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WORKPLAN FOR WASTE CHARACTERIZATION OF INCINERATOR ASH

Voluntary Corrective Action for Consolidated Unit 73-002-99 (Incinerator Ash Removal) Los Alamos National Laboratory, New Mexico

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WORKPLAN For
Waste Characterization of Incinerator Ash
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Consolidated Unit 73-002-99
(Incinerator Ash Removal)
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ACRONYMS AND ABBREVIATIONS

lbs/ft^3	pounds per cubic feet
mg/kg	milligrams per kilogram
yd^3	cubic yards
CCA	comprehensive certificate of analysis
CDQMP	Chemical Data Quality Management Plan
COC	Chain of Custody
DOE	U.S. Department of Energy
DQO	Data Quality Objectives
EDDs	electronic data deliverables
ID	identification number
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
MDA	minimum detectable activity
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
Pb	lead
PCB	polychlorinated biphenyl
PQL	Practical Quantitation Limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCI	reactivity, corrosivity, ignitability
RPD	relative percent difference
RL	reporting limit
SAP	Sampling and Analysis Plan
SEDD	Staged Electronic Data Deliverable
SOP	standard operating procedures
SVOC	semivolatile organic compounds
TCLP	toxicity characteristic leaching procedure
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
XRF	x-ray fluorescence

EXECUTIVE SUMMARY

The purpose of this Work Plan is to describe sampling activities to be conducted as part of the waste characterization efforts for the incinerator ash at Consolidated Unit 73–002–99 at the Los Alamos Airport. This activity is the first step in the proper waste characterization, profiling, and acceptance of the waste at an appropriately licensed receiving facility prior to its removal and offsite disposal.

Sampling activities will include characterization sampling for both hazardous and radiological constituents sufficient to properly characterize the waste and support its acceptance by potential receiving facilities. The Work Plan includes a Sampling and Analysis Plan (SAP) that describes the objectives, the sampling strategy and rationale, sample locations, sample collection and handling procedures, field screening and fixed-laboratory analytical methods. The SAP also identifies quality control procedures to be employed throughout the sampling and analysis of the waste.

1.0 INTRODUCTION

Innovative Technical Solutions, Inc. (ITSI) has been contracted by U.S. Army Corps of Engineers, Sacramento District (USACE) to remove and properly dispose of ash located on the slope of Pueblo Canyon adjacent to the Los Alamos Airport on behalf of the National Nuclear Security Administration, U.S. Department of Energy (DOE). The ash was generated from the operation of a small incinerator located immediately adjacent to the ash.

Prior to the removal and disposal of the ash, the ash must be successfully profiled and accepted by the final receiving facility. Available analytical results for the ash are insufficient to properly characterize the ash for disposal purposes. Additionally, available analytical results are insufficient to fully judge health and safety requirements associated with working with the ash during the removal process on the steep slope where it is located.

To provide sufficient data representing current conditions to address the above concerns, additional sampling of the ash is proposed. This Work Plan provides the details of the proposed sampling activities and subsequent analyses of the samples.

1.1 BACKGROUND

Consolidated Unit 73–002–99 is comprised of Potential Release Sites (PRS) 73–002, 73–003, 73–004 (a, b), and 73–006. The Voluntary Correction Action is for PRS 73-002, a small incinerator operated for a short time at the site beginning in 1947. The incinerator's primary use was for the destruction of classified documents, however, it did not function properly and was removed from service shortly after completion.

In 1948, The Zia Company acquired the facility, which it held until 1973 and operated the incinerator for other than classified sanitary waste. The stack and equipment have been removed from the building, which is currently in use as a storage facility

The ash is located on the south slope of Pueblo Canyon, immediately north of the incinerator building. The ash covers an area of approximately 30,000 square foot, and ranges in thickness from less than one foot to greater than eight feet (Voluntary Corrective Action Fact Sheet for PRS 73–002).

Sampling was conducted of the ash pile generated by operations of the incinerator and within the associated drainages in 1996, 1997, and 1998. A preliminary review of the resulting data tentatively identified several potential contaminants of concern. In general, high concentrations of several inorganic chemicals have been noted in the ash samples but not in soil and sediment (non-ash) samples, with concentrations of lead as high as 13,100 milligrams per kilogram (mg/kg). The ash also contains low concentrations of several organic chemicals including, but not limited to, pesticides and dioxins/furans. Low levels of several radiological constituents have been detected in a limited number of ash samples.

1.2 OBJECTIVE OF SAMPLING PROGRAM

The principal objective of the sampling program is to provide a sufficient number and types of analyses to identify the nature of potentially hazardous and radiological constituents in the ash. Sample results will allow the design of adequate protective measures to protect the health and safety of workers, nearby residents and the environment during the removal activity; and to evaluate waste management options for the ash, including potential segregation of the waste, if appropriate, prior to its removal. Sample results will support decisions for the most cost-effective material handling and disposal options consistent with State of New Mexico and federal requirements.

2.0 FIELD SAMPLING PLAN

The general approach of the sampling program that will be conducted is described below.

- Delineate the approximate lateral extent and thickness of ash.
- Establish the sampling grid to cover the lateral extent of the ash and varying thicknesses of ash. An estimated 40 to 45 samples will be targeted based on the lateral distribution and varying thicknesses of ash.
- Collect samples based on the established grid using either shallow soil sampling technique (using scoop or thin-wall tube sampler techniques or similar) or deeper soil sampling technique (thin-walled, hand auger or split-spoon sampling techniques or similar), depending on the thickness of the ash at the sample location.
- Evaluate samples onsite using field screening techniques (to build correlation with laboratory results for later use during the removal action).
- Submit samples to Sample Management Office (SMO) for analysis (as negotiated, LANL is managing the laboratory analysis for this project, and ITSI will utilize their paperwork and procedures, where possible, to facilitate the process).

Once analytical results are available, evaluate the results relative to hazardous and radiological criteria for waste classification and disposal, in consultation with potential disposal facilities, USACE and DOE, and State of New Mexico, as appropriate.

2.1 DELINEATING THE EXTENT OF ASH

At present, the ash is believed present over an area of some 30,000 square feet, extending in an expanding arc from the top of the slope near the incinerator building to some 150 to 200 feet down slope. Although covered in some vegetation, the ash appears to be visually distinct from surrounding and underlying sediments.

Delineation of the ash will be performed by visual inspection using sample crews on the slope. At each sample point, the presence or absence of ash will be noted, and depth of ash will be

estimated. The location of each point will also be marked and subsequently surveyed. Thickness of ash will be determined using a thin rigid rod (or similar device) pushed or driven into the ash perpendicular to the slope until refusal. Areas well outside the ash pile will be used to calibrate the resistance of the underlying soils for this method.

The location, presence or absence and depth of ash will be used to develop a better understanding of its lateral extent and thickness. The sampling grid will be refined to be most representative of the ash for characterization purposes.

2.2 ESTABLISHING THE SAMPLING GRID

Based on the limits of the ash confirmed during the initial delineation, a sampling grid will be established based on approximately one sample per 100 cubic yards of ash. Sufficient lateral coverage will be obtained to facilitate segregation of the waste based on the analytical results. Initially, the grid will be based on approximately 20-foot grids. Samples will be collected from within one or more adjoining grids, depending on the average thickness of ash within each grid, to approximate 1 sample per 100 cubic yards.

For instance, if ash thickness averages 4 feet in a series of adjoining grids, two grids, each representing approximately 60 cubic yards, will be joined together to represent a single sample point. This sampling scheme may be adjusted in the field based on the results of the delineation of the ash.

Several sample points will be established outside the ash pile footprint to provide background samples for calibrating the field screening techniques. This will be used to insure the field screening equipment is capable of accurately handling and reporting the wide range of concentrations expected between the ash and underlying soil.

2.3 COLLECTING THE ASH SAMPLES

Samples will be collected in a manner consistent primarily with Los Alamos National Laboratory's (LANL) Standard Operating Procedures (SOPs), and ITSI's Chemical Data Quality Management Plan (CDQMP) (reviewed and approved by USACE Sacramento District for use under the PRAC).

For samples with ash thickness less than or equal to 1 foot, samples will be collected using a stainless steel trowel (SOP–06.09) or hand auger or thin-wall tube sampler (SOP–06.10), depending on ash thickness. Samples will be collected in such a manner to represent as much of the ash column as possible at the given sample point. This may include field compositing to insure the sample is representative of the ash column (consistent with SOP–06.09). Samples will be transferred into appropriate containers provided by the Sample Management Office (SMO).

For samples from locations with ash thicker than 1 foot, samples will be collected by hand auger or thin-wall tube sampler (SOP–06.10), or split-spoon or Shelby-tube sampler (SOP–06.24), depending on ash thickness. Samples will be collected in such a manner that they represent as much of the ash column as possible at the given sample point. This may include field compositing to insure the sample is representative of the ash column (consistent with SOP–06.24). Samples will be transferred into appropriate containers provided by the SMO.

Samples will be labeled with unique sample identification number (ID) for each location and depth. Following labeling, samples will be placed in re-sealable plastic bags and transferred to the SMO under proper chain-of-custody (COC) procedures (consistent with SOP–15.09).

Sampling equipment will be decontaminated following each use by washing in a non-phosphate detergent, water rinse, and a distilled or de-ionized water rinse (consistent with SOP–01.08).

2.4 FIELD SCREENING OF SAMPLES

Samples will be field screened for lead and selected other metals using field portable x-ray fluorescence (XRF). Based on a review of available laboratory results from previous sampling efforts, the ash contains measurable concentrations of lead (Pb) and other metals that, along with radiological isotopes, should serve as a valuable screening tool during the removal activity in allowing real-time testing of soils to better evaluate when ash has been fully removed and prior to collecting formal confirmation samples.

Once screened, the samples will be packaged. A radiological survey will be performed external to the packaging by LANL (as negotiated, LANL is providing the onsite radiological monitoring and safety oversight) and authorize delivery to the SMO for analysis.

2.5 ANALYTICAL CRITERIA

Samples will be analyzed for the following:

Analyses	Frequency of Analyses	
	Every Sample (approx. 1 per 100 yds^3)	Composite of 5 samples (approx. 1 per 500 yds^3)
TCLP Analyses (including zinc) [1][2]	X	
VOCs by EPA Method 8260B[1]		X
SVOCs by EPA Method 8270C[1][3]		X
PCBs by EPA Method 8082[1][3]		X
Dioxins and Furans by EPA Method 8290[3]		X
Metals (Total) by EPA Method 6010B/7471[3]	X	
Gross Alpha, Beta and Gamma by EPA Method 9310[3]	X	
Gamma Spectroscopy[1]	X	
Specific Radioisotope analyses (based on previous detections) (2): - Americium 241 - Cesium 137 - Plutonium (Pu-238, 239, 240, 241) - Radium 226 - Uranium (U-234, 235, 238)	X	
Physical characteristics - Density (lbs/ft^3) [1] - Grain-size analysis[1] - Proctor (ASTM D-698) [1] - Paint filter test (EPA Method 9095) [1][2]		X
Miscellaneous Analyses - Reactive Cyanide (EPA Method 9014) [1] - Reactive Sulfide (EPA Method 9034) [1] - pH (EPA Method 9045) [1] - RCI[2]		X

[1] Required to complete waste profile forms for EnviroCare of Utah.
[2] Required for potential acceptance by Rio Rancho, based on 20 NMED 9.1, Sect. 704 and/or release modeling.
[3] Criteria for confirmation samples per Scope of Work
yd^3 – cubic yards
TCLP – toxicity characteristic leaching procedure
VOC – volatile organic compounds
EPA – United States Environmental Protection Agency
SVOC – semivolatile organic compounds
PCB – polychlorinated biphenyls
lbs/ft^3 – pounds per cubic feet
RCI – reactivity, corrosivity, ignitability

The above analyses were selected for a variety of reasons, including requirements of the potential receiving facilities (e.g., Rio Rancho, EnviroCare, Duratek, etc…) to provide data generally consistent with previous investigations of the ash, and to screen the ash relative to potential confirmation sampling requirements.

Table 1 provides the analytical methods and reporting limits for the above analyses. The levels were established consistent with regulatory criteria for waste classification (e.g., TCLP levels) and requirements from the potential receiving facilities. Radiological levels were established based on 1/2 previously reported levels for the ash. Table 2 provides the sample volumes and containers needed for the selected analyses (consistent with LANL ER–SOP–01.02).

2.6 QUALITY CONTROL SAMPLES

Quality control (QC) samples consisting of field duplicate samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment blanks (if applicable), will be collected as part of the sampling activity. QC samples will be collected as described below, and will be packaged, labeled, handled, and transported in the same manner as the primary samples. Field QC samples and frequencies are listed in Table 3, and are consistent with LANL ER–SOP–01.05.

2.6.1 Quality Assurance Samples

At the sole discretion of USACE and/or DOE, duplicate samples may be collected at a frequency of 5% (one duplicate sample will be collected for every 20 primary samples collected) and sent to an alternate laboratory for independent comparison of results. These split samples will be labeled in the same manner as the primary samples, and will be recorded on a separate COC form for shipment to the designated alternate laboratory.

2.6.2 Field Duplicate Samples

Field duplicate samples will be collected as part of the normal QA/QC procedures at a frequency of 5 % of the primary samples for each analytical method (consistent with LANL ER–SOP–01.05). Each duplicate sample will be collected from a location as close to the primary

sample as possible.

2.6.3 Matrix Spike/Matrix Spike Duplicate Samples

At a frequency of 5% (one per every 20 primary samples submitted to the laboratory), a sample will be provided in sufficient quantity to allow sample analysis, MS/MSD analysis, and re-extraction/re-analysis of the MS/MSD. Field blanks will not be used for MS/MSD analysis.

2.6.4 Equipment Rinse Blanks

Equipment rinse blank samples will be collected at a frequency of 5% (one per every 20 samples) (consistent with LANL ER–SOP–01.05). Equipment rinse blanks will be collected for any non-disposable sampling equipment used. The rinse blank samples will be collected by pouring analyte-free source water over the sampling equipment that comes in direct contact with the environmental sample. Equipment rinse blank samples will be used to assess the efficiency of the decontamination process and possible cross-contamination between environmental samples. Rinse blank samples will be collected and analyzed for the same constituents as the primary sample. Due to differences between the sample matrix (e.g., solids) and the equipment rinse (e.g., water), the analytical method for the equipment rinse may be different than that of the primary sample. A comparable analytical method will be used in these instances for the equipment rinse blanks.

2.7 RECORDKEEPING

2.7.1 Sample Labels

Samples will be labeled for identification. Pre-printed sample labels will be used when available, or labels will be completed prior to or at the time of sample collection. Labels will be completed in waterproof ink and secured to the sample container with clear tape wider than the label itself before the samples are packaged for transportation to the laboratory. At a minimum, labels will contain the information listed below.

- Sample identification number
- Sample location

- Date and time of collection
- Initials of the person collecting the sample
- Analysis requested
- Preservation method
- Any other information pertinent to the sample.

2.7.2 Chain of Custody/Documentation

The purpose of sample custody procedures is to maintain the integrity of field samples throughout field activities, from the point of collection through delivery to and acceptance by the laboratory. Sample collection activities will be documented using COC procedures consistent with LANL ER–SOP–15.09.

Chain of Custody Records

A COC form will be completed and will accompany each group of samples sent to the laboratory to document sample possession from the time of collection to sample receipt. The COC form will contain information listed below.

- Sample number or identification
- Name and signature of the collector, sampler, or recorder
- Name and location of the project
- Date of sample collection
- Sample matrix
- Preservative type, if any
- Analyses requested
- Signatures of the persons relinquishing and receiving the samples
- Date and time of laboratory receipt of the samples.

Field Logbook

Daily field activities and relevant sampling information will be documented in a field logbook. The field team involved in the collection of data in the field will maintain the logbook with serially numbered pages, consistent with requirements in the CDQMP (ITSI, 1999). The logbook will be signed and dated each day before field work begins. Logbook corrections will be

made by striking out the incorrect entry with a single line and entering the correct information. The person making the entry will initial and date the correction. Unused partial logbook pages will be crossed out and signed and dated at the end of each workday. Entries must be legible, in ink, and factual in content.

Logbook entries may include the following information, as appropriate:

- Project name and number
- Site name and location
- Arrival and departure dates/times for project personnel
- Names and affiliations of personnel on site, and any other individuals or organizations contacted
- Author's name and date
- Field instruments, calibration methods and equipment identification numbers
- Chronology, locations, and descriptions of activities conducted
- Sampling locations
- Sample identification numbers
- Sample type and amount collected
- Date and time of sample collection
- Name of sampler
- Sampling method and container (size/type) for each sample collected, including QC samples. (Alternatively, this information may be contained on the COC form, soil sampling form, or other field form. The logbook will then contain a unique identifier linking the field logbook entry to the field form).
- Field observations and appropriate comments
- Modifications to or deviations from the Work Plan.

3.0 QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPP) presents the Data Quality Objectives (DQOs), procedures for sample custody and holding, laboratory analytical methods, and general QC procedures for this project. This QAPP was prepared in accordance with ITSI's Chemical Data Quality Management Plan (CDQMP) (ITSI, 1999).

3.1 DATA QUALITY OBJECTIVES

The following table is a brief description of the seven-step DQO process used in developing the scope of work outlined in the FSP.

Step 1: State the Problem
Analytical results representing current conditions within the ash are needed.
Step 2: Identify the Decisions
Study Questions: 1) Are proper measures being taken to protect human health and the environment during the upcoming removal action? 2) Is there adequate data to properly classify and profile the ash for disposal purposes? Decisions: 1) Assess concentrations of target compounds to plan appropriate worker and environmental protection measures. 2) Assess the concentration of target compounds, in particular heavy metals and radiological compounds, to determine if the ash is considered hazardous and/or low-level radiological waste, and thus decide how the ash should be pre-treated and disposed.
Step 3: Identify Inputs to Decisions
Inputs for Study Question 1 include: Historical data from previous investigations and analytical data collected during this sampling event, which will be compared to established threshold limits and dose-response factors for establishing protective measures. Inputs for Study Question 2 include: Historical data from previous investigations and analytical data collected during this sampling event, which will be compared to federal and state hazardous and radiological waste classification standards, and acceptance standards at potential disposal facilities.

Step 4: Define Study Boundaries
The physical limits of the study area are just beyond the physical limits of the ash, as confirmed through visual inspection.
Step 5: Develop Decision Rules
Decision 1: Ash samples will be taken and analyzed for target compounds. Decision Rule 1: Are the levels of target compounds present in the ash sufficient to require personal protective equipment greater than modified Level D? Is the level of lead present in the ash sufficient to invoke the OSHA lead rule, and/or require blood lead monitoring? Decision 2: Ash samples will be taken and analyzed for target compounds. Decision Rule 2: Are the levels of target compounds present in the ash above federal or state limits for the ash to be classified as hazardous or radiological waste? If no, the ash will be excavated and disposed of as industrial (non-hazardous) waste. If yes, the ash will be excavated, pre-treated (if required) and disposed of as hazardous and/or radiological waste as required per waste classification.
Step 6: Specify Tolerable Limits on Decision Errors
In order to support the project purposes, the data generated from this sampling effort needs to be accurate and reliable. All samples collected for this activity will be analyzed in accordance with accepted methods and protocols. The precision, accuracy, and sensitivity requirements for the laboratory data generated during this sampling effort will be in accordance with the published requirements for each method.. Decision errors will be considered tolerable when data meet stated goals for precision, accuracy, representativeness, completeness, and comparability (collectively known as PARCC parameters). Data associated with precision and accuracy results outside acceptance criteria will be evaluated for usability.
Step 7: Optimize Sampling Design
The sampling locations for this effort will be established within the lateral limits of the ash, as identified during previous sampling efforts and also confirmed just prior to sampling. A sampling grid will be established at the site based on an anticipated 25 to 30-foot grid, sufficient to provide approximately 1 sample per 100 cubic yards of ash.

3.2 SAMPLE CUSTODY AND HOLDING TIMES

As samples are collected, they will be logged on a COC form. COC procedures are addressed in Section 2.7.2 above.

3.3 ANALYTICAL PROCEDURES

Laboratory analyses will be coordinated by LANL SMO. Thus, sections of this QAPP dealing with laboratory selection and specific QC requirements of the laboratory and individual methods are not included here. However, specific project goals are discussed below to insure the objectives of the sampling program are met. The analytes and methods for the project are listed below.

- TCLP Analyses (including zinc, as required by EnviroCare)
- VOCs by EPA Method 8260B
- SVOCs by EPA Method 8270C
- PCBs by EPA Method 8082
- Dioxins and Furans by EPA Method 8290
- Metals (Total) by EPA Method 6010B/7471
- Gross Alpha, Beta and Gamma by EPA Method 9310
- Gamma Spectroscopy
- Specific Radioisotope analyses (based on previous detections):
  - Americium 241
  - Cesium 137
  - Plutonium (Pu-238, 239, 240, 241)
  - Radium 226
  - Uranium (U-234, 235, 238)
- Physical characteristics
  - Density (lbs/ft3)
  - Grain-size analysis
  - Proctor (ASTM D-698)
  - Paint filter test (EPA Method 9095)
- Miscellaneous Analyses
  - Reactive Cyanide (EPA Method 9014)
  - Reactive Sulfide (EPA Method 9034)
  - pH (EPA Method 9045)
  - Reactivity, Corrosivity, and Ignitability (RCI)

3.4 REPORTING LIMITS

Project-required reporting limits (RLs) are provided in Table 1. Where appropriate, the practical

quantitation limit (PQL) will be a minimum of 2 to 5 times lower than the RL, and the minimum detectable activity (MDA) should be a minimum of 2 times lower than the RL.

4.0 DATA REDUCTION, VALIDATION, AND REPORTING

Only data necessary for the purposes of this project will be collected. Necessary data include the laboratory analyses for target analytes. One hundred percent of the laboratory-generated data will be evaluated by ITSI upon receipt of the results from LANL.

4.1 COMPREHENSIVE CERTIFICATES OF ANALYSIS

The project laboratories will report all analytical results in the form of comprehensive certificates of analysis (CCAs). Each CCA will include the field sample ID, the corresponding laboratory ID, and a clear association to the applicable preparation and method QA/QC batch results. Each CCA will also contain a case narrative.

Case narratives will be written on laboratory letterhead and the laboratory manager or his/her designee will authorize the release of data. Items to be included in the case narrative include the items listed below.

- The field sample ID with the corresponding laboratory ID
- Analytic parameters for each sample and the methodology used (USEPA method numbers or other citation)
- A statement on the status of samples analyzed with respect to holding times (met or exceeded)
- A detailed description of all problems encountered
- A discussion of possible reasons for out-of-control QA/QC criteria
- Observations regarding any occurrences which may effect sample integrity or data quality

4.2 ELECTRONIC DATA DELIVERABLES

Use of electronic data deliverables (EDDs) and electronic data validation promotes objectivity, substantially reduce costs, and facilitate data exchange. EDDs will be provided in a format consistent with LANL requirements.

4.3 DATA VALIDATION REPORTS

Formal Level 3 Verification or Level 4 Validation will not be performed for the waste characterization analyses. However, ITSI's chemists will review 100 percent of the laboratory data for completeness and to insure the data is adequate for its intended purposes. A data usability summary will then be provided.

4.4 FINAL REPORT

The sample results from ash samples collected in accordance with this SAP will be included as part of the Technical Memorandum for waste disposal.

5.0 REFERENCES

Innovative Technical Solutions, Inc. (ITSI), 1999. Chemical Data Quality Management Plan, SmART (Small Action Remediation Type) Services Contract No. DACA05-98-R-0007. September 21.

U.S. Environmental Protection Agency (USEPA), 1986. Test Methods for Evaluating Solid Wastes–Physical/Chemical Methods, SW-846, Office of Solid Waste and Emergency Response, USEPA, Washington, D.C., 3rd Edition, September 1986 (including Update III, January 1995).

U. S. Department of Energy, Environmental Measurements Laboratory (EML), 1997, HASL-300; EML Procedures Manual, 28th Edition

Table 1

Analytical Methods, Parameters for Analysis, and Reporting Limits

Method and Parameters	Reporting Limit	
	Water (μg/L)	Soil (μg/kg)
EPA Method 8081A: Organochlorine Pesticides		
alpha-BHC	0.050	50
beta-BHC	0.050	50
gamma-BHC	0.050	50
delta-BHC	0.050	50
Heptachlor	0.010	50
Aldrin	0.050	50
alpha-Chlordane	0.050	50
gamma-Chlordane	0.050	50
Heptachlor epoxide	0.010	50
Dieldrin	0.01	50
Endrin	0.10	50
Endrin aldehyde	0.10	50
4,4'-DDD	0.10	50
4,4'-DDE	0.10	50
4,4'-DDT	0.10	50
Endosulfan I	0.10	50
Endosulfan II	0.10	50
Endosulfan sulfate	0.10	50
Methoxychlor	1.0	50
Toxaphene	1.0	1,000
EPA Method 8082: Polychlorinated Biphenyls		
Aroclor 1016	1.0	500
Aroclor 1221	1.0	500
Aroclor 1232	1.0	500

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits
Chemical Data Quality Management Plan

Method and Parameters	Reporting Limit	
	Water (µg/L)	Soil (µg/kg)
EPA Method 8082: Polychlorinated Biphenyls (Continued)		
Aroclor 1242	1.0	500
Aroclor 1248	1.0	500
Aroclor 1254	1.0	500
Aroclor 1260	1.0	500
EPA Method 8260B: Volatile Organic Compounds		
Acetone	20	20
Benzene	5.0	5.0
Bromodichloromethane	5.0	5.0
Bromoform	5.0	5.0
Bromomethane	10	10
2-Butanone	20	20
Carbon disulfide	5.0	5.0
Carbon tetrachloride	5.0	5.0
Chlorobenzene	5.0	5.0
Chloroethane	10	10
Chloroform	5.0	5.0
Chloromethane	10	10
Dibromochloromethane	5.0	5.0
1,1-Dichloroethane	5.0	5.0
1,2-Dichloroethane	5.0	5.0
1,1-Dichloroethene	5.0	5.0
1,2-Dichloroethene (total)	5.0	5.0
1,2-Dichloropropane	5.0	5.0
cis-1,3-Dichloropropene	5.0	5.0
trans-1,3-Dichloropropene	5.0	5.0

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits

Method and Parameters	Reporting Limit	
	Water (µg/L)	Soil (µg/kg)
EPA Method 8260B: Volatile Organic Compounds (Continued)		
Ethylbenzene	5.0	5.0
2-Hexanone	20	20
4-Methyl-2-pentanone	20	20
Methylene chloride	10	5.0
Styrene	5.0	5.0
1,1,2,2-Tetrachloroethane	5.0	5.0
Tetrachloroethene	5.0	5.0
Toluene	5.0	5.0
1,1,1-Trichloroethane	5.0	5.0
1,1,2-Trichloroethane	5.0	5.0
1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	10
Trichloroethene	5.0	5.0
Vinyl acetate	10	10
Vinyl chloride	10	10
Xylenes (total)	5.0	5.0
EPA Method 8270C: Semivolatile Organic Compounds		
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benzoic acid	50	1,660
Benzo[a]anthracene	10	330
Benzo[b]fluoranthene	10	330
Benzo[k]fluoranthene	10	330
Benzo[g,h,i]perylene	10	330
Benzo[a]pyrene	10	330
Benzyl alcohol	10	330

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits

Method and Parameters	Reporting Limit	
	Water (μg/L)	Soil (μg/kg)
EPA Method 8270C: Semivolatile Organic Compounds		
Bis(2-chloroethoxy)methane	10	330
Bis(2-chloroethyl)ether	10	330
Bis(2-ethylhexyl)phthalate	10	330
4-Bromophenyl phenyl ether	10	330
Butylbenzylphthalate	10	330
4-Chloroaniline	10	330
4-Chloro-3-methylphenol	10	330
2-Chloronaphthalene	10	330
2-Chlorophenol	10	330
4-Chlorophenyl phenyl ether	10	330
Chrysene	10	330
Dibenzo(a,h)anthracene	10	330
3,3'-Dichlorobenzidine	20	660
Dibenzofuran	10	330
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
2,4-Dichlorophenol	10	330
Diethylphthalate	10	330
2,4-Dimethylphenol	10	330
Dimethyl phthalate	10	330
Di-n-butylphthalate	10	330
4,6-Dinitro-2-methylphenol	50	1,660
2,4-Dinitrophenol	50	1,660
2,4-Dinitrotoluene	10	330
2,6-Dinitrotoluene	10	330

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits

Method and Parameters	Reporting Limit	
	Water (μg/L)	Soil (μg/kg)
EPA Method 8270C: Semivolatile Organic Compounds (Continued)		
Di-n-octyl phthalate	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-Methylnaphthalene	10	330
2-Methylphenol	10	330
4-Methylphenol	10	330
Naphthalene	10	330
2-Nitroaniline	50	1,660
3-Nitroaniline	50	1,660
4-Nitroaniline	50	1,660
Nitrobenzene	10	330
2-Nitrophenol	10	330
4-Nitrophenol	50	1,660
N-Nitrosodiphenylamine	10	330
N-Nitroso-di-n-propylamine	10	330
2,2'-Oxybis(1-chloropropane)	10	330
Pentachlorophenol	50	1,660
Phenanthrene	10	330
Phenol	10	330
Pyrene	10	330

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits

Method and Parameters	Reporting Limit	
	Water (μg/L)	Soil (μg/kg)
EPA Method 8270C: Semivolatile Organic Compounds (Continued)		
1,2,4-Trichlorobenzene	10	330
2,4,5-Trichlorophenol	10	330
2,4,6-Trichlorophenol	10	330
EPA Method 8290: Dioxins and Furans		
2,3,7,8-TCDF	0.00001	0.001
1,2,3,7,8-PeCDF	0.00001	0.001
2,3,4,7,8-PeCDF	0.00001	0.001
1,2,3,4,7,8-HxCDF	0.00001	0.001
1,2,3,6,7,8-HxCDF	0.00001	0.001
1,2,3,7,8,9-HxCDF	0.00001	0.001
2,3,4,6,7,8-HxCDF	0.00001	0.001
1,2,3,4,6,7,8-HpCDF	0.00001	0.001
1,2,3,4,7,8,9-HpCDF	0.00001	0.001
OCDF	0.00001	0.001
2,3,7,8-TCDD	0.00001	0.001
1,2,3,7,8-PeCDD	0.00001	0.001
1,2,3,4,7,8-HxCDD	0.00001	0.001
1,2,3,6,7,8-HxCDD	0.00001	0.001
1,2,3,7,8,9-HxCDD	0.00001	0.001
1,2,3,4,6,7,8-HpCDD	0.00001	0.001
OCDD	0.00001	0.001

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits
Chemical Data Quality Management Plan

Method and Parameters	Reporting Limit	
	Water (µg/L)	Soil (µg/kg)
EPA Method 6010B: Metals by ICP		
Aluminum	50	50,000
Antimony	5.0	500
Arsenic	5.0	500
Barium	20	2,000
Beryllium	3.0	300
Cadmium	2.5	250
Calcium	500	50,000
Chromium	5.0	500
Cobalt	70	7,000
Copper	60	6,000
Iron	70	7,000
Lead	5.0	500
Magnesium	500	50,000
Manganese	20	2,000
Molybdenum	80	8,000
Nickel	40	15,000
Potassium	500	50,000
Selenium	5.0	500
Silver	70	7,000
Sodium	500	50,000
Thallium	2.0	1,000
Vanadium	4.0	400
Zinc	50	5,000

Table 1 (Continued)

Analytical Methods, Parameters for Analysis, and Reporting Limits
Chemical Data Quality Management Plan

Method and Parameters	Reporting Limit	
	Water (μg/L)	Soil (μg/kg)
EPA Method 7470A/7471A		
Mercury	0.2	100
EPA Method 9014		
Reactive Cyanide	10,000	10,000
EPA Method 9034		
Reactive Sulfide	10,000	10,000
Radiochemistry	**pCi/g**	**pCi/g**
Gross alpha, beta and gamma	10/10/5	10/10/5
Gamma spectroscopy	1	1
Specific radioisotopes		
- Americium 241	0.05	0.05
- Cesium 137	0.1	0.1
- Plutonium 238, 239, 240, 241	0.01	0.01
- Radium 226	0.1	0.1
- Uranium 234, 235, 238	0.01	0.01

(1) Reporting Limits (RLs) in this table are typical values. Variations between different labs, techniques, equipment, etc may be permitted. Permissible RL values must be examined on an individual project basis.
(2) RLs for EPA Method 8260B assume a 5-mL purge volume. Lower RL's may be obtained with a 25 mL purge volume.

Table 2

Sample Preservation and Storage Requirements

Method Number	Parameters	Matrix	Holding Time (from sample date)	Containers	Preservative	Minimum Sample Size
8081A	Organochlorine Pesticides and PCBs	water	extraction - 7 days analysis - 40 days	1.0 liter glass	Store at 4 deg C	2 X 1.0 L
		soil	extraction - 14 days analysis - 40 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g
8082	Polychlorinated Biphenyls	water	extraction - 7 days analysis - 40 days	1.0 liter glass	Store at 4 deg C	2 X 1.0 L
		soil	extraction - 14 days analysis - 40 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g
8260B	Volatile Organic Compounds	water	analysis - 14 days	40 mL VOA vials	Hydrochloric acid to pH < 2 Store at 4 deg C	2 X 40 mL
		soil	analysis - 14 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	15 g
8270C	Semivolatile Organic Compounds	water	extraction - 7 days analysis - 40 days	1.0 liter glass	Store at 4 deg C	2 X 1.0 L
		soil	extraction - 14 days analysis - 40 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g
8290	Dioxins and Furans	water	extraction - 30 days analysis - 45 days	1.0 liter glass	Store at 4 deg C	2 X 1.0 L
		soil	extraction - 30 days analysis - 45 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g

Table 2 (Continued)

Sample Preservation and Storage Requirements

Method Number	Parameters	Matrix	Holding Time (from sample date)	Containers	Preservative	Minimum Sample Size
6010B	Metals by ICP	water	analysis - 6 months	500 mL plastic (a)	Nitric acid to pH < 2	500 mL
		soil	analysis - 6 months	8-ounce glass jar or stainless steel tube	Store at 4 deg C	250 g
7471A	Mercury by CVAA	water	analysis - 28 days	500 mL plastic (a)	Nitric acid to pH < 2	500 mL
		soil	analysis - 28 days	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g
9014	Reactive Cyanide	water	–	500 mL plastic	Store at 4 deg C	500 mL
		soil	–	4-ounce plastic	Store at 4 deg C	10 g
9034	Reactive Sulfide	water	–	500 mL plastic	Store at 4 deg C	500 mL
		soil	–	4-ounce plastic	Store at 4 deg C	10 g
9045B	pH	water	analysis - 24 hours	250 mL plastic (b)	Store at 4 deg C	250 mL
		soil	ASAP	8-ounce glass jar or stainless steel tube	Store at 4 deg C	100 g
	Ignitability	water	–	–	–	–
		soil	–	8-ounce glass jar or stainless steel tube	Store at 4 deg C	10 g
	Radiochemistry	water	analysis – 6 months	1.0 liter plastic	Nitric acid to pH < 2	1 L
		soil	analysis – 6 months	8-ounce glass jar or stainless steel tube	Store at 4 deg C	500 g

(a) = The following methods can be sampled together in a 1.0 L plastic container preserved with nitric acid: 6010A, 6020, 7041, 7060A, 7421, 7740, 7841, and 7471A
(b) = The following methods can be sampled together in an unpreserved 1.0 L plastic container: 300.0, 310.0, 160.1, 150.1, and 120.1.

Table 3

Summary of External (Field) QC Samples

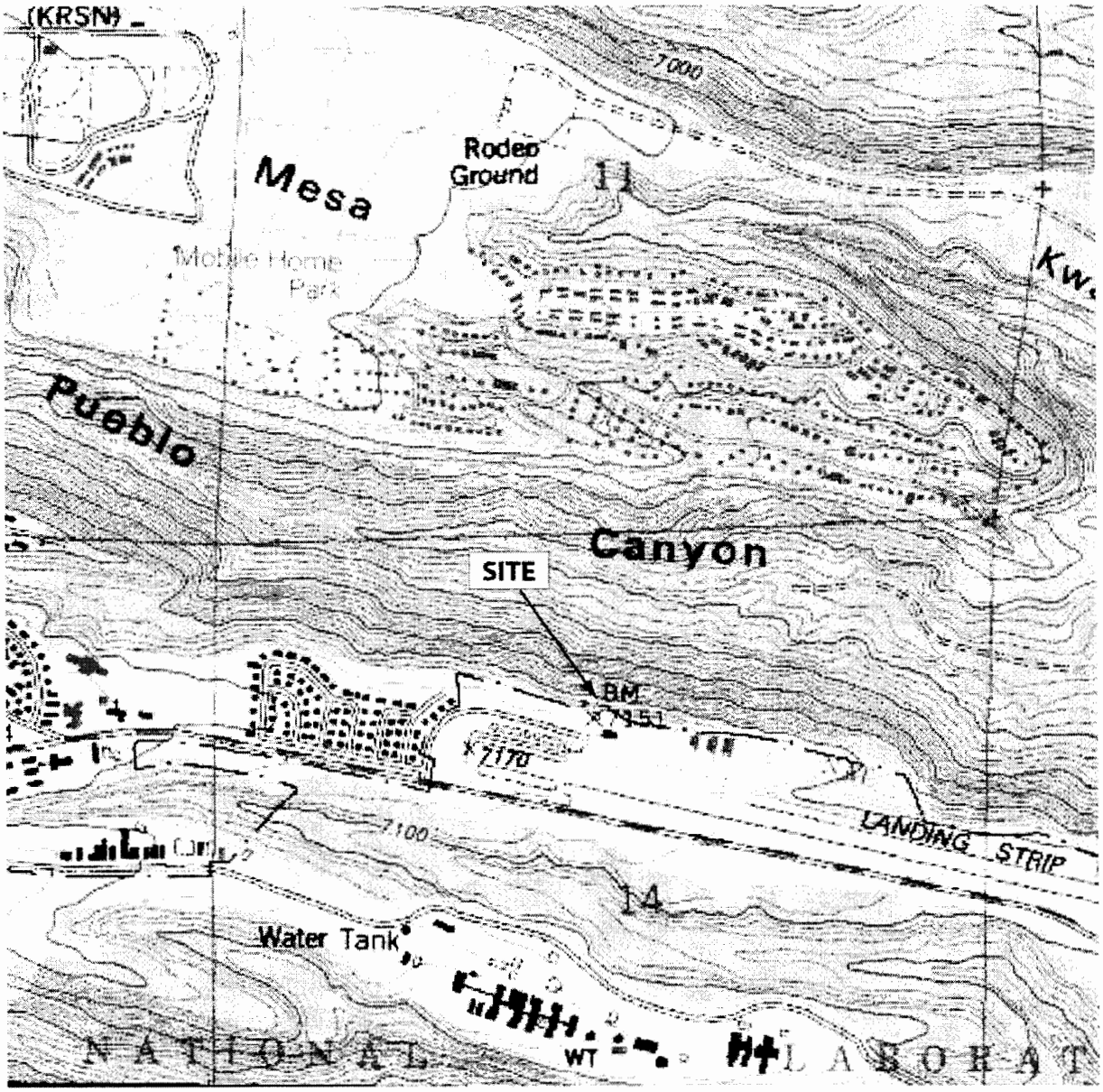
Method Number	Parameters	Trip Blanks	Equipment Rinse Blanks	Field Water Blanks	QA Samples (if requested)	Field Duplicates
	TCLP Analyses	NA	NA	NA	1 per 20 samples	1 per 20 samples
8081	Organochlorine Pesticides	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
8082	Polychlorinated Biphenyls	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
8260B	Volatile Organic Compounds	1 per container	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
8270C	Semivolatile Organic Compounds	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
8290	Dioxins and Furans	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
6010B	Metals by ICP	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
7471A	Mercury by CVAA	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
9014	Reactive Cyanide	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
9034	Reactive Sulfide	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
9045B	pH	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
	RCI	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
9310	Gross alpha, beta and gamma	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
	Gamma Spectroscopy	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples
	Specific Radioisotopes	NA	1 per 20 samples	1 per lot of water	1 per 20 samples	1 per 20 samples

1 per container indicates one trip blank per shipping container per laboratory.
1 per event indicates one equipment blank per day for groundwater sampling activities if reusable bailers are used. The frequency of equipment blanks for soil sampling activities (if required) will be specified in the SAP.
1 per lot of water indicates one field water blank per discrete lot of water used for rinsing reusable sampling equipment.
Field water blanks are not required when dedicated or disposable sampling equipment is used.
QA samples are Quality Assurance samples, if requested, which will be submitted to the COE contract QA laboratory as specified by the USACE District Chemist.

Table 4

Field Measurement Calibration Procedures and Precision Requirements

Field Measurement	Instrument	Calibration Procedure	Precision
Elevation of Sample Site	Level and rod or Total Station	Surveyor Calibration	0.01 foot
Location of Sample Site	Steel or Fiberglass Tape or Total Station	Reference to New Tape or Surveyor Calibration	1 foot
Soil Sample Depth	Steel or Fiberglass Tape	Reference to New Tape	Variable, depending on depth and surface irregularities
	Length of Sample Rod	Reference to Steel Tape	0.5 foot
Portable Metals Analysis	XRF	NIST Standards	Variable, depending on specific metals reported



N

Source: USGS 7.5 minute, Guaje Mountain Quadrangle, 1984

Innovative Technical Solutions, Inc.

U.S. Army Corps of Engineers, Sacramento District

Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

Figure 1
Site Location Map

04-400.12:LANL\Graphics\Waste Characterization Workplan\Fig 1 - Site Location Map.ai

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Source: USGS Aerial Photograph for 1996 (from TerraServer).

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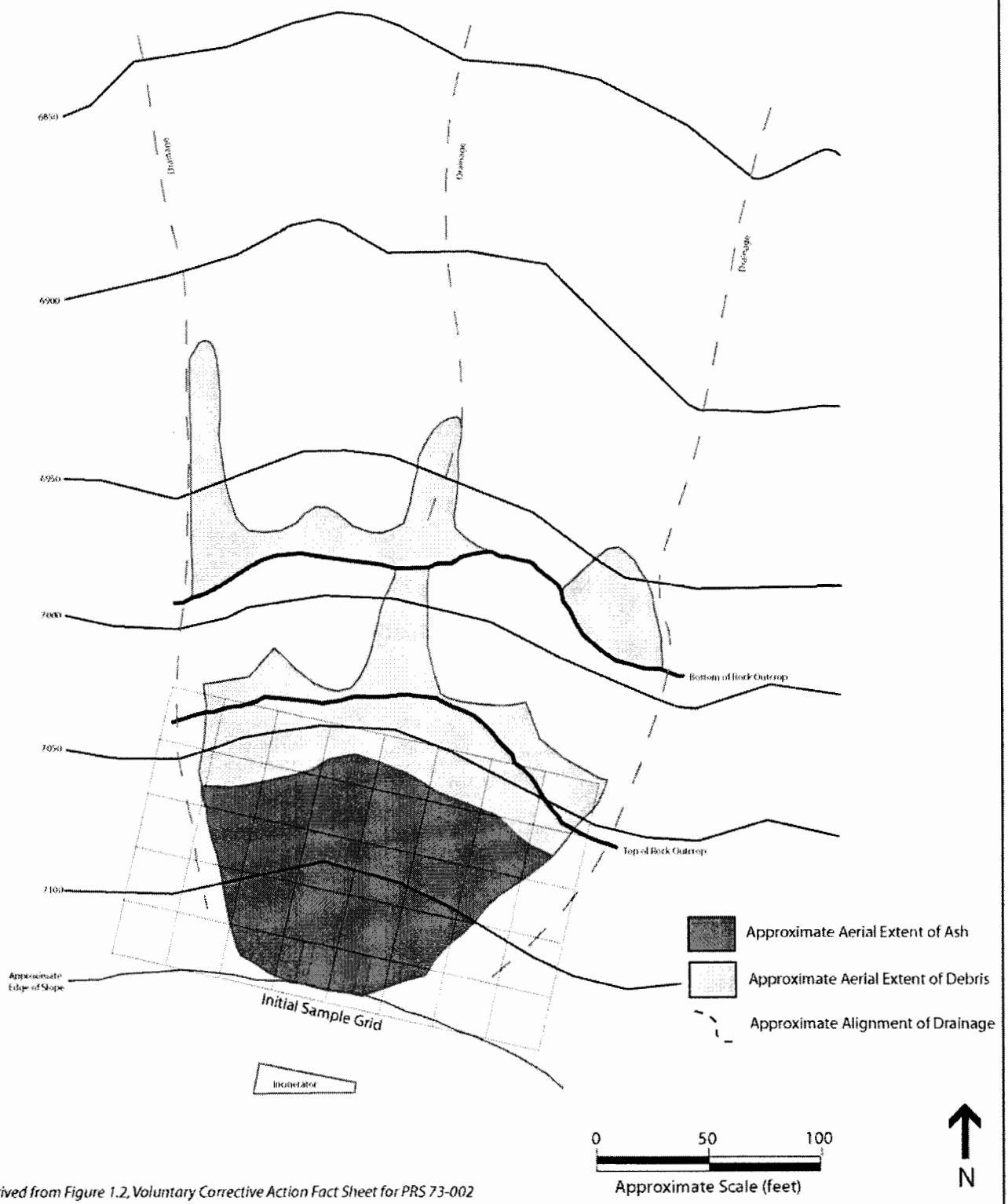
Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

Figure 2
Site Layout

04-400.12\LANL\Graphics\Waste Characterization Workplan\Fig 1 - Site Layout.ai



Source: Derived from Figure 1.2, Voluntary Corrective Action Fact Sheet for PRS 73-002

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Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

Figure 3
Distribution of Ash and Proposed Initial Sample Grid

04-490.12\LANL\Graphics\Waste Characterization Workplan\Fig 3 - Distribution of Ash.ai