STANDARD OPERATING PROCEDURE NO. 2
SAMPLE MANAGEMENT

REVISION LOG

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<td>2.0</td>
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<td>2.1</td>
<td>Revisions by McLemore after field testing</td>
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1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard operating procedure (SOP) for sample management for the Molycorp, Inc. (Hereafter referred to as Molycorp) Rock Pile Stability Project, including sample handling, numbering, documentation, and analysis for samples collected from the following matrices for chemical and other analyses: sediment, soil, and
ground water. The analogous requirements for microprobe analyses can be found in the applicable sampling SOP. This procedure is to be used together with other SOPs.

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 Project Manager.

3.0 DATA QUALITY OBJECTIVES

The Data Quality Objective of this Sample Management SOP are to provide and maintain consistent standard procedures to label, transport, ship, and maintain Chain of Custody for Molycorp Project samples.

4.0 RELATED STANDARD OPERATING PROCEDURES

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

- SOP 1  Data management
- SOP 5  Sampling outcrops and drill core (solid)
- SOP 6  Drilling, logging, and sampling of subsurface materials (solid)
- SOP 7  Decontamination of sampling equipment
- SOP 8  Sample preparation (solids)
- SOP 9  Test pit excavation, logging, and sampling (solid)
- SOP 15  Surface Water and Seep Sampling
- SOP 16  Ground-water Sampling
- SOP 30  ICP-OES
- SOP 31  ICP-MS
- SOP 68  Water Analyses
- All other SOPs related to Molycorp samples
5.0 EQUIPMENT LIST
The following equipment will be used for sample management:

- Shipping forms
- Sample containers (collection bottles for water samples and 5 gallon buckets for bagged solid samples)
- Ziploc bags or other sample bags
- Ice (for water samples)
- Tape (clear and strapping)
- Scissors/knife
- Cooler/ice chest (for water)
- Custody seal
- Waterproof Pens
- Chain of Custody (COC) Forms
- Weatherproof Sample Labels
- Appropriate database forms
- Gloves
- Preservatives (if necessary)
- Packing material
- Trip blank (as necessary)
- Temperature blank

6.0 PROCEDURES FOR SAMPLE HANDLING, DOCUMENTATION, AND ANALYSIS

6.1 Sample Labeling
All sample labels should be weatherproof and should be filled out with indelible pen. Sample labels may be completed and attached to sample vessels prior to sample collection. Labels may be partially completed prior to sample collection. If buckets are used to ship solid samples, then each bucket must be labeled on the top and side with the same required information. For bagged solid samples, the outside of the bag must be labeled. The date and the sample identification number are required on all samples. At a minimum, each label shall contain the following information:

- Date of sample collection
- Analyses required
- Preservation used (if applicable)
- Filtered (if applicable)
- Sample identification (see below)

An example of sample label is provided in Appendix 1.

6.2 Sample Nomenclature Scheme
Each sample is assigned a unique field identification (field ID) number. A chain of custody form will be completed and sent with each sample batch.
The field ID number for samples will be comprised of three components, separated by dashes, as discussed in the table below:

**Field ID number**

<table>
<thead>
<tr>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three letter abbreviation for the mine feature, for example SSW for Sugar Shack West.</td>
<td>Three letter initials of the sample collector, for example HRS for Heather R. Shannon.</td>
<td>Sequential four number designation, for example 0001</td>
</tr>
</tbody>
</table>

Each sample is then assigned a separate sample ID number during sample preparation. The first part is identical to the field ID number and is followed by a sequential two numbers, for example SSW-HRS-0001-01.

**Sample identification number (Sample ID)**

<table>
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<th>Component 4</th>
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<td>Sequential four number designation, for example 0001</td>
<td>Sequential two number designation, for example 01</td>
</tr>
</tbody>
</table>

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

### 7.0 SAMPLE HANDLING

This section discusses proper sample containers, preservatives, and handling and shipping procedures. Tables 1, 2, and 3 summarize the information contained in this section and also include the sample holding times for water samples for each analysis.

#### 7.1 Sample Containers

Plastic bags can be used for solid samples and sealed by a twist tie, insuring they are airtight to prevent water loss and oxygen ingress over time. In most cases double bagging should be done to prevent potential sample loss. Include appropriate labels both inside and outside of the bag for each sample.

Clean sample containers for water analysis samples shall be obtained from the analytical lab. Each water sample should be placed in three bottles: one 125-ml bottle for trace element analysis, one 125-ml bottle for IC analysis, and one 250-ml bottle for all remaining Chem Lab analyses.

#### 7.2 Sample Preservation

All water samples will be stored on frozen ice packs in an insulated cooler to obtain a temperature of 4°C immediately following sample collection. Water samples collected for nitrate
and nitrite analyses will be preserved in the field with a few drops of chloroform and the sample container clearly labeled “w/ chloroform”. Water samples collected for trace element analysis will be preserved in the laboratory by laboratory personnel. Trace element sample bottles will be preserved with ultrapure nitric acid to a pH less than 2 at least 16 hours before analysis and will be clearly labeled “w/ HNO₃”. Cooling will be sufficient to preserve all other water samples. Soil and rock samples do not require additional preservation.

8.0 SAMPLE SHIPPING
Most samples will be transported by truck to the NMBGMR laboratories. The procedures following apply for samples shipped by carrier to other facilities. Solid samples will be stored in plastic sample bags, labeled, sealed, and placed in a plastic bucket for shipping. The bucket will be properly labeled as discussed above. Sample containers will be placed in resealable plastic storage bags and wrapped in protective packing material (if appropriate). Water samples will then be placed in a cooler with frozen ice packs for shipment to the laboratory. The drain on the cooler shall be taped shut. Samples collected in glass containers will be packed in foam liners and bubble packing or Styrofoam peanuts to ensure that no breakage occurs during shipment. A temperature blank will be included in each cooler.

Samples will be sent to the analytical laboratory via NMBGMR vehicle or by Federal Express or an equivalent carrier. Sample shipments will be insured if needed. Shipping receipts should be retained for documentation and sample tracking.

A completed chain-of-custody (COC) form (Appendix 1) for each sample container (bucket, cooler, other) will be placed in a Ziploc bag and taped to the inside of the cooler lid. A copy of pH, specific conductivity, and turbidity field data completed on water samples should be attached to the COC form delivered to the NMBGMR Chemistry Laboratory. Wrap each cooler with strapping tape in two places to secure the lids. Signed and dated custody seals shall be placed in two places on the outside of each cooler in such a manner as to allow detection of tampering (e.g., the seals must be broken to open the cooler). An example custody seal is included in Appendix 1.

9.0 HOLDING TIME REQUIREMENTS
The holding time is specified as the maximum allowable time between sample collection and analysis and/or extraction based on the analyte of interest, stability factors, and preservation methods. Allowable holding times for chemical analysis parameters for water samples are listed in Table 1. Samples should be sent to the laboratory after collection within sufficient time to allow the laboratory to meet holding time requirements.

10.0 QUALITY CONTROL REQUIREMENTS
QC requirements relevant to analysis of environmental samples shall be followed during analytical activities to meet the quality objectives and criteria of the project. The purpose of this
QC program is to produce data of known and documented quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis.

11.0 QC SAMPLES

A number of QC samples will be employed to assess various data quality parameters, such as representativeness of the environmental samples, the precision of sample collection and handling procedures, the thoroughness of the field equipment decontamination procedures, and the accuracy of laboratory analyses. A summary of QC samples for all chemical analysis methods is included in Table 1. Types of QC samples are discussed below and the number of these samples is also summarized in Table 1.

11.1 Matrix Spike/Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) water samples are prepared by spiking additional aliquots of sample with known concentrations of all project target analytes. The sample to be used for the MS/MSD analyses shall be designated on the chain of custody and additional sample volume shall be submitted, as necessary. The MS/MSD results are used to document the bias of a method due to sample matrix. Consequently, MSs and MSDs are not used to control the analytical process. A minimum of one MS and one MSD sample shall be analyzed for every 20 environmental samples of a given matrix. Alternately, a laboratory may prepare and analyze a MS sample and a laboratory duplicate sample as discussed below. Analysis of a MS/MSD or MS/LD (see next section for definition of LD) sample set to assess matrix effects on accuracy and precision is typically dependent on the analyte class (e.g., inorganic vs. organic) and the likelihood of detecting the target analyte.

11.2 Laboratory Duplicate

A laboratory duplicate (LD) is prepared by taking an additional aliquot of a sample and preparing and analyzing it in the same fashion as the parent sample. The LD is used to assess the precision of the method due to sample matrix. A minimum of one LD shall be analyzed for every 20 environmental samples of a given matrix. Alternately, the laboratory may analyze a MS/MSD pair as a means of assessing precision. Analysis of a MS/MSD or MS/LD sample set to assess matrix effects on accuracy and precision is typically dependent on the analyte class (e.g., inorganic vs. organic) and the likelihood of detecting the target analyte.

11.3 Field Blank

The field blank consists of American Society of Testing and Materials (ASTM) Type II reagent grade water (Type II reagent grade water is defined by ASTM as water that has greater than 1 megohm-cm resistivity) supplied by the laboratory that is poured into applicable sample containers at the sampling site (in the same vicinity as the associated samples). It is handled like an environmental sample and transported to the laboratory for analysis with the other samples. Field blanks are used to assess the potential introduction of contaminants from ambient sources to the samples during sample collection (e.g., blowing dirt, gasoline motors in operation, etc.). The frequency of collection for field blanks shall be a minimum of one field blank for every 20
environmental samples that are collected for organic analyses. Field blanks shall be collected at or near a sample location and if possible, downwind of possible contamination sources.

11.4 Rinsate Blank

A rinsate blank is a sample of ASTM Type II reagent grade water poured into, or over, or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. ASTM Type II reagent grade water obtained from the laboratory is used to prepare the rinsate blank sample. Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures used to prevent cross-contamination between sampling locations. The frequency of collection for rinsate blanks shall be a minimum of one rinsate blank for every 20 environmental samples collected with a given type of sampling equipment, and only for sampling equipment which is decontaminated and reused to collect environmental samples. Rinsate blanks will be prepared in a manner identical to samples and shall be analyzed for all laboratory analyses requested for the environmental samples collected at the site using the subject equipment.

11.5 Trip Blank

Trip blanks are required to determine if there is sample contamination during shipment and collection of the samples. The trip blank consists of a sample vial filled in the laboratory with ASTM Type II reagent grade water and transported to the sampling site. Trip blanks are not opened in the field, but are otherwise treated like an environmental sample and returned to the laboratory for analysis. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler sent to the laboratory containing samples for analysis.

11.6 Field Duplicates

A field duplicate sample is a second discrete sample volume collected at the same location as the original sample; homogenization is not performed between the original sample and the field duplicate. Aqueous field duplicate samples are collected from successive volumes from the same sample source and device (e.g., bailers). Sediment and soil field duplicates are collected in succession from the same sample source and device. Field duplicate samples are collected using identical recovery techniques and are treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as field duplicate samples by laboratory personnel performing the analysis.

Field duplicate sample results are used to assess precision of the sample collection process and the heterogeneity of the medium sampled. The frequency of collection for field duplicates is a minimum of one field duplicate sample from each group of 20 environmental samples of a given matrix. Specific locations for collection of field duplicate samples may be designated prior to the beginning of sample collection.
12.0 DOCUMENTATION AND TRACKING

A chain of custody form and request for analyses (Appendix 1) will be filled out for each continuous numbered sample or for each sample shipment container.

12.1 Field Notes

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 with waterproof ink in a permanently bound weatherproof field logbook with consecutively numbered pages and on field sampling data sheets.

The information in the field logbook will include the following as a minimum. Unless information is recorded on a field sample collection form and that form is cross referenced in the logbook entry. Additional information is included in the specific SOPs regarding the appropriate data sheets.

- Project name
- Location of sample
- Sampler's signature
- Date and time of sample collection
- Sample identification numbers and sample depth (if applicable)
- Description of samples (matrix sampled), indicate if composite or grab sample
- Analyses to be performed
- Number and volume of sample containers
- Description of QA/QC samples (if collected)
- Sample methods or reference to the appropriate SOP
- Sample handling, including filtration and preservation, as appropriate for intended analyses
- Field observations
- Results of any field measurements, such as depth to water, pH, temperature, turbidity, and conductivity
- Decontamination information
- Calibration information
- Personnel present
- Method of shipment
- Any deviations from SOPs

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 in the field logbook.

12.2 Chain of Custody Form

A record of each sample collected will be kept on a COC form. A given COC form shall not cover samples shipped in multiple coolers, but every sample in the bucket or cooler shall be covered by the COC form(s) accompanying that cooler. The COC form will provide an accurate written record that can be used to trace the custody of all samples from the time of collection through analyses and reporting. An example of an acceptable, completed COC form is provided in Appendix 1.
The following will be specified for each sample on the COC form as a minimum:

- Sample number
- Sample date
- Requested analyses
- Number of containers
- Sampler’s signature or initials
- Preservation technique
- Sample type (i.e., medium)

Also recorded on the COC is the signature of the person relinquishing custody, the date and time that custody was relinquished, the name and address of the laboratory, and the name and phone number of a contact person regarding the shipment. Whenever pH, specific conductivity, and turbidity have been measured in the field, a copy of the data should be included with the COC.

A sample is considered in custody if it is:

1. In one’s actual possession
2. In view, after being in physical possession
3. Locked so that no one can tamper with it, after having been in physical custody
4. In a secured area

Given that many of these samples are being collected by a group of team members, any one person in that group can take possession of the samples to start the chain of custody even if that individual is not the one who actually collected the sample. The person responsible for custody of the sample prior to delivery of the samples to the laboratory will sign the COC form and make a copy of the COC form to be placed in the binders at NMT. Upon receipt at the laboratory, the person receiving the samples will sign the COC form. Copies of the COC forms and all custody documentation will be received and kept in the central files. The original COC forms will remain with the samples until final disposition of the samples by the laboratory. The analytical laboratory should submit any remaining solid samples to the Project Manager for archiving after data reporting. Water samples will be disposed of in an appropriate manner. After sample disposal, a copy of the original COC will be sent to the Project Manager or Quality Assurance Manager or specified designee by the analytical laboratory to be incorporated into the central files.