared soil samples (dried if necessary, minus 60-mesh sieve, and placed in a polyethylene XRF sample cup for analysis). The laboratory analysis will be performed for the CAM-17 metal constituents. The soil samples will be collected at locations that represent the range of the lead and arsenic concentrations measured by the in-situ field XRF measurements. The intrusive XRF and laboratory analysis will provide metals concentration data to correlate with and confirm the in-situ XRF measurements, to evaluate detection limits of the in-situ XRF measurements, and to provide data for the CAM-17 metal constituents that can not be measured by the portable XRF instrument. The XRF measurements, soil sample collection, and laboratory analysis of the samples will be performed as specified in the following sections of this Sampling and Analysis Plan. Quality control procedures are specified in the Quality Assurance Project Plan (QAPP) for the 2006 Priority Action Work Plans.

The locations of the XRF measurements will be determined by measuring the distance along the trail with a measuring wheel, referenced to the individual trail head. The locations will be identified as the

continuous station distance from the respective trail head (2+00, 4+00, etc.). At each interval, measurements will be located near the approximate centerline of the trail as determined in the field by visual inspection. The measurement identification will be entered into the XRF datalogger. The coordinates of each measurement location will also be determined using a hand-held GPS. Photographs will also be taken at the measurement locations and at other locations along the trail at the discretion of the field personnel to document the measurement locations and the general conditions along the trail.

As described in the work plan, a visual survey will be performed during the XRF measurements to define the overall physical condition and configuration of the trails. The visual survey will document the alignment, width, physical access, soil surface conditions, presence of defined stormwater drainage paths, and vegetative conditions adjacent to the trails. The soil comprising the trail surface will be described based on visual observations of color and texture. The presence of mine/mill related materials (i.e. waste rock or tailings) comprising the trail surface or located adjacent to the trail will also be visually identified. The presence of potential mine/mill related historic features (e.g. shafts, building foundations, cribbing) located adjacent to the trails will also be identified. The above visual survey information will be recorded in the field logbook.

At each measurement location, the following information will be recorded in the field logbook or on a designated field form:

- Names of field personnel
- Date/time of measurement
- Trail name and measurement identification location
- GPS coordinates
- General weather conditions (e.g. hot, windy, no precipitation)
- Trail width, alignment, and terrain (e.g. 2-foot width, straight, flat)
- Soil description, including color and texture (e.g. red-brown, sandy silt with occasional gravel) and relative moisture content (e.g., dry, moist, wet)
- Description and location of mine/mill related materials, if visually present on or adjacent to the trail
- Description and location of nearby features (e.g. shafts, building foundations, cribbing), if visually present
- Description and location of stormwater drainage paths, if present near the measurement location
- General description of vegetation conditions adjacent to the trail surface

- Soil sample identification, sample collection location, and collection time, if sample is collected
- Any problems encountered or deviations in XRF operation or sample collection methods
- Description of any unusual circumstances
- Photo documentation details, if necessary

In addition, the following information will be recorded in the field logbook at least on a daily basis to document the field in-situ XRF measurements:

- XRF make and model number
- Documentation and results of instrument performance checks
- Certified reference materials (NIST standards) and blanks used for calibration purposes
- Site-specific calibration standards used
- Any problems encountered in instrument set up and operation

2.0 FIELD PORTABLE X-RAY FLUORESCENCE (XRF) PROCEDURES FOR MEASUREMENT OF METAL CONCENTRATIONS IN SOILS

2.1 Scope and Applicability

The following procedures describe the protocol for performing in-situ and intrusive analysis of soil using a field-portable, NITON Corporation X-Ray Fluorescence (XRF) Spectrometer, in accordance with EPA Method 6200, Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, Revision 0, January 1998. These procedures will also be used in conjunction with the NITON Corporation operation manual for the XRF 700 series instrument. Any changes or modifications to these procedures will be documented by the field technician and approved by the project manager.

2.1.1 Principles of Operation

The NITON XRF 700 series instrument uses a cadmium (Cd-109) radioisotope source for the analysis of inorganic metal concentrations. Principles of operation are defined in the NITON operation manual and EPA Method 6200.

2.1.2 Health and Safety Issues

Proper training for safe use of the instrument and radiation training will be completed by the user prior to use of the instrument. This will include participation in a formal training session by the NITON representative. Information and procedures contained herein are specific to the operation of NITON XRF 700 series instrument. The user will also refer to the operation manual for the NITON XRF 700 series instrument for proper operation of that instrument. The instrument user should also be aware of local, state and national regulations that pertain to the use of radiation producing equipment and radioactive materials. Compliance with all applicable regulations is required.

Safety precautions, as specified by NITON Corporation, for use of the XRF instrument are as follows:

- Never point the XRF at yourself or anybody else with the shutter open.
- Stand to the rear or side of the XRF when the shutter is open. Do not operate the instrument in a seated position; this may expose your lower body to radiation.
- Do not fix the shutter in an open position (except in provided test stands).
- Do not leave the XRF unattended.
- Only trained people will operate an XRF.
- Open the shutter only with the sample in place.
- Never open the probe.

- Store the XRF in a safe place. Do not drop the machine (or put the instrument in a position where it will be likely to be dropped).
- Wear a dosimeter ring (if required by regulations).
- Perform wipe tests, per manufacturer's instructions.
- Women of child bearing age should be aware of the potential damage to a developing fetus from radiation exposure.
- Transport XRF in a shock-proof case.
- Follow all manufacturer's training and instructions.

OSHA exposure limits, as presented by NITON Corporation, are presented below.

Whole body exposure:	5,000 mrem/yr	1,250 mrem/quarter
Extremities:	50,000 mrem/yr	18,750 mrem/quarter

Some states have specified lower limits for public exposure. The lowest exposure limits were found to be 100 mrem/yr and 1 mrem/day.

More detailed information and procedures are contained in EPA Method 6200, Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, Revision 0, January 1998.

2.2 Procedures

This section provides procedures for two types of measurement of metal concentrations with the portable XRF instrument according to procedures recommended in EPA Method 6200: in-situ and intrusive measurements. The in-situ XRF measurements are performed directly on the soil surface in the field to provide real-time analysis of metal concentrations. The intrusive XRF measurements are performed on prepared soil samples.

2.2.1 In-Situ XRF Analysis

The following procedures outline the steps for in-situ XRF analysis of undisturbed soils in the field. The procedures for intrusive XRF analysis of a prepared soil sample are provided in Section 2.2.2.

2.2.1.1 XRF Daily Calibration and Preparation

See instructions in Section 2.2.2.3, for XRF Calibration that follows general manufacturer procedures and calibration checks with certified reference materials (CRM), field blanks, etc.

2.2.1.2 XRF In-Situ Analysis

Attach the NITON test guard to the NITON XRF detector. Determine and prepare the location to be sampled. Remove any debris on the soil surface consisting of rocks, pebbles, leaves, vegetation, twigs roots, or other debris. Level and smooth the soil surface with a stainless-steel or plastic trowel so that the probe window is in direct contact with the soil surface. Lightly tamp the soil surface with the trowel to increase soil density and compactness. The soil will not be saturated or have a moisture content exceeding approximately 20 percent.

When ready for analysis, press the XRF down on the soil surface, thus opening the XRF shutter. Maintain the XRF shutter open for the specified count time (60 seconds is recommended) then remove/release the XRF from the sample to stop the analysis. The measured metal concentrations are recorded by the XRF datalogger.

2.2.1.3 Decontamination

After every test the XRF detector shutter and the NITON test guard will be wiped clean with tissue or wipes. If a stainless-steel trowel or other non-disposable equipment is used for the XRF in-situ measurements, decontamination procedures that are provided in Section 2.2.2.9 will be followed.

2.2.2 Intrusive XRF Analysis

The following method outlines procedures for intrusive XRF analysis of a collected and prepared soil sample according to procedures recommended in EPA Method 6200.

2.2.2.1 Supplies

General Sample Supplies:

Stainless steel bowls
Stainless steel trowel or spoon
Disposable plastic spoons
Paper towels
Toaster oven
Deionized water
Alconox detergent (or similar)
Scrub brushes
Sample bags/containers

XRF Equipment and Supplies

(obtained from the XRF manufacturer):

XRF instrument and mini lab kit
Sieves
Mortar and pestle (ceramic)
Polyethylene sample cups, collar, and bottom
X-ray window film (Mylar, or similar)

2.2.2.2 Sample Collection and Preparation

Soil samples will be collected in such a manner that the sample is representative of the soil matrix tested by the in-situ XRF measurement. Sample collection procedures are described in Section 3.0. Typically, the soil sample will be collected from a 4-inch by 4-inch square area to a depth of one to two inches.

However, a larger soil volume may be required to provide a sufficient sample for drying and sieving depending on the soil texture and moisture content, and if necessary splitting for QC testing or laboratory analysis. Rocks, pebbles, vegetation matter, and other foreign debris will be removed from the sample. The minimum soil sample volume will be sufficient to fill a 4-ounce plastic sample bag after sieving. The sample will be placed in a clean sample container suitable for thorough mixing of the sample, such as a Ziploc bag or stainless steel bowl.

2.2.2.3 XRF Daily Calibration and Preparation

Turn the XRF detector on and allow it to warm up for at least 15 minutes, as recommended by NITON. Perform a calibration check (i.e., instrument performance check) of the XRF detector according to manufacturer specifications. QC samples such as CRM, field standards, etc. will also be analyzed prior to sample analysis, as described in Section 2.4.

2.2.2.4 Homogenize the Sample

The sample will be mixed by kneading within the Ziploc bag or mixing in a stainless steel bowl using a clean stainless steel or plastic spoon. The sample will be mixed until the analyst is confident the sample has been completely homogenized.

2.2.2.5 Drying the Sample

If the sample is wet (moisture content greater than approximately 20 percent), the sample will be air-dried or dried in a conventional or toaster oven at a temperature no greater than 150 degrees Celsius. A microwave oven will not be used to dry the sample. If the sample is air-dried, it will be allowed to dry in a protected environment to prevent contamination by dust deposition. The sample will be inspected for any remaining foreign debris (rocks, metal, wood, etc.); any such debris will be removed. The sample should be dry enough for sieving; however, drying time may need adjustment, depending on the initial moisture content of the sample.

2.2.2.6 Sieving

Once the sample is dry, transfer a split of the sample to a 60-mesh sieve to obtain a sample of uniform particle size. After sieving, transfer the material retained on the 60-mesh sieve to the mortar and pestle and grind until soil particles are broken up. Once the sample is ground, pass the sample again through the 60-mesh sieve. The material retained on the sieve after it has been ground and sieved a second time will be discarded. If more processed material is needed for data analysis the above process will be repeated with another split of the original sample.

2.2.2.7 Sample Cups

Prepare the polyethylene sample cup by placing a piece of Mylar X-ray film over the sample cup body. Next, secure the film to the body by pressing the polyethylene collar down over the Mylar film and cup body. Make sure that the film has been “stretched” taut (no slack) and there are no wrinkles on the window portion of the film. Turn the sample cup over so the film is resting on the table. Next, transfer the sieved sample (Section 2.2.2.6) to the cup and fill the cup to the top or to a level where a minimum of 3/8-inch depth of sample is contained in the cup. If the sample size is not large enough to fill the cup, place a small piece of filter paper over the soil and then fill the remaining area with polyethylene cotton. The cotton should take up any remaining space in the cup so that the sample will stay pressed against the Mylar film. Next, press the cup bottom on the sample cup so that it lies flush against the cup body. Next, turn the sample cup over. There should be neither slack in the Mylar film nor space between the Mylar film and the soil sample in the cup. Write the sample identification number on the cup bottom with an indelible marker. The sample is ready for XRF analysis.

2.2.2.8 XRF Analysis

Place the sample cup in the soil test platform with the Mylar film/soil side up. Next place the XRF detector on the soil test platform. When ready for analysis, depress the XRF into the test stand, opening the shutter. The soil test platform has a lock down device and will hold the XRF in place. Keep the XRF shutter open for a specified count time (60 seconds is recommended) then remove/release the XRF from the sample to stop the analysis. Count times are the seconds the sample is analyzed. The same count time will be used for calibration standards and samples for the same matrix. Count times may vary depending on the required results and may range from 20 seconds to over 600 seconds. The longer the count time the lower the detection limit obtained. The measured metal concentrations are recorded by the XRF datalogger.

2.2.2.9 Decontamination

Equipment, including stainless steel bowls, mortar and pestle, sieves, reusable trowels or spoons, etc. will be decontaminated prior to reuse. Decontamination procedures will consist of wiping with a clean paper towel or dry brushing loose soil from each piece of equipment. Next, rinse and/or scrub equipment with a DI and Alconox mixture using a clean scrub brush. Rinse with DI or distilled water, and then wipe dry with clean paper towels or air dry. If air drying is used, ensure the area is clean and away from areas where recontamination by dust deposition is possible. Store equipment in plastic or other protective covering to keep clean. The XRF detector and soil test platform may be wiped with a clean paper towel. The work area will be kept clean and clear of unnecessary equipment at all times. It is recommended that

plastic be used to cover the work surface so that it may easily be replaced with new and clean plastic whenever necessary.

2.3 Documentation

Information to be recorded in the field notebook or designated field form for the field in-situ XRF analysis is described in Section 1.0. The following information will be recorded in a notebook or logbook for intrusive XRF analysis:

- Site-specific calibration standards used, or field standards if any
- Instrument make and model number, supplier of instrument, radioactive source used
- Date of analyses
- Name of analyst
- Sample locations and identification numbers
- Documentation of instrument performance checks
- QC samples, their origin and type
- Sample preparation method, sieve size used, if any
- Samples submitted to the laboratory for analyses
- Any problems encountered in instrument set up and operation or sample preparation and analysis

2.4 Quality Assurance/Quality Control

Proper warm up times and calibration of the XRF detector will always be followed as recommended and specified by the manufacturer (Section 2.1.1).

Additional QA/QC measures may include analyses of sample duplicates, field standards, and soil blanks to describe precision, accuracy of field XRF data. Certified reference material (NIST standards) and soil blanks have been provided with the NITON XRF. The low, medium, and high NIST soil standards and soil blanks provided by NITON will be measured every time the instrument is calibrated to insure the accuracy the XRF. Calibration will be performed at least once per day.

Duplicate in-situ field XRF measurements and intrusive XRF measurements will be repeated at a minimum of one for every 20 measurements. No equipment blanks or field blanks will be collected.

3.0 SOIL SAMPLING AND ANALYSIS PLAN

A soil sample will be collected at 20 percent of the field in-situ XRF measurements. The soil samples will be collected at locations that represent the range of the lead and arsenic concentrations measured by the in-situ field XRF measurements. The soil samples will be analyzed by intrusive XRF measurement, and by the laboratory for CAM-17 metal constituents. The intrusive XRF and laboratory analysis will provide metals concentration data to correlate with and confirm the field in-situ XRF measurements, to evaluate detection limits of the in-situ XRF measurements, and to provide data for the CAM-17 metal constituents that can not be measured by the portable XRF instrument.

3.1 Soil Collection and Handling Procedures

Following field in-situ XRF measurement, the soil sample will be collected at the location of the in-situ XRF measurement. Soil samples will be collected using a dedicated plastic trowel. A metal spoon, shovel, hand spade, or pick can be used if needed to loosen the soil. The soil sample will be collected from an approximate 4-inch by 4-inch area from the surface to a depth of 1 to 2 inches. Stones, pebbles, and organic matter will be removed from the sample. At the discretion of the field sampling personnel, samples may be collected with a decontaminated stainless steel trowel, hand spade, or spoon if hard-packed soil conditions preclude the use of the plastic trowel. Samples will not be collected under or immediately adjacent to trees, shrubs and or structures. The sample will be collected in a clean re-closeable freezer-type plastic storage bag (Ziploc). The soil sample will be homogenized in the sample bag by kneading and hand-crushing of clods until the sample is thoroughly mixed. Each bag will be labeled with the sample identification number, sampler's initials, and the date and time of sample collection. The above information will also be recorded in the log book.

3.2 Equipment Decontamination Procedures

The following information describes the general decontamination procedures for field sampling equipment that is used to collect the soil sample. Sampling equipment will be decontaminated between sample collection points, if the equipment is not disposable, in order to avoid cross contamination between samples. Decontamination equipment may include, pump sprayers, spray bottles, deionized water, phosphate free soap solution, scrub brushes, buckets, disposable gloves, paper towels, etc. Field personnel will wear disposable gloves while decontaminating equipment.

The following sampling equipment decontaminated procedures will be followed:

- 1) Visually inspect sampling equipment for adhered soil; a disposable paper towel or stiff brush will be used to remove any visible material.
- 2) Wash the field equipment with phosphate free soap and water, rinse with distilled water, and air dry or wipe with disposable paper towels.
- 3) All disposable items, such as paper towels and disposable gloves will be deposited into a garbage bag and properly disposed.

3.3 Chain of Custody Procedures

A chain of custody form will be maintained for all soil samples from the time of collection until their final deposition, as described in the QAPP.

3.4 Soil Sample Packaging and Shipping

Each sample bag will be properly labeled in the field. All Ziploc bags will be checked for proper seal (reseal or re-bag any leaking bags) and entered by sample number on the chain of custody form. After collection, individual samples will be placed in a cooler or other suitable container for storage in the field. Samples will be shipped to the laboratory in a cooler with ice. The ice in the cooler will be double-bagged. One copy of the chain of custody form will be enclosed in a plastic bag in each cooler containing the samples identified on the form. The cooler will be taped shut and custody seals will be attached to the outside of the cooler to ensure that the cooler cannot be opened without breaking the seal. The cooler will be shipped using an authorized shipping service to the laboratory for analysis.

3.5 Quality Control Samples

Duplicate samples will be collected and submitted to the laboratory to evaluate the precision and reproducibility of sampling and analysis procedures. In addition, duplicate field in-situ and intrusive XRF measurements will be performed as described in Section 2.4. Duplicate soil samples will be submitted for laboratory analysis at a minimum of one duplicate sample for every 20 soil samples and will represent a split of the soil sample collected in the field. The duplicate soil samples will be preserved, packaged, and handled in the same manner as the soil samples. No equipment blanks or field blanks will be collected.

3.6 Laboratory Analytical Methods

The soil samples will be analyzed for the CAM-17 total metal constituents using methods detailed in Test Methods for Evaluating Solid Waste, Revised Methods, SW-846. Soil samples will be digested in accordance with SW-846 Method 3050. After digestion, all samples will be analyzed by EPA Method

6010. Table 1 identifies the CAM-17 metal constituents and method detection limits. Sample holding times and sample volume requirements are identified in the QAPP.

3.7 Log Book

A field log book will be maintained to document all sampling activities. All notes will be made in indelible ink. Entries on each page will be initialed at the end of each page by the sampling crew member who entered the information. If any changes are made to the record, the original notation will be crossed out with a single line and initialed. Information to be recorded in the log book or on a designated field form is described in Section 1.0.

Table 1 Soil Sample CAM-17 Parameters, Analysis Methods and Method Detection Limits

Parameter	Analytical Method	Target Method Detection Limit (mg/Kg)
Antimony	EPA 6010	2
Arsenic	EPA 6010	4
Barium	EPA 6010	0.3
Beryllium	EPA 6010	0.2
Cadmium	EPA 6010	0.3
Chromium	EPA 6010	1
Cobalt	EPA 6010	1
Copper	EPA 6010	1
Lead	EPA 6010	4
Mercury	EPA 7470	0.02
Molybdenum	EPA 6010	1
Nickel	EPA 6010	1
Selenium	M7742/Hydride	4
Silver	EPA 6010	0.5
Thallium	EPA 6010	20
Vanadium	EPA 6010	0.5
Zinc	EPA 6010	1