EL DORADO HILLS NATURALLY OCCURRING ASBESTOS MULTIMEDIA EXPOSURE ASSESSMENT

TECHNICAL STANDARD OPERATING PROCEDURE
SOIL SAMPLE PREPARATION
Revision Number 3

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized procedure for preparation of soil samples for asbestos analysis. This procedure will be used by employees of United States Environmental Protection Agency (USEPA) Region 9 and by USEPA contractors/subcontractors supporting soil assessment activities during the USEPA Region 9, El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure project. Deviations from the procedures outlined in this document must be reviewed and approved by the USEPA Region 9 Task Monitor, Technical Advisor, or Quality Assurance Officer.

The procedures in this SOP were designed originally for the USEPA Region 8 project Libby, Montana, Environmental Monitoring for Asbestos; they have been modified to address site specific issues related to the El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure Assessment. The essence of the original soil preparation procedures remain largely unaltered, and the majority of the changes had to do with eliminating the references and related protocol specific to the Libby project.

For example, the particle size of 250 microns (Fm) remains unchanged. It was selected in an attempt to balance two opposing goals: 1) grinding the sample to a small enough particle size to obtain homogeneous soil samples; and 2) keeping the particle size distribution of sufficient size to accommodate analyses by several methods including polarized light microscopy-visual area estimation (PLM-VE), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). It is possible that for methods such as the TEM, further preparation at the laboratory may be necessary. If so, these additional steps will be addressed at the level of the TEM SOP.

One important change, however, was a modification of the soil drying time and temperature, which in the original document took into account the vermiculite in the soil in Libby. Since vermiculite in the soil is not a consideration for the El Dorado Hills soil, USEPA determined that it is acceptable to reduce the drying time and increase the drying temperature for the El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure Assessment.

Procedures outlined in this SOP have been designed with the intent to prepare soil samples having a target concentration greater than or equal to approximately 0.1 to 0.2% (weight percent) total Libby amphibole (LA) material.

2.0 RESPONSIBILITIES

The Preparation Laboratory Project Leader (PL^2) may be a USEPA employee, contractor, or sub-contractor who is responsible for overseeing the soil sample preparation activities. The PL^2 is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by the SOP. It is the responsibility of the PL^2 to communicate with the Preparation Laboratory personnel regarding specific collection objectives and anticipated situations that require any deviation from the this SOP. It is also the responsibility of the PL^2 to communicate and document the need for any deviations from the SOP with the appropriate START Project Manager. The START Project Manager will be responsible for gaining modification/deviation approval from the USEPA Region 9 Task Monitor, Technical Advisor, or Quality Assurance Officer.

Personnel preparing soil samples are responsible for adhering to the applicable tasks outlined in this procedure and conducting all sample handling and preparation activities in the ventilation hood.

3.0 EQUIPMENT

- General purpose laboratory oven - must be capable of maintaining a constant temperature of approximately 120-130EC.
- Analytical balance- calibrated and accurate to tolerance limits indicated on Attachment 2, range of 0.1 g to at least 2000 g.
- Riffle splitter - with 3/4 inch chutes to split samples.
- Plate Grinder - capable of accepting soil particles of approximately 1/4 inch diameter and grinding to produce particles of approximately 250 Fm.
- Metal (other than plastic) scoop or spoon - for transferring samples.
- 1/4 inch metal (other than plastic) sieve and catch pan - for coarse sieving samples.
- 60 mesh (250 Fm) and 200 mesh (74 Fm) metal (other than plastic) sieves - for verification of the plate grinder settings.

- Clean quartz sand - required for preparation of grinding and drying blank samples (Sections 6.2, 9.2, 12.1 and 12.3) and for decontamination of grinder (Section 9.4).

- Clean soil - sufficient aliquot required for calibration of grinder (Section 9.1).

- Drying Pans - pans used during the sample drying process.

- Sample c rs - plastic ziplock bags (pint and gallon size)

- Gloves - sonal protection and to prevent cross-contamination of samples. May be plastic x. Disposable, powderless.

- Field clothing and Personal Protective Equipment - as specified in the Health and Safety Plan.

- Filed notebook - used to record progress, any problems or observations and deviations.

- Sample Drying Log Sheets - (Attachment 1) - used to record all sample drying information.

- Sample Preparation Log Sheets - (Attachment 1) - used to record all sample preparation information (splitting, sieving and grinding).

- Three-ring binder books - binders will contain:

  Analytical Balance Calibration and Maintenance Log (Attachment 2)
  Grinder Calibration and Maintenance Log (Attachment 3)
  Ventilation Hood Calibration and Maintenance Log (Attachment 4)
  Vacuum Maintenance Log (Attachment 5)
  Oven Temperature Calibration and Maintenance Log (Attachment 6)
  Sample labels

- Trash Bags - used to dispose of gloves, wipes and other investigation derived waste.

- Indelible Marking Pen - used to record sample information onto plastic siplock bags and to record logbook information.

- Ballpoint Pen - used to record filed logsheet information.

4.0 METHOD SUMMARY

Figure 1 provides an overview of the steps in this procedure. Approximately two litters volume of soil will be submitted to preparation laboratory. Soil samples are dried in a standard laboratory oven and split into a preparation sample and an archive sample. The preparation sample is sieved to separate coarse material (> 1/4 inch) from fine material (<1/4 inch). The fine material is ground to a standard particle size of about 250 Fm for subsequent asbestos analysis and archiving. The coarse material is collected and archived.

5.0 SOIL RECEIPT AND STORAGE

All samples will be assigned a "Sample Identification Name" prior to preparatory laboratory receipt of samples. Samples will be delivered to the preparatory laboratory under US EPA Chain-of-Custody documents and seals. Upon receipt of samples by the preparatory laboratory, the chain-of-custody documents will be signed and copies must be retained with other preparatory documentation. All received samples will be assigned a batch number by the laboratory based on the date of sample receipt. Upon receipt of samples, samples will logged and stored based on either the original "Sample Identification Name" or by an "Laboratory's Index Identification Name". Each samples "Sample Identification Name" will be recorded on the Sample Drying Log Sheet and Sample Preparation Log Sheet (Attachment 1).

6.0 BULK SOIL DRYING

Prior to drying, samples will be grouped in a drying batch and assigned a drying batch number. The drying batch will include all samples dried together in a drying oven. The following sections detail all activities and procedures related to drying samples.

6.1 Calibration

Samples will be weighed prior to and following drying activities. The analytical balance used for drying activities will be calibrated on days when samples are loaded into, or unloaded from, the oven. Before weighing samples, calibrate the balance using S-1 class weights and record all measurements, any required maintenance, and the balance number on the Analytical Balance Calibration and Maintenance Log (Attachment 2).

All drying activities will be performed under a negative pressure (high-efficiency particulate air) HEPA filtered hood. Prior to loading the oven, the ventilation hood will be calibrated to ensure that the ventilation system is operating properly. Ventilation hood calibration and any

required maintenance will be documented on the Ventilation Hood Calibaration and Maintenance Log (Attachment 4).

A HEPA vacuum will be used to decontaminate the oven following the removal of dried samples. Vacuum calibration will be performed daily, prior to drying activities. All system checks, required maintenance and the vacuum number will be recorded on the Vacuum Maintenance Log (Attachment 5).

Oven temperature calibration will be performed on a weekly basis. Oven temperature calibration and any required maintenance will be documented on the Oven Temperature Calibration and Maintenance Log (Attachment 6).

6.2 Drying Blanks

A drying blank will be created and associated with each drying batch prior to loading samples into the oven. A drying batch will consist of all samples dried together in a single oven. The drying blank will consist of approximately 100 to 200 grams of clean quartz sand, placed in a drying pan and assigned an identification name. Each drying blank will be identified on the Sample Drying Log Sheet (Attachment 1) and will be prepared using the same methodology as other soil samples. Following preparation, whenever possible, each blank will be shipped with its associated batch samples. See Section 12.1 for more details regarding drying blanks.

6.3 Drying Procedure

Samples will be loaded into the drying oven using the following steps:

- Record the SOP name and revision number used to prepare the samples on the Sample Drying Log Sheet (Attachment 1). Record the oven number used to dry the samples on the Sample Drying Log Sheet (Attachment 1).

- Prior to unsealing and drying each sample, record the sample mass of all submitted soil to the nearest 0.1 g, using a calibrated balance (See Section 6.1 for balance calibration details). The mass, with technician's initials and the date are recorded on the Sample Drying Log Sheet (Attachment 1). If, the total mass of sample exceeds the balance's capacity, then soil transfer may be necessary prior weighing and multiple weighing will be necessary.

- Set the oven temperature to 120EC and130EC. For every sample drying batch, check the oven temperature to verify that proper temperature has been reached, and document the start date/time and temperature on the Sample Drying Log Sheet (Attachment 1).

- Transfer each sample to be dried from its ziplock storage bag into a clean drying pan. Each sample should be transferred to its respective drying pan under the negative pressure HEPA filtered hood. Label each drying pan with its respective index ID. Place each sample in the oven.

- Leave the samples in the oven until completely dry. Verify that each sample is dry, by squeezing a portion of the soil with a freshly gloved thumb and forefinger to test the cohesiveness. Once it is confirmed that samples are dry, record on the Sample Drying Log Sheet (Attachment 1) the technician's initials, the date, and time of completion.

- Turn off the oven and allow the samples to cool in the oven. Once the samples are cooled, unload each sample and transfer each sample volume to a clean, tared ziplock bag.

- Determine final mass of dried sample and record mass on the Sample Drying Log Sheet (Attachment 1), for each bagged sample to the nearest 0.1 g. Include the technician's initials and the date.

- Re-bag the sample within another clean ziplock bag, and mark the dried sample with the index ID. All samples should be transferred to ziplock bags under the negative pressure HEPA filtered hood to prevent potential exposure to fibers that might be released from the sample.

6.4 Oven Decontamination

Decontaminate the inside of the hood and the inside of the oven by HEPA vacumming and wet wiping all surfaces before loading a new batch for drying.

Decontaminate all sample drying pans under the ventilation hood using compressed air or a HEPA vacuum to remove any residual organic material left on the pans. Wet wipe or brush off any visible material that is not removed from the air blast or vacuum. All pans will be decontaminated between samples.

7.0 DIVISION OF ARCHIVE AND PREPARATION SAMPLES

Prior to sieving and grinding, samples will be divided into a portion for archive and a portion for preparation. The sections below describe the sample splitting procedure.

7.1 Hood Calibration

Prior to any splitting, sieving, or grinding activities, calibrate the ventilation hood to ensure that the ventilation system is operating properly. Document ventilation hood calibration and any required maintenance on the Ventilation Hood Calibration and Maintenance Log (Attachment 4).

7.2 Procedu[illegible]ample Division

Samples will be divided using the following steps:

- Place the cooled, re-bagged samples in the hood, and knead the contents of the bag to break up any soil clumps.

- Splitting must be performed in the hood to prevent potential exposure to fibers that might be released from the sample. Place one pan on each side of the riffle splitter. Divide the sample into two equal sub-parts by removing the sample from its plastic bag and loading the dry material into the splitter.

- After splitting, set aside one part for sample preparation as described below (if the volume of the portion left for preparation is too large for processing, split the sample again so that 3/4 of the original sample will be archived and 1/4 will be set aside for processing).

- Place the remaining split portion into a clean, ziplock bag, re-bag the sample in another clean ziplock bag, and store as an archive sample in the event additional analyses are required in the future. Identify the archive sample with the identification name with an additional suffix of "A" (for archive fraction). 1, (ex. NYB-S10-101304-A for archive fraction). Record the technician's initials and date on the Sample Preparation Log Sheet. Store the archive portion for return to START with copy of the Sample Drying Log Sheet and Original Chain-of-Custody documents.

7.3 Preparation Duplicate Samples

One preparation duplicate sample will be processed for every 20 field samples prepared. A preparation duplicate is a split of soil sample submitted to the preparatory laboratory that is prepared in the same fashion as the parent sample (preparation split). The preparatory laboratory will be assigned a unique and random identification number to the preparation duplicate. For both samples, the corresponding identification numbers will be indicated in the

notes section of the Sample Preparation Log Sheet (Attachment 1). If a preparation duplicate is not being prepared for a particular sample, proceed to Section 7.4.

Following the division of a sample for preparation and archive. Divide the designated sample into two equal sub-parts using a riffle splitter (as described in Section 7.2). Retain one portion as the parent sample and assign the other portion the new identification number Record the technician's initials and the date of creation on the Sample Preparation Log Sheet (Attachment 1) when the duplicate sample is prepared. Prepare each portion according to the processes outlined below. For further information on preparation duplicates, refer to Section 12.2.

7.4 Splitter Decontamination

The splitter will not be decontaminated following this step provided the fine ground sample will be split again into four fractions in Section 10.0. If for any reason the same sample is not immediately split further, the riffle splitter must be decontaminated as follows:

Use a HEPA vacuum and compressed air to decontaminate the splitter, and brush or wipe off any visible material that is not removed by the air blast. The splitter is now ready to process the next sample.

8.0 PREPARATION SAMPLE SIEVING

All samples will be sieved prior to grinding to separate out the coarse and fine fractions. The sample sieving procedure is described in the sections below.

8.1 Post Sieving Calibration

All sieving activities will take place in the ventilation hood. Refer to Section 6.1 for details regarding the frequency of ventilation hood calibration.

Samples will be weighed during sieving activities. The analytical balance will be calibrated daily with S-1 class weights before processing begins. All measurements, any required maintenance, and the analytical balance number will be recorded on the Analytical Balance Calibration and Maintenance Log (Attachment 2).

8.2 Sample Sieving Procedure

Conceptually, sample sieving may generate a course and a fine fraction sample. Samples will be sieved using the procedure outlined below.

Coarse Fraction

A 1/4 inch stainless steel screen with catch pan will be used to divide the fine and coarse fractions using the following procedure:

- Pour the sample through the 1/4 inch stainless steel sieve and give the screen a shake to ensure all particles <1/4 inch in size are allowed to pass through the screen. In addition, a pestle may be used to break up any remaining soil clumps to ensure all particles <1/4 in size pass through the screen.
- Pour all material which does not pass through the screen (>1/4 inch) into a new, tared, sample bag, and identify the coarse sample with the identification name and an additional suffix of "C" (for "coarse fraction").
- Record the mass of the coarse fraction to the nearest 0.1 g on the Sample Preparation Log Sheet (Attachment 1), and record the technician's initials and the date.
- Double-bag the coarse sample portion, and identify the outer bag of the sample with sample identification name an additional suffix of "C"(for "coarse fraction", e.g. NYB-S10-101304-C for coarse fraction #1). Store the coarse fraction samples for return to START with copy of the Sample Preparation Log Sheet, Sample Drying Log Sheet, and original Chain-of-Custody documents. .

Fine Fraction

Tare an empty sieve pan to account for the weight of the pan containing the fine sample, and weigh the fine material that passed through the sieve. Record the mass of the fine fraction to the nearest 0.1 g on the Sample Preparation Log Sheet (Attachment 1). If all of the material passes through the screen, such that there is no coarse fraction, record a mass of zero for the coarse fraction on the Sample Preparation Log Sheet.

Whenever possible, immediately process the fine material that passes through the screen in accordance with the approach described in Section 9.3 (below). If processing cannot occur immediately, pour the fine material that passed through the sieve into a new plastic ziplock bag, and identify the fine sample material with an additional suffix of "F" (for "fine fraction"). Double-bag the sample and identify the inner and outer sample bag with the sample identification name the additional suffix.

8.3 Sieve Related Decontamination

Decontaminate all sieves, pans and the pestle under the ventilation hood using compressed air blow. Wipe or brush off any visible material prior to decontamination.. A wet wash or HEPA vacuum may also be used to remove any residual material left on the sieve pans. All pans and sieves will be decontaminated between every sample.

9.0 FINE SA[illegible] GRINDING

The fine sieved sample will be ground to produce a material of about 250 Fm. The fine sample will be packaged and shipped to the laboratory for asbestos analysis. The procedure for grinding the fine sieved sample is outlined below.

9.1 Grinding Related Calibration

All grinding activities will take place in the ventilation hood. Refer to Section 7.1 for details regarding the frequency of ventilation hood calibration.

A HEPA vacuum will be used to decontaminate the ventilation hood and processing equipment following the preparation of each sample. Vacuum calibration will be performed daily prior to grinding activities. All system checks, required maintenance and the vacuum number will be recorded on the Vacuum Maintenance Log (Attachment 5).

A standard BICO vertical plate grinder will be used to process samples. The grinder will be calibrated daily or after any adjustments are made to the plates. To verify proper particle size (approximately 250 Fm), and demonstrate that samples will not be over-processed, grind a sample of clean soil (rather than quartz sand) and sieve using stacked sieves. Unlike the coarseness of quartz sand, soil will more accurately approximate the typical grain size and texture of the samples being processed and will reduce the chance of over-processing. Note that the particle size is cited as “approximately 250 Fm.” This is due to the nature of grinding asbestos material. Some material that is longer than 250 Fm may pass through the grinder if its longest side is parallel with the vertical grinder plates. The material that comes in contact more nearly perpendicular to the vertical grinder plates will be ground to <250 Fm.

The grinder is adjusted acceptably if all material passes through a 60-mesh (250 Fm) screen and is substantially retained by a 200-mesh (74 Fm) sieve. If the appropriate amount of material does not pass through the stacked sieves, adjust the plates of the vertical grinder until all material processed passes through the aforementioned sieve sizes. Document the grinder

number, verificaiton of acceptable adjustment and any observations in the Grinder Calibration and Maintenance Log (Attachment 3).

Following the calibration activities, the stacked sieves will be decontaminated using a HEPA vacuum, wet wash, and compressed air; and an aliquot of approximately 20 g of quartz sand will be passed through the grinder before the next sample is processed.

Samples will be weighed following grinding activities. The analytical balance will be calibrated daily with S-1 class weights before processing begins. All measurements, any required maintenance, and the analytical balance number will be recorded on the Analytical Balance Calibration and Maintenance Log (Attachment 2).

9.2 Grinding Blanks

A grinding blank will be prepared daily, per grinder used, and will be associated with all samples prepared per day, per grinder. The grinding blank will consist of approximately 100 to 200 grams of clean quartz sand and will be processed on days that field samples are ground. Each grinding blank will be identified in the notes section of the Sample Preparation Log Sheet (Attachment 1) and will be processed according to the direction of Section 9.3. Grinding blanks will be included with daily shipments to the laboratory. For further information on grinding blanks refer to Section 12.3.

9.3 Grinding of Fine Field Samples

The sample portion that was sieved to <1/4 inch will be ground to a particle size of approximately 250 Fm. Set up a catch pan under the grinder to collect all the ground material. Take the fine sample set aside in Section 8.2, load the grinder hopper, and allow the fine sample to pass through the plate grinder into the catch pan. Note the technician's initials date of grinding, and grinder number on the Sample Preparation Log Sheet (Attachment 1).

9.4 Grinding Decontamination

When grinding is complete, do not move the plates for decontamination (this would require re-calibration). Decontaminate the hopper and catch pan by using a HEPA vacuum, followed by a blast of high pressure air. Set the catch pan aside and clean the grinder with several blasts of compressed air. Pay special attention to areas where dust from the grinding process is known to accumulate (e.g., between the plates and areas adjacent to the catch pan clamps). Reattach the catch pan to the grinder. Pass an aliquot of approximately 20 g of quartz sand through the grinder to clean out any residual soil. Discard the quartz sand and re-clean the grinder with the vacuum and another round of high pressure air blasts. After this decontamination procedure, the grinder is ready to process the next sample.

10.0 SPLITTING OF THE FINE GROUND SAMPLE

The fine ground soil sample should be distributed into four approximately equal sub-samples using a splitter. All splitting activities will be performed in the ventilation hood. Refer to Section 7.1 for details regarding the frequency of ventilation hood calibration.

10.1 Splitting [illegible]dure for Fine Ground Sample

The following m[illegible]or splitting a soil sample was adapted from EPA 540-R-97-028 (USEPA 1997):

- Set up on[illegible]ving pan on each [illegible] the splitter. Load the soil from the grinder catch pan [illegible]n 0.3) into the sp[illegible]ollecting the sample in two receiving pans.

- Tap the catch pan vigorously several times to free any remaining material. Tap the splitter to facilitate the flow of all material through the chutes into the receiving pans.

- Empty each receiving pan into the grinder catch pan and sieve catch pan, respectively. Set the sieve pan aside; this portion of fine ground sample will be split again later.

- Replace the receiving pans under the splitter. Take the grinder catch pan, containing half of the fine ground sample and re-load the contents into the splitter as detailed above. Repeat the process of dispersing the sample material by shaking the catch pan and tapping the splitter to uniformly distribute the sample. The resulting splits are the “FG1" and “FG2" portions on the Sample Preparation Log Sheet (Attachment 1).

- Take these two portions and carefully transfer each into a clean, tared, ziplock sample bag. Re-bag one sample portion in another clean ziplock sample bag and identify this fine ground sample with the sample identification name the additional suffix of “FG” (for “fine fraction, ground”) and the fraction number 1, (ex. NYB-S10-101304-FG1 for fine ground fraction #1). Identify the bagged second portion with the sample identification name the additional suffix or “FG” and the fraction number 2

- Place the two empty receiving pans from the “FG1" and FG2” portion next to the splitter. Repeat the splitting procedure using the other fine ground portion set aside in the sieve pan and split the remaining sample material to create the “FG3" and “FG4."

- Take the remaining “FG3" and “FG4" portions and carefully transfer each into a clean, tared, ziplock sample bag, identify each remaining fine ground sample with the sample identification name the additional suffix as noted above.

- Weigh each sample portion (FG1 through FG4), and record each mass along with the technician's initials and date on the Sample Preparation Log Sheet (Attachment 1).

- Combine all bagged fine portions into one large clean, ziplock sample bag.

Fine ground samples are now ready to be packaged for shipment to the analytical laboratory or START, as directed. When samples are shipped for analysis, the "FG1" fraction will be will be double bagged and sent first. If further analyses are required for the fine ground portion, the subsequent fractions will be double bagged and sent (i.e., FG-2 then FG-3, etc.). All archived fine ground portions will be stored with appropriate documentation.

10.2 Post Splitting Decontamination

Use the vacuum and compressed air to decontaminate the splitter and brush or wipe off any visible material that is not removed by the vacuum or air blast. The splitter is now ready to process the next sample.

11.0 DOCUMENTATION

The field Sample Identification names and laboratory's Index Identification name (if different) with appropriate suffixes are recorded on the Sample Drying Sheet, Sample Preparation Log Sheet (Attachment 1) and on all sample containers. Sample Drying Sheets and Sample Preparation Log Sheets will be filed under their associated preparation batch number. If revisions to the Sample Drying Sheet and/or Sample Preparation Log Sheet are necessary, the appropriate parties will be notified of the changes, however, these changes will not necessitate revision to the current standard operating procedure.

As mentioned above, the following equipment calibration and maintenance logs will also be maintained:

- daily analytical balance calibration using S-1 class weights (Attachment 2)
- daily grinder setting verification for calibration check and/or post-adjustment verification, grinder maintenance as necessary (Attachment 3)
- daily ventilation hood operating condition verification (i.e., inline filter checks, changes) (Attachment 4)
- HEPA vacuum maintenance and bag changes (Attachment 5)
- weekly oven temperature calibration, oven maintenance as necessary (Attachment 6)

Prepared samples will be submitted to the E & E designated analytical laboratory with custody record and copies of the sample drying and sample preparation logs. Copy of the custody records, drying logs, preparation logs and calibration logs (i.e. data package) should be submitted to E & E.

12.0 QUALITY ASSURANCE

All quality control sample results will be monitored for potential contamination. If sample results indicate cross-contamination, the PL^2 will be notified. The PL^2 will then identify the affected samples and notify the appropriate parties of these samples. Laboratory procedures will also be re-assessed and appropriate changes will be made and documented accordingly by the PL^2.

12.1 Drying Blanks

At least one drying blank will be processed with each batch (per oven) of approximately 15 field samples (Section 6.2). Results from each drying blank will determine if cross-contamination occurred during the drying process. The drying blank, consisting of clean quartz sand, will be assigned a random and unique index identification number and will be submitted to the laboratory blind. Detection of asbestos fibers in any drying blank (at the PLM sensitivity) should be taken as a sign of potential cross-contamination, and steps should be taken to identify and address the source of the cross contamination.

12.2 Preparation Duplicates

One preparation duplicate sample (Section 7.3) will be processed for every 20 field samples prepared. Results from duplicate samples serve to evaluate the precision of the sample preparation process and of the laboratory analysis. A preparation duplicate is prepared by using a riffle splitter to divide the sample into two approximately equal portions, creating a parent and duplicate sample. Both samples are prepared in the same fashion. The preparation duplicate is assigned a unique and random index identification number, and is submitted to the laboratory blind. Inconsistent sample results should be taken as an indication of variability in sample preparation, and steps should be taken to identify and address the source of the variability in sample preparation.

12.3 Grinding Blanks

One grinding blank (Section 9.2), consisting of clean quartz sand, will be processed once per day, per grinder, on days that field samples are ground. Each grinder used in the lab will be

assigned a number and all samples processed will be associated with the grinder used for preparation. The grinder number used for each sample will be noted on the Sample Preparation Log Sheet (Attachment 1). Grinding blanks will not be dried, split for archive, or sieved, a grinding blank will only be ground and split into four fine ground samples. Results from the grinding blank will determine if decontamination procedures of laboratory equipment are adequate in preventing cross-contamination of samples during sample grinding and fine ground sample splitting processes only. If asbestos fibers are detected in any grinding blank the PL^2 will be notified. The PL^2 will identify all samples that were processed on the day the grinding blank was prepared, and the grinder that was used to process the grinding blank. Detection of asbestos fibers in any drying blank (at the PLM sensitivity) should be taken as a sign of potential cross-contamination, and steps should be taken to identify and address the source of the cross contamination.

13.0 DECONTAMINATION

All non-disposable equipment used during sample preparation must be decontaminated prior to use. Scoops or spoons, splitters, sieves and drying pans that are re-used must be decontaminated with a HEPA vacuum, compressed air, wet-wiping and/or by brushing off any residual material. If soil particles are visible on any of the equipment, repeat the decontamination procedure until the equipment is clean.

Detailed decontamination procedures for specific equipment are noted in Sections 6.4, 7.4, 8.3, 9.4, and 10.2.

14.0 REFERENCES

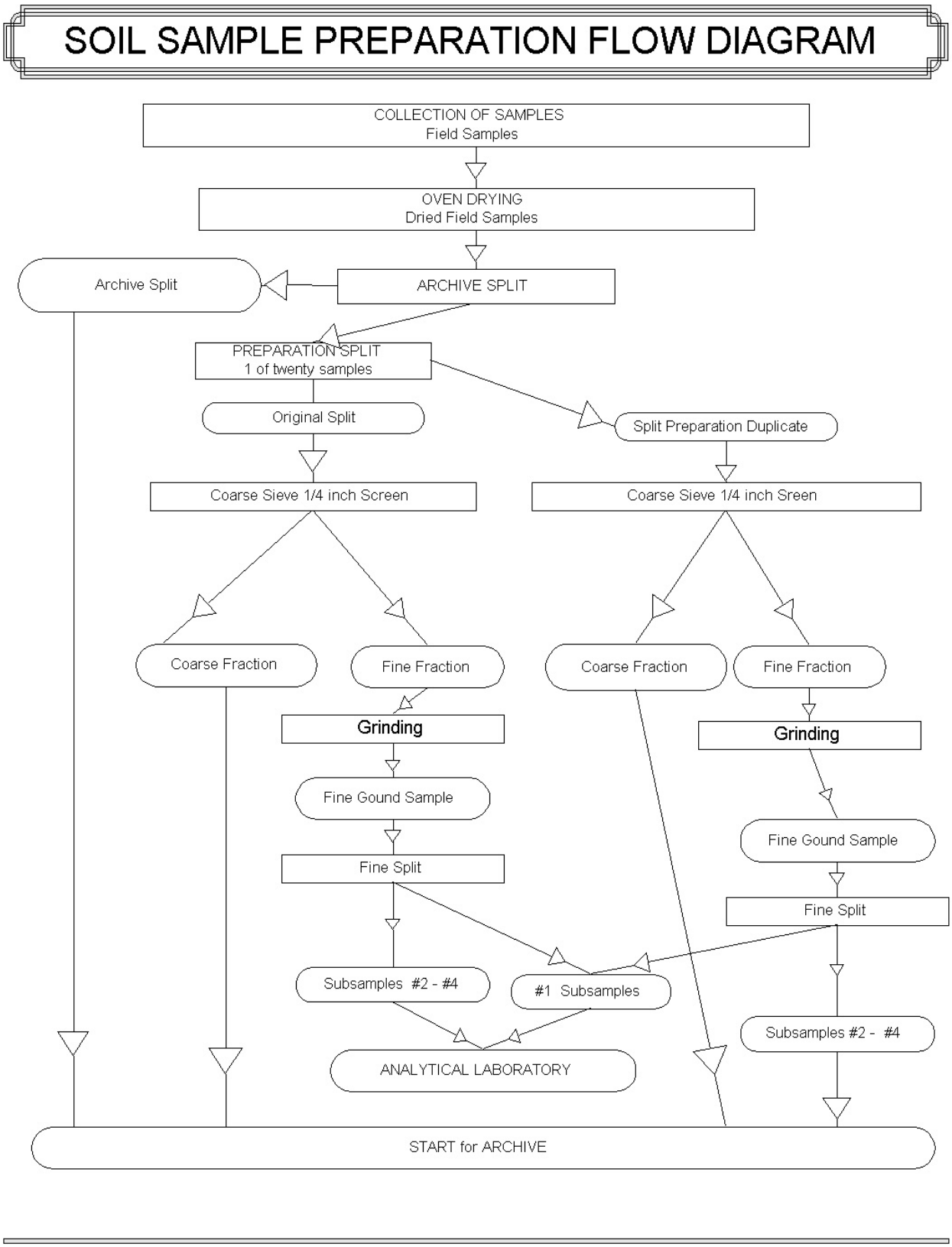
American Society for Testing and Materials. 1998. Standard Practice for Reducing Samples of Aggregate to Testing Size, ASTM Designation: C 702 - 98, 4 p.

CDM. 2004. Close Support Facility Soil Preparation Plan, Libby Asbestos Site, Operable Unit 4, Libby, Montana. February.

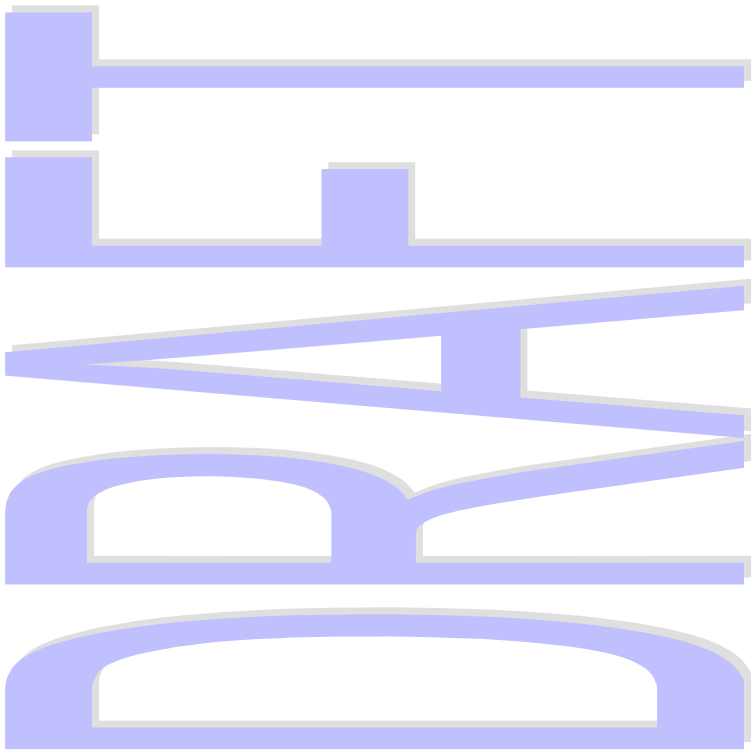
USEPA. 1997. Superfund Method for the Determination of Releasable Asbestos in Soils and Bulk Materials. EPA 540-R-97-028.

USEPA. 2004. Soil Sample Preparation, ISSI-Libby-01, Revision 8.

FIGURE 1


SOIL SAMPLE PREPARATION FLOW DIAGRAM
COLLECTION OF SAMPLES
Field Samples
OVEN DRYING
Dried Field Samples
Archive Split
ARCHIVE SPLIT
PREPARATION SPLIT
1 of twenty samples
Original Split
Split Preparation Duplicate
Coarse Sieve 1/4 inch Screen
Coarse Sieve 1/4 inch Sreen
Coarse Fraction
Fine Fraction
Coarse Fraction
Fine Fraction
Grinding
Grinding
Fine Gound Sample
Fine Gound Sample
Fine Split
Fine Split
Subsamples #2 - #4
#1 Subsamples
Subsamples #2 - #4
ANALYTICAL LABORATORY
START for ARCHIVE

ATTACHMENT 1
SAMPLE DRYING AND SAMPLE PREPARATION LOG SHEETS



Sample Drying Log Sheet

Drying Batch ID _____ Sheet No. _____

Date/Time Drying Begun _____
Date/Time Drying Completed _____
Oven Number _____
Oven Temp (c) _____

Laboratory's Index Identification Name	Notes: Original Sample Identification Name or Drying Blank Identification)	Batch Number	Mass (g)			Initials and Date
			Before Drying	After Drying	Initials and Date	

The following preparation steps require Technician Initials and Date to document activity. Sample Mass, Data Entry QC.

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Sample Preparation Log Sheet

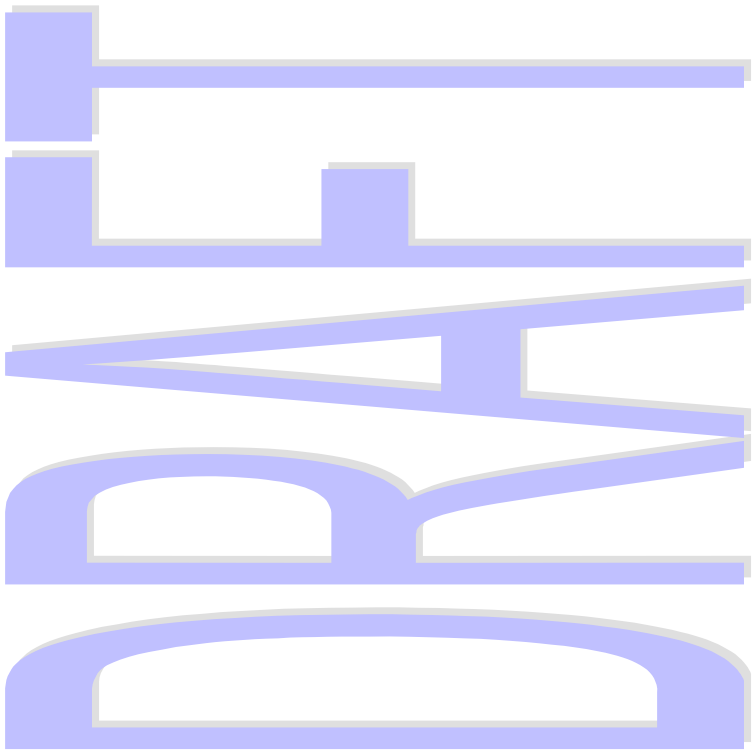
Prep Batch ID _____ Sheet No. _____

Index Identification Name	Notes Original Sample Identification or (indicate if grind blank, dry blank, or duplicate pair. For duplicate pair enter the parent/child ID)	Batch Number	Dry Batch ID	Active Sample Splitting	Duplicate Sample Splitting	Sieving			Sample		Sample Splitting					QC
						Sample Mass (g)	Sample Mass (g)				Sample Mass (g)					
				Initials and Date	Initials and Date	Fraction >1/4"	Fraction <1/4"	Initials and Date	Initials and Date	Grinder #	FG1	FG2	FG3	FG4	Initials and Date	Initial and Date

The following preparation steps require Technician Initials and Date to document activity. Archive Sample Spelling, Preparation Duplicates Splitting.

ATTACHMENT 2

ANALYTICAL BALANCE CALIBRATION AND MAINTENANCE LOG



TECHNICAL STANDARD OPERATING PROCEDURE
SOIL SAMPLE PREPARATION
Revision Number 3

Balance # = _____

Measurement Number	S-1 Class Weight Measurements					Measurement within range? Yes or No	If "No" Recalibrate	Technician Initials	QC check initials
	Calibration Weights	0.1 g	1 g	10 g	100 g				
	Tolerance Limit Range	0.05-0.15 g	0.90-1.10 g	9.75-10.25 g	99.00-101.00 g				
	Date								
1									
2									
3									
4									
5									
6									
7									
8									
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10									
11									
12									
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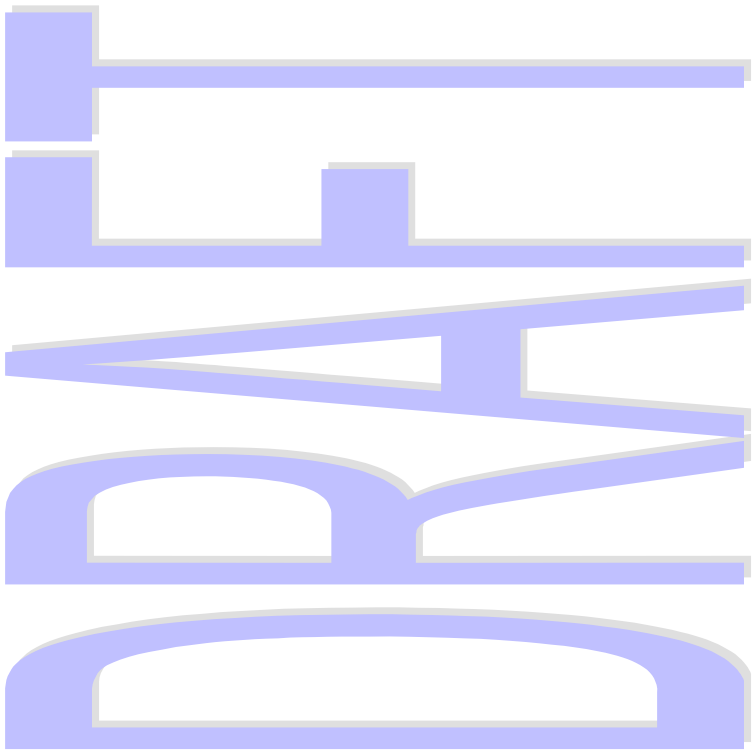
16									
17									
18									
19									
20									
21									
22									

The analytical balance calibration will be verified daily.
All tolerance limits are standard tolerance limits for Class S-1 weights.
After 20 measurements, the tolerance range will be evaluated for reasonableness.
Weights falling outside the range require that the balance be recalibrated using all S-class weights.

Sheet No.: _____

ATTACHMENT 3

GRINDER CALIBRATION AND MAINTENANCE LOG



TECHNICAL STANDARD OPERATING PROCEDURE
SOIL SAMPLE PREPARATION
Revision Number 3

Grinder # = _____

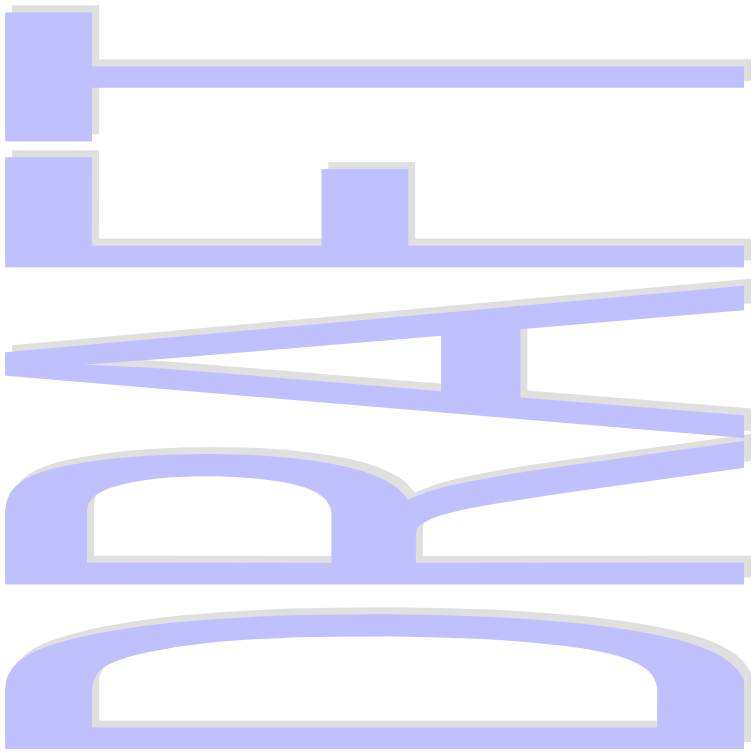
Date	Activity Type (D,A,M)	Sieve Test		Notes (include description of action/maintenance)	Technician Initials	QC Check Initials
		60 Mesh acceptable Y or N	200 Mesh acceptable Y or N			

D = Daily calibration
A = Adjustment Calibration Verification
M = Maintenance Only
For the 60 mesh sieve test to be acceptable all of the clean soil must pass through the sieve.
Failure of either sieve test requires adjustment of the plates followed by adjustment verification prior to grinder samples.

Sheet No.: _____

ATTACHMENT 4

VENTILATION HOOD CALIBRATION AND MAINTENANCE LOG



Ventilation Hood # = ______________________

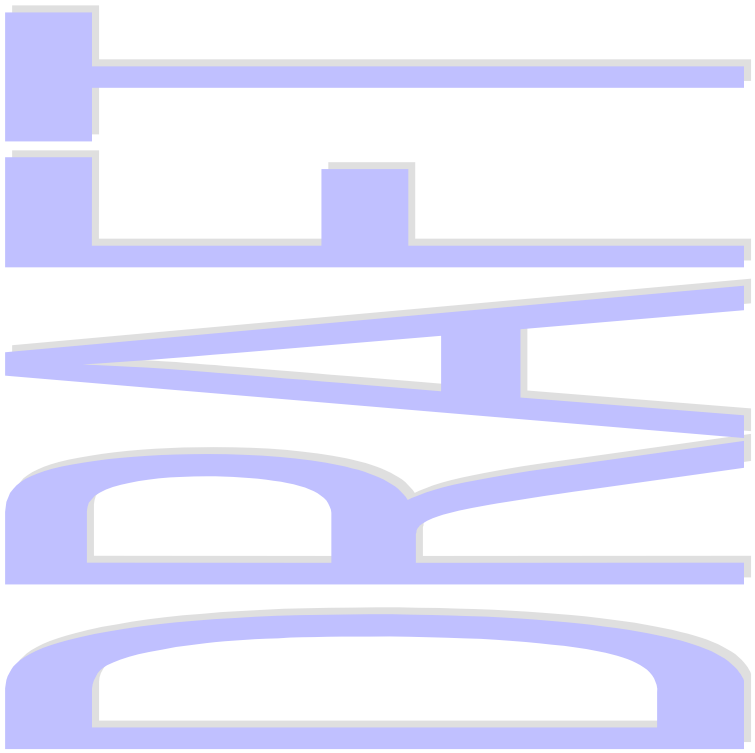
Date	In-line HEPA indicators acceptable?	Notes (include description of action/maintenance)	Technician Initials	QC Check Initials

Ventilation system operating conditions should be verified daily
In-line system should indicate the velocity/negative flow is 100 ft/min. If not, the problems with the system must be corrected prior to processing samples. Note actions or maintenance taken.

Sheet No.: ______________________

ATTACHMENT 5

VACUUM MAINTENANCE LOG



Vacuum # = _____

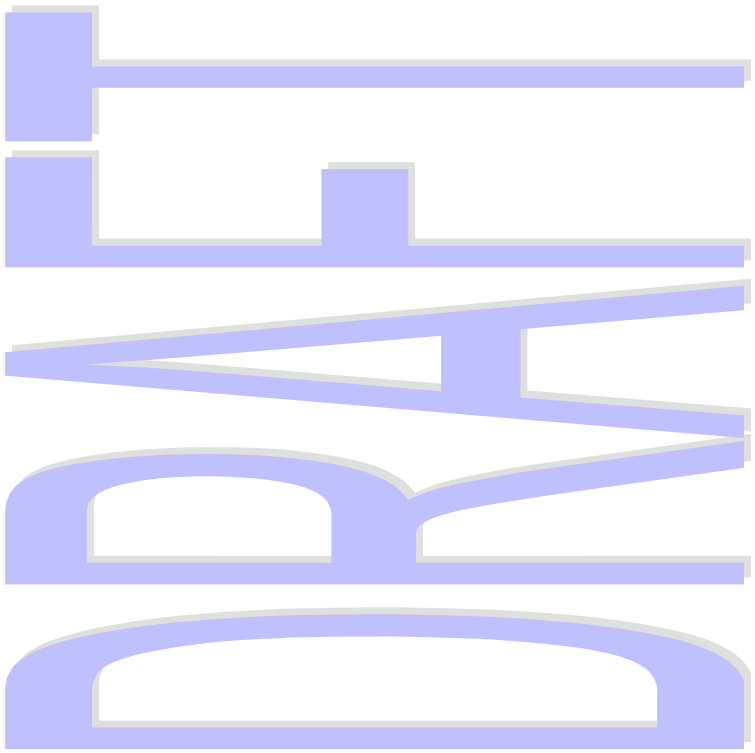
Date	System Check Acceptable? Yes or No	HEPA filter clean? Yes or No	Bag fill level acceptable? Yes or No	Notes (include description of action/maintenance performed)	Technician Initials	QC Check Initials

Physically check the vacuum suction and note audible change in motor daily. If significant reduction in the vacuum suction or motor "strain" is audibly noted then the system check is unacceptable. If unacceptable, perform and document the HEPA filter and bag maintenance checks above and perform maintenance.

Sheet No.: _____

ATTACHMENT 6

OVEN TEMPERATURE CALIBRATION AND MAINTENANCE LOG



TECHNICAL STANDARD OPERATING PROCEDURE
SOIL SAMPLE PREPARATION
Revision Number 3

Oven # = _____

Date	Certified Temperature Reading (EC)	Thermometer ID	System Check Acceptable? (+/- 1EC) Yes or No	Notes (include description of action/maintenance performed)	Technician Initials	QC Check Initials

Sheet No.: Oven - _____