STANDARD OPERATING PROCEDURE NO. 81
COLLECTING INTACT SAMPLES FOR DIRECT SHEAR TESTS

REVISION LOG

Revision Number	Description	Date
81v0	Original SOP by KB and RDL	6/8/2006
81v1	Final edits by LMK Finalized by LMK for posting to Molycorp Project website and to send to George Robinson for lab audit	4/4/07

1.0 PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) provides technical guidance and methods that will be used to sample solid materials during environmental investigations at the Molycorp, Inc. (hereafter referred to as Molycorp) mine. This SOP is a supplement to the site-wide and investigation-area specific work plans and field sampling plans (FSPs), and should be used in conjunction with the other SOPs in this volume.

2.0 RESPONSIBILITIES AND QUALIFICATIONS

The Project Manager and Characterization Team will have the overall responsibility for implementing this SOP. They will be responsible for assigning appropriate staff to implement this SOP and for ensuring that the procedures are followed accurately.

All personnel performing these procedures are required to have the appropriate health and safety training. In addition, all personnel are required to have a complete understanding of the procedures described within this SOP, and to receive specific training regarding these procedures, if necessary.

All environmental staff and assay laboratory staff are responsible for reporting deviations from this SOP to the Team Leader.

3.0 DATA QUALITY OBJECTIVES

The characterization portion of this research project has identified nine DQOs (Data Quality Objectives), described in the QAPP (Quality Assurance Procedure Plan), that must be addressed in order to solve this problem. The field sampling plan specifically addresses three of these DQOs, which are listed below:

- Determine if cementation forms in the rock piles and alteration scars and, if so, determine how the cementation contributes to the stability of the rock piles.

- Perform direct shear test of intact samples under varying loads to determine the effects on shear strength and displacement as well as properties such as Mohr strength envelopes.

- Determine the influence of weathering on the shear strength properties of the material.

4.0 RELATED STANDARD OPERATING PROCEDURES

The procedures set forth in this SOP are intended for use with the following SOPs:

- SOP 1 Data management (including verification and validation)
- SOP 2 Sample management (including chain of custody)
- SOP 3 Surveying (GPS) and coordinate systems
- SOP 4 Taking photographs
- SOP 5 Sampling Outcrops, Rock Piles, and Drill Core (Solid)
- SOP 7 Decontamination of sampling equipment
- SOP 8 Sample preparation (solids)
- SOP 9 Test pit excavation, logging, and sampling (solid)
- SOP 36 Sample preservation, storage, and shipment
- Any other SOPs dealing with solid sample collection

5.0 TYPES OF SAMPLES TO BE COLLECTED

The following samples are to be collected for this project and for which sampling procedures are described in this SOP.

- Undisturbed soil samples (blocks)

Zip lock plastic bags are preferred for sample containers to prevent contamination in most cases and to retain the moisture content of the sample. Many cloth bags contain additives to enhance their strength, therefore, cloth bags that could contaminate the sample shall not be used for sample containers. In cases where plastic bags are not appropriate, other containers will be used as specified in the SOP and on the field sample forms (for example, moisture content jars, paper or cloth for moist samples).

6.0 EQUIPMENT LIST

- Nails (6 inches long)
- Square wood template (approximately 7”x7” piece of plywood with holes drilled ½” apart in a 6”x6” square)
- Piece of 2”x 4” wood approximately 1 foot in length
- Shovel
- Sidewalk scraper with the edge sharpened
- Pick
- Adhesive tape or Duct tape
- Plastic Wrap
- Wax Paper

- XXL and one gallon Ziploc Bags
- Styrofoam Insulation
- Rubber head hammer
- 4-inch square electrical boxes with the screw tabs removed and the edges sharpened
- Electrical box covers matching the size of the electrical boxes
- Measuring Tape
- Pocket Knife
- 5 gallon plastic buckets with lids
- Health and Safety equipment as outlined in the Site-Specific Health and Safety Plan
- Bound weatherproof field logbook
- Field sample data sheets
- Weatherproof labels and permanent markers
- GPS unit (SOP No. 3) set to correct coordinate system
- Decontamination Equipment (SOP 7)
- Digital Camera

7.0 SAMPLING PROCEDURES

7.1. COLLECTING SAMPLES FOR THE 4 INCH SHEAR BOX

1. This sampling method uses the wood square template and 6 inch nails. Three samples will be taken from each sample location.

2. Carefully select the sample location so the grain sizes in the samples are appropriate for the shear box size to be used during testing (See SOP 50 Shear box tests).

3. Place the wood square template over the area to be sampled. Using the rubber hammer, carefully drive a nail through one of the pre-drilled holes in each corner of the wood square template to hold it in place. Hammer nails into the remaining holes until a “cage” is formed around the sample.

4. Using the pick and shovel, excavate the soil around the nail cage. The nails and wood square template can then be carefully removed to reveal the undisturbed, intact sample.

5. Cover the exposed faces of the intact sample with pieces of Styrofoam insulation which have been cut to the size of the sample and wrap the insulation with tape. Carefully separate the intact sample from the outcrop by using the sidewalk scraper and turn it over. Cover the exposed side with a piece of Styrofoam insulation and wrap the sample with tape.

6. Wrap the sample and Styrofoam thoroughly with plastic wrap and apply tape around the entire sample assembly. This will help preserve moisture in the intact sample.

7. Using an indelible marker, write the sample number and unit identification (1 of 3, 2 of 3 or 3 of 3) on the tape surrounding the intact sample.

8. Write the sample number and sample identification on both the outside and the inside of an XXL Ziploc bag and place the wrapped sample in the bag and seal it. If possible, the sample should be kept in a cooler until it is ready to be tested.

9. Repeat steps 3 through 8 until three sample units are collected from each sample location.

10. A 5-gallon bucket sample should be collected from each sample location for particle size analysis, Atterberg Limits, and direct shear on disturbed samples.

7.2 COLLECTING SAMPLES FOR THE 2-INCH SHEAR BOX

1. Select a sample location where the grain size is appropriate for the size of the shear box to be used during sample testing (see SOP 50, Shear box tests).

2. Line the electrical box with plastic wrap and wax paper to prevent the sample from sticking to the electrical box.

3. Carefully push the electrical box into the sample location. If the box cannot be pushed into the sample location by hand, cover it with a piece of wood and, using as little force as possible, hammer the electrical box into the sample location with the rubber hammer.

4. Carefully remove the soil around the electrical box by excavating with the pick and shovel.

5. Use the sidewalk scraper to undercut the box and turn it over. Do this slowly to prevent disturbing the intact sample.

6. Place an electrical box cover over the sample and wrap the entire assembly with plastic wrap and tape. Using an indelible marker, write the sample number and unit identification (1 of 3, 2 of 3 or 3 of 3) on the tape surrounding the sample.

7. Write the sample number and sample identification on the outside and inside of a one-gallon Ziploc bag and place the sample assembly in the bag and seal it to maintain the moisture content of the sample. Place the sample in a cooler for transportation. The sample should remain in the cooler until it is ready to be tested.

8. Repeat steps 2 through 8 until three sample units have been collected from the same location.

9. A 5-gallon bucket sample should be collected from each sample location for particle size analysis, Atterberg Limits and direct shear on disturbed samples.

8.0 DECONTAMINATION OF SAMPLE EQUIPMENT

Sample equipment must be decontaminated between collection of each sample using available appropriate means (see SOP 7 Equipment decontamination). At a minimum, equipment must be brushed and wiped clean after each sample. Compressed air, acetone, or deionized water can be used when available. Use of heavy-weight latex gloves to protect hands when collecting is recommended for all sampling.

9.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND SAMPLES

QA/QC samples are designed to help identify potential sources of sample contamination, and to evaluate any potential error introduced by sample collection and handling. All QA/QC samples will be labeled and sent with the other samples to the laboratory for analysis. The type and number of QA/QC samples are defined in SOP 2, Sample Management.

10.0 SAMPLE MANAGEMENT

Each sample is assigned a unique field identification number. A chain of custody form will be completed and sent with each sample batch.

The field identification (ID) number for samples will consist of three components separated by dashes, for example SSW-HRS-0001, as described below.

Field Identification Number (Field id)

Component 1	Component 2	Component 3
Three letter abbreviation for the mine feature, for example SSW for Sugar Shack West.	Three letter initials of the sample collector, for example HRS for Heather R. Shannon.	Sequential four number designation, for example 0001.

Any deviations from this sampling numbering system will be documented and reported to the Team Leader and Principle Investigators.

11.0 DOCUMENTATION

Documentation of observations and data acquired in the field will provide information on the acquisition of samples and also provide a permanent record of field activities. The observations and data will be recorded on field sample forms and field logbooks and consequently entered into the database. All information on field forms must be completed.

If samples are held for an extended period of time (i.e., inadvertently missed Fed-Ex pick up), field personnel will document all sample handling and custody on field sample and COC forms and enter this information into the database.

APPENDIX 1 FORMS

See Molycorp project database for current versions of forms.

- Sample_field form
- Sample_anal_request_form
- Sample_preparation form