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TECHNICAL MEMORANDUM

Results of Incinerator Ash Waste Characterization

Corrective Action for SWMU 73-002 (Incinerator Ash Removal) Los Alamos National Laboratory, New Mexico

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Prepared for:
United States Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

And

Los Alamos National Laboratory
National Nuclear Security Administration, US Department of Energy
P.O. Box 1663 MS-A316
Los Alamos, NM 87544

Prepared by:
Innovative Technical Solutions, Inc.
2730 Shadelands Drive, Suite 100
Walnut Creek, CA 94598

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Innovative Technical Solutions, Inc.

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ACRONYMS AND ABBREVIATIONS

mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mrem/yr	millirem per year
pCi/g	picocuries/gram
uCi	microcuries
ALARA	as low as reasonably achievable
Am	Americium
BV	Background Value
CFR	Code of Federal Regulations
CI	Confidence Interval
Cs	Cesium
COC	Chain of Custody
CRZ	Contamination Reduction Zone
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ER	Environmental Restorations
EPA	Environmental Protection Agency
ID	identification number
LANL	Los Alamos National Laboratory
LLRW	Low-Level Radioactive Waste
LSA-1	Low Specific Activity Type 1
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
ND	Non Detectable (<MDC)
PCB	polychlorinated biphenyl
PRS	Potential Release Site
Pu	Plutonium
QC	quality control
Ra	Radium
RCI	reactivity, corrosivity, ignitability
RCRA	Resource, Conservation and Recovery Act
RCT	Radiological Control Technician
SA	Specific Activity
SMO	Sample Management Office
SVOC	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TCLP	toxicity characteristic leaching procedure
U	Uranium

Abbreviations and Acronyms (continued)

UCI	Upper Confidence Interval
UCL95%	95% Upper Confidence Level
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds

EXECUTIVE SUMMARY

This Technical Memorandum describes the procedures, analytical results of sampling activities conducted for purposes of waste characterization of the incinerator ash at Solid Waste Management Unit (SWMU) 73–002 at the Los Alamos Airport (Figure 1). The results are discussed relative to their applicability towards waste characterization and, ultimately, profiling and waste acceptance at an appropriately licensed receiving facility.

Sampling activities for both hazardous and radiological constituents were conducted in April 2005. Elevated metals and low levels of some organic compounds were identified in the ash, but an evaluation of the sample results indicates the ash is not a hazardous waste by current Resource Conservation and Recovery Act (RCRA) standards promulgated by the U.S. Environmental Protection Agency (EPA). However, the ash is subject to management as a Low-Level Radioactive Waste (LLRW) based on elevated levels of radiological constituents, according to guidelines established by the U.S. Department of Energy (DOE).

1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Innovative Technical Solutions, Inc. (ITSI) was contracted by U.S. Army Corps of Engineers, Sacramento District (USACE) to characterize, remove and properly containerize the ash located on the slope of Pueblo Canyon adjacent to the Los Alamos Airport, on behalf of the National Nuclear Security Administration, DOE. Figure 1 shows the location of the site. The ash was generated from the operation of a small incinerator located immediately adjacent to the ash.

This Technical Memorandum provides the results of sampling of the ash in April 2005 for waste characterization purposes, and evaluates the analytical results according to EPA and DOE guidelines for the characterization and classification of waste.

1.2 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 Correction Action is for SWMU 73-002, a small incinerator that 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 (Los Alamos National Laboratory [LANL], 2005).

In 1948, The Zia Company acquired the facility, which it held until 1973 and operated the incinerator for municipal trash. 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 less than 30,000 square foot, and ranges in thickness from less than one foot to greater than eight feet.

Previous sampling efforts were conducted of the ash pile and within the associated drainages in 1996, 1997, and 1998. These previous sampling events identified high concentrations of several metals, with concentrations of lead as high as 13,100 milligrams per kilogram (mg/kg), as well as low concentrations of several organic chemicals. Low levels of several radiological constituents were also detected in a limited number of ash samples.

2.0 FIELD ACTIVITIES

The sampling program was conducted as described below.

- Establish site control.
- Establish a sampling grid with the dimensions of 30-feet by 30-feet per grid over the full aerial extent of the ash.
- Measure depth of ash in each of the established grids to determine approximate volume of ash. Based on field measurements, an estimated 1,650 cubic yards of ash is present.
- 18 individual locations were sampled, for a total of 20 ash samples collected, (including 2 duplicate samples) based on the estimated 1,650 cubic yards of ash.
- Screen ash samples onsite using a portable x-ray fluorescence meter.
- Submit ash samples to the Sample Management Office (SMO) for analysis.

The analytical results were evaluated relative to hazardous and radiological criteria for waste classification, consistent with EPA and DOE guidelines, and in consultation with potential disposal facilities.

2.1 SITE CONTROL AND WORK PROCEDURES

Prior to starting work on the ash pile, site control was established. Sampling activities were conducted under the direct observation of a LANL Radiological Control Technician (RCT). A radiological control line was established between the "dress out" area (Contamination Reduction

Zone [CRZ]) and the outlying Support Zone. Sampling equipment and personnel exiting the Exclusion Zone (and passing through the CRZ) were screened by the RCT before they were allowed to leave the CRZ. In addition, all environmental samples were screened at the control line by the RCT, and the results of the screening were recorded on the appropriate sample collection logs, per standard LANL SMO procedure.

2.2 ESTABLISH SAMPLE GRID AND DETERMINE EXTENT OF ASH

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

The sample grid was established on a 30-foot by 30-foot grid system down the slope. A point of origin was staked near the top of the hill, just below the East Pier (a concrete structure protruding out from the top of the slope, see photographs 1 and 2 in Figure 2). A compass and 30-foot section of rope was used to lay out the grid. Grid rows (running north-south) were labeled A through E (west to east) and ranks were labeled 1 through 5 (top to bottom of slope).

The extent of the ash was then evaluated by visual inspection, and its depth was estimated using a thin rigid rod (or similar device) pushed or driven into the ash perpendicular to the slope until refusal, or by hand-auguring until encountering either native soil or bedrock. At each sample point, the presence or absence of ash was noted, and depth of ash was estimated. The location of each point was also marked and subsequently surveyed. The maximum ash thickness was approximately 8 feet. Table 1 provides the location and depth information for the sample points, and Figure 3 shows the thickness of the ash.

The samplers working on the hillside slope were dressed in Tyvek® disposable protective garments, taped at the boots and gloves, and wore half-face respirators. The samplers also wore

climbing harnesses (see photograph 3 in Figure 2) and were attached by climbing ropes secured (with triple redundancy – clove hitch, leading to a figure 8, leading to a final clove hitch) to the metal railings running along the two concrete piers at the top of the hill. Self-braking belay descenders were used to self-belay when working on the steep slope. Personal air monitors were worn for the first two days of sampling to monitor for airborne lead concentrations.

2.3 COLLECTION OF THE ASH SAMPLES

Samples were collected from locations where the ash appeared to be the thickest in each grid. Grid squares that contained more than 3 feet of ash were split, and sampled twice at different locations, within the grid, to maintain a sampling frequency of approximately 1 sample per 100 cubic yards of ash. Grid squares with only a thin layer of ash were not sampled, but the presence of ash was noted. Figure 4 shows the sample locations.

Material from each hand auger bucket removed from the ash pile was placed in a disposable paper bucket. Each 5-gallon paper bucket was labeled with the grid identification number and depth interval represented by the material collected in that bucket. The last bucket of material removed from each hand auger boring was marked with the grid number, depth interval and the letters "TD" for Total Depth. A messenger line pulley system was used to transfer the sample buckets up the hill to the sample preparation area.

Multiple buckets from one hand auger boring location were spread out on clean Tyvek® (cut from a roll of Tyvek®) and field composited by mixing with a stainless steel trowel (see photograph 4 in Figure 2). The samples were collected specific analyses at differing frequencies, based on previously reported results for the ash and typical acceptance requirements for the various receiving facilities (e.g., metals and radioisotopes at a higher frequency of 1 sample per 100 cubic yards of ash, and volatile organic compounds [VOCs], semivolatile organic compounds [SVOCs], polychlorinated biphenyls [PCBs], and dioxins/furans at 1 sample per 500 cubic yards of ash).

The sample for the 1 per 100 cubic yard analyses were collected from the homogenized composite representing material collected over the entire thickness of ash at each sample location, and transferred into appropriate containers provided by SMO. A split was collected from each composite and placed in a labeled resealable plastic bag for XRF analysis.

The remaining material was reserved to be composited with additional hand auger boring samples for the 1 per 500 cubic yard analyses. Samples for VOC and bulk density were collected in 2-inch by 6-inch stainless steel tubes by driving a 12-inch long, nominal 2-inch diameter sample core barrel with a slide hammer attachment. These discrete samples were collected at locations where the ash was thickest for the grid locations making up the 1 per 500 cubic yard composite.

Samples were labeled with unique sample identification number (ID) for each location and depth provided by SMO. Following labeling, samples were placed in an iced cooler until subsequently transferred to the SMO under proper chain-of-custody (COC) procedures.

Sampling equipment was decontaminated following each use by washing in a non-phosphate detergent, water rinse, and a distilled or de-ionized water rinse. Equipment rinsate samples were collected by pouring water over the hand auger or other non-disposable equipment, and placing the resulting sample in appropriate sample containers provided by SMO.

2.4 FIELD SCREENING OF SAMPLES

The split-portion of each sample placed in the plastic bag was analyzed using an Innov-X Systems handheld XRF (see photograph 5 in Figure 2). The field screening results are provided in Table 2.

2.5 LABORATORY ANALYSIS

Table 3 lists the analytical criteria and frequency for the samples. The analyses were performed based on: 1) requirements of the potential receiving facilities; 2) to provide data generally consistent with previous investigations of the ash; and 3) to screen the ash relative to potential confirmation sampling requirements.

3.0 RESULTS OF ANALYSES

Laboratory results for the ash samples are provided in Table 4 (organic compounds), Table 5 (metals), and Table 6 (radiological). The ash samples contained elevated levels (greater than LANL background concentrations) of metals, several radionuclides, and detectable concentrations of many organic compounds. The results were consistent with results from previous sampling activities of the ash.

4.0 WASTE CLASSIFICATION

Based on the results of the most recent (April 2005) sampling efforts, along with the results of previous sampling efforts at the site, the appropriate waste classification can be determined. The results will be evaluated against requirements promulgated under the RCRA, and rules governing the classification of radiological wastes.

4.1 RCRA WASTE CLASSIFICATION

A solid waste can be considered hazardous based on the following primary criteria:

- The waste exhibits the characteristics of a hazardous waste if it exhibits on one or more of the following (40CFR 261 Subpart C):
  - Characteristics of ignitability (40CFR 261.21)
  - Characteristics of corrosivity (40CFR 261.22)
  - Characteristics of reactivity (40CFR 261.23)
  - Characteristics of toxicity (40CFR 261.24)
- The waste is specifically listed as hazardous (40CFR 261 Subpart D)

4.1.1 Reactivity, Corrosivity and Ignitability (RCI)

The results of the characterization sampling efforts included testing for reactivity, corrosivity and ignitability (known collectively as RCI). The results of analyses for each of the characteristics of RCI are shown in Table 4, and discussed below:

- The ash did not exhibit characteristics of **reactivity** (several criteria, most relevant is the generation of cyanide or sulfide in sufficient quantity to present a danger to human health or the environment [typically reactive cyanide >250 mg/kg, and reactive sulfide >500 mg/kg]) based on non-detect reactive sulfide and reactive cyanide measurements for samples analyzed ranging from 0.052 to 0.14 mg/kg.
- The ash did not exhibit characteristics of **corrosivity** (requiring a pH of ≤2 or ≥12.5) based on pH measurements for samples analyzed ranging from 8 to 8.3.
- The ash did not exhibit characteristics of **ignitability** (requiring a flashpoint <60°C) based on flashpoint measurements for each sample analyzed of >60°C.

4.1.2 Toxicity

The results of the characterization sampling efforts included testing for organic and inorganic compounds with established maximum concentrations by Toxicity Characteristic Leaching Procedure (TCLP) listed in 40CFR 261.24. Table 4 provides the results for metals analyzed using TCLP methodology, and Table 5 provides the results for organic compounds analyzed as totals, and adjusting these results based on the 20:1 dilution employed in the TCLP methodology and assuming 100% solubility (a very conservative assumption). The 90% Upper Confidence Interval (UCI) of the mean is then calculated using all the sample results from the most recent ash characterization sampling, per EPA methodology (EPA SW-846 Chapter 9). The 90% UCI of the mean is then compared to the established regulatory levels. In every case, the 90% USI of the mean is below the established regulatory levels, and the waste is non-hazardous.

To further clarify this methodology, an example will be calculated using TCLP lead. The raw values reported for lead by TCLP ranged from minimum of 0.316 to a maximum of 6.29 milligrams per liter (mg/L), with a regulatory level for lead of 5.0 mg/L. To calculate the

confidence interval (CI) of the mean, the following equation is used:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}}$$

with $t_{.20}$ from tabulated student's "t" test values for two-tailed probability of 0.20 (equivalent to 0.10 single tail probability) with appropriate degrees of freedom (n-1, where n is number of samples collected and analyzed). The first step is calculating the mean of the samples using the equation:

$$\bar{x} = \frac{\sum_{i=n}^{n} x_i}{n}$$

where n = number of sample measurements. For lead, 20 samples were collected, and the calculated mean is 1.811. Standard error is calculated using the following equation:

$$s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

where s is the standard deviation of the samples. For lead, the standard deviation is 1.527 and, as mentioned above, n is 20.

Now, calculating the CI and substituting the above equation:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}} = (1.811) \pm (1.328)(\frac{1.527}{\sqrt{20}}) = 1.811 \pm 0.453 = 1.358 - 2.264$$

Thus, the 90% UCI for lead is 2.264 mg/L, well below the regulatory level of 5.0 mg/L.

4.2 RADIOLOGICAL WASTE CLASSIFICATION

Characterizing the incinerator ash is complicated by the presence of low-levels of radioactive material. The key questions are 1) whether the ash is considered a radioactive waste (typically material that has become contaminated [i.e., greater than background concentrations] by radioactive elements or isotopes, and 2) if a radioactive waste, should the ash be considered a

LLRW, or 3) could the ash be released to an industrial-waste landfill.

There is little guidance on evaluating bulk media for release from radioactive waste requirements. The guidance available is mainly governed by DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE, 1990), DOE-EH memorandum "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material" (DOE, 1995) regarding the implementation of DOE 5400.5, and the proposed regulation 10 CFR 834, "Radiation Protection of the Public and the Environment" The "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) process is not applicable for waste characterization, but is applicable for final site closure after completion of remediation activities.

Furthermore, the proposed DOE Standard, "Guide to Good Practice for Establishing Authorized Limits for the Release of Waste and Property Contaminated with Residual Radioactivity," was reviewed. This standard reiterates the requirements specified in the DOE 1995 memorandum.

4.2.1 2005 Sample Results

Samples were collected from April 19 - 21, 2005 of the incinerator ash. Table 6 lists the results of the radionuclide analyses. LANL SOP – 15.13, "Performing Background Value Comparisons for Radionuclides," dated 4/10/2000, provides guidance on comparing background and fallout values on radionuclides at the LANL Environmental Restoration (ER) project. Background values are obtained from "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," dated September 1998.

The following table summarizes the sample results and compares them to the background values (BV) specified by LANL (1998) and compares results to the 1999 draft report that summarizes the samples taken in 1996 to 1998.

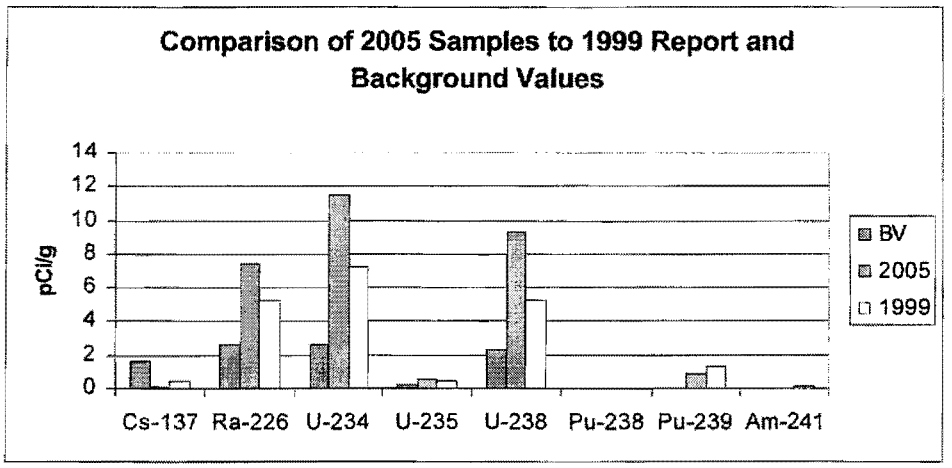
Radionuclide	Sample Results Range picocurie per gram (pCi/g)	UCL95% (pCi/g)	# of Detects >BV	Soil BV (pCi/g)	1999 Report (pCi/g)
Cesium 137 (Cs-137)	0.025(non-detect [ND]) to 0.138	0.066	0	1.65	0.49
Radium 226 (Ra-226)	0.65(ND) to 25.2	7.409	12	2.59	5.3
Uranium 234 (U-234)	1.59 to 37.3	11.55	13	2.59	7.2
Uranium 235 (U-235)	0.057 to 2.02	0.59	10	0.2	0.4
Uranium 238 (U-238)	1.15 to 31.2	9.318	13	2.29	5.2
Plutonium 238 (Pu-238)	0.01(ND) to 0.022(ND)	0.015	0	0.023	0.005
Plutonium 239 (Pu-239)	0.10 to 2.34	0.832	18	0.054	1.3
Americium 241 (Am-241)	0.003(ND) to 0.037	0.023[1]	6	0.013	0.16

Note 1: The Americium 241 UCL95 exceeded the BV partially due to the Minimum Detectable Concentration (MDC) exceeding the BV value. Six out of eighteen samples indicated a presence of Am-241 above the MDC.

Note 2: The following radionuclides showed up in some of the analytical results exceeding the laboratory MDC and were not included in the table above: Ac-228; Bi-211; Bi-214; K-40; Pa-234m; Pb-212; Pb-214; Ra-228; Tl-208; Th-231. All radionuclides normally exist in background; with most accounted for due to the natural decay series of Actinium, Thorium, and Uranium, applying the assumption of secular equilibrium.

Note 3: 2005 sample results that were below MDC were calculated at 50% of MDC for statistical purposes.

The following chart demonstrates a comparison between sample results and background values:



The 2005 sample results demonstrably exceed background values (LANL, 1998) for the following radionuclides: Ra–226; U–234; U–235; U–238; Pu–239; and Am–241. Likewise, the sample results exceeded the 1999 summary report for the following radionuclides: Ra–226; U–234; U–235; and U–238. The samples also revealed the presence of plutonium. Nearly all plutonium is manufactured synthetically by exposing U–238 to neutron radiation, thus its presence could

suggest a classification of "low level radioactive waste" under Nuclear Regulatory Commission guidelines NUREG/BR-0216, Rev. 2 "Radioactive Waste: Production, Storage, Disposal" (NRC, 2002).

The 1999 report performed a dose estimate to the residential population of 19 millirem per year (mrem/yr), exceeding 15 mrem/yr (a recommended soil cleanup goal established by U.S. EPA). The majority of the dose contribution was based on Ra–226 and U–234 radionuclides at 55% and 30% respectively. Since the results for the most recent sampling event were higher than the 1999 results, it is likely the dose estimate to the residential population would exceed the 1999 estimate of 19 mrem/yr.

In addition to the radioisotope lab results discussed above, a gross alpha mean activity of 11.2 pCi/g and a gross beta mean activity of 13.3 pCi/g, was also provided by the analytical laboratory. These results were lower than expected when comparing to the individual radionuclide analytical results, which was mainly due to the analytical errors associated with sampling. These values will be used for information only with more weight placed on the individual radioisotope lab results when used for waste characterization.

4.2.2 Evaluating for Release

The release evaluation first must consider the radionuclides that may have been enhanced by the DOE at the particular site. An initial review of the incinerator building and process indicates that this process was not used for the incineration of radioactive material. Regardless, this, evaluation for release considers possible contaminants that the Los Alamos National Laboratory may have introduced (e.g., the presence of plutonium).

DOE Order 5400.5, "Radiation Protection of the Public and the Environment", provides a discussion on evaluating for the release of residual radioactive material. Section II.5 Para. c.(6)

states there is no guidance currently available for release of material that has been contaminated in depth. Further guidance has since been provided in the 1995 DOE memorandum on releasing material to an offsite non-DOE landfill that is not authorized for disposal of low-level radioactive waste. There are basically four requirements that must be met:

- The material is approved by DOE on the basis of an ALARA assessment and ensures individual doses to the public are less than 25 mrem in a year.
- The landfill is evaluated to ensure the ground water will be protected with respect to applicable state regulations.
- The landfill is assessed to ensure no remediation is required under DOE 5400.5, or applicable requirements, if the landfill property is released.
- The release is coordinated with and acceptable to the landfill operator, and state regulators.

This memo further states that authorized limits must be approved by EH-1 (Environment, Safety, and Health Department, DOE headquarters) in coordination with EH-412 (Air, Water, and Radiation Division).

The release can be approved by the DOE field office if the exposure to any individual does not exceed 1 mrem in a year or a collective dose exceeding 10 mrem in a year. According to the DRAFT - Preliminary Screening Evaluations of the Ash Debris (PRS 73-002) in July 1999, by LANL (LA-UR-01-3243), the dose to the public was determined to be 19 mrem/yr for a residential setting. Primary contributors were Radium 226 and Uranium 234 at 55% and 30% respectively. The 2005 sample results were higher than the samples evaluated in the 1999 report; thereby, indicating that a review and approval of the authorized limits for the waste would be required by the EH-1 Department at DOE headquarters.

4.2.3 Waste Characterization

Based on the presence of transuranic radionuclides (e.g., plutonium), the waste may be classified as LLRW. However, the waste may be subject to release from regulation based on calculated authorized limits, with approval of DOE headquarters. If released, the waste may still be subject to regulations under the Department of Transportation (DOT).

According to the DOT regulations (49 Code of Federal Regulations [CFR]173.403, revised 10/2004), radioactive material means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table in article 173.436 or values derived according to the instructions in article 173.433.

The activity of the waste is based on the mean concentration of the radionuclides. The samples that were taken of the incinerator ash were based on collecting a representative sample for each 100 cubic yards of ash. As shown in Table 6, the distribution of radionuclides is relatively consistent between samples (e.g., plutonium is reported in each of the samples), thus using the mean and 95% Upper Confidence Level (UCL95%) of the samples is appropriate to characterize the entire waste stream.

Below is a waste characterization summary showing the primary contributors and the total activity for an assumed package weight of 20,000 pounds (assumes packaging the ash in 10 cubic yard sacks):

Description	Mean SA (pCi/g)	Maximum SA (pCi/g)	UCL95 SA (pCi/g)	Total Activity per 20,000 lbs (microcuries [uCi])
U-234	7.91	37.30	11.50	72.81
U-235	0.40	2.02	0.59	3.59
U-238	6.25	31.20	9.32	56.77
Pu-238	0.01	0.02	0.02	0.12
Pu-239	0.59	2.34	0.83	5.34
Am-241	0.02	0.04	0.02	0.17
Ra-226	5.17	25.20	7.41	46.95
Cs-137	0.06	0.14	0.07	0.50

Note: The above table does not include daughter progeny for the following radionuclides: U-235, U-238, Cs-137, and Ra-226.

The following table compares the sample results to 49CFR173.436, "Exempt Material Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides".

Description	Mean SA (pCi/g)	Calculated SA for Parent and Progeny	Exempt Concentration in pCi/g	Exempt Concentration Met	Consignment (40,000#) (Ci)	Exempt Consignment (Ci)	Exempt Concentration Met	Consignment Exempt Limit (Pounds)
U-234	7.91		270	Exempt	1.44E-04	2.70E-07	Not Exempt	75
U-235	0.4	0.8	270	Exempt	1.45E-05	2.70E-07	Not Exempt	743
U-238*	6.25	18.75	27	Exempt	3.41E-04	2.70E-08	Not Exempt	3
Pu-238	0.01		27	Exempt	1.82E-07	2.70E-07	Exempt	40,000
Pu-239	0.59		27	Exempt	1.07E-05	2.70E-07	Not Exempt	1,008
Am-241	0.02		27	Exempt	3.63E-07	2.70E-07	Not Exempt	29,736
Ra-226	5.17	46.53	270	Exempt	8.45E-04	2.70E-07	Not Exempt	13
Cs-137	0.066	0.132	270	Exempt	2.40E-06	2.70E-07	Not Exempt	4,505
K-40	8.3		2700	Exempt	1.51E-04	2.70E-05	Not Exempt	7,165

* This assumes $U_{natural}$ for Exempt Limits; however, only Th-234, and Pa-234m are used for Progeny due to Ra-226 Progeny are already included.

The mean activity concentration of the radionuclides were compared to the exemption limits specified in 49CFR173.436. In every case, the individual radionuclides met the exemption criteria for activity concentration; however, when comparing the limits to the total consignment activity of 40,000 pounds, every radionuclide failed the exemption criteria except Pu–238. Further analysis indicated that a consignment weight of less than 3 pounds could be considered exempt material based on the concentration of U–238.

The strict interpretation of the DOT regulations, the ash would not necessarily be designated a radioactive material. However, in practice, since the consignment fails the criteria for exemption of the designation as radioactive materials, in practical terms it may be appropriate to classify the ash as a radioactive material. If so designated, the DOT classification for the ash would be Low Specific Activity Type 1 (LSA-I) material. LSA-I waste requires IP-1 rated packaging for transportation per 49CFR173.427.

4.2.4 Summary

Based on the activities demonstrably greater than background, and the presence of transuranic radionuclides (e.g., plutonium), the waste is classified as LLRW. The waste may be subject to release from regulation based on calculated authorized limits, however, this exception would require approval of DOE headquarters based on the previously calculated exposure greater than 1 mrem/yr.

5.0 CONCLUSIONS

Based on the discussions and analyses contained in Sections 4.1 and 4.2 above, the ash as a whole is classified as non-hazardous, low-level radioactive waste. The results of the characterization for the ash has been reviewed by EnviroCare of Utah, who has tentatively accepted the ash for disposal as LLRW, to be handled as a debris due to its physical properties (low bulk density).

The miscellaneous debris associated with the ash (degraded cans, etc.) that are in direct contact with the ash can be managed with the ash (and has been approved by EnviroCare for handling in this manner). Other surficial debris (cans and other metallic debris) located away from the ash can be handled as non-hazardous debris for disposal at a municipal or industrial landfill. This surficial debris has been tentatively accepted for disposal at Rio Rancho Landfill, as long as it contains no ash (due to classification of ash as a "special waste" by State of New Mexico with specific permit requirements [which Rio Rancho Landfill is excluded from accepting] and not due to any chemical or radiological constituent in the ash).

6.0 REFERENCES

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DOE Memorandum November 17, 1995, "Application of DOE 5400.5 requirements for release and control of property containing residual radioactive material," (DOE 1995 Memo)

DOE (DRAFT), "Radiation Protection of the Public and the Environment," Title 10 Code of Federal Regulations Part 834 Draft (10 CFR 834 Draft)

Department of Transportation 2004, "Shippers – General Requirements for Shipments and Packagings," Title 49 Code of Federal Regulations Part 173 (49 CFR 173)

Los Alamos National Laboratory (LANL) July 1999 Draft, "Preliminary Screening Evaluations of the Ash Debris (PRS 73-002)," (LA-UR-01-3243)

LANL SOP 15.13, April 10, 2000, "Performing Background Value Comparisons for Radionuclides," (LANL SOP 15.13)

LANL September 1998, "Inorganic and Radionuclide Background Data for Soils, Sediments, and Bandelier Tuff at Los Alamos National Laboratory," (LANL 1998)

LANL, 2005, Voluntary Corrective Action Fact Sheet for PRS 73-002

Nuclear Regulatory Commission (NRC), 2002, "Radioactive Waste: Production, Storage, Disposal", NUREG/BR-0216, Rev. 2

Table 1
Ash Sample Locations
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Description	Sample ID	Northing	Easting	Elevation
24	RE73-05-58824	1776490.221	1632870.901	7085.18
25	RE73-05-58825	1776494.262	1632847.334	7085.47
26	RE73-05-58826	1776475.116	1632859.181	7100.64
27	RE73-05-58827	1776476.228	1632846.198	7100.44
28	RE73-05-58828	1776451.751	1632858.314	7121.89
	RE73-05-58829	Composite of above 5 samples		
30	RE73-05-58830	1776471.547	1632872.435	7100.76
31	RE73-05-58831	1776478.455	1632886.711	7089.16
32	RE73-05-58832	1776490.287	1632886.624	7081.26
33	RE73-05-58833	1776481.277	1632906.012	7075.99
34	RE73-05-58834	1776487.883	1632908.340	7071.53
	RE73-05-58835	Composite of above 5 samples		
36	RE73-05-58836	1776508.764	1632881.722	7069.28
37	RE73-05-58837	1776510.558	1632866.333	7070.62
38	RE73-05-58838	1776454.530	1632829.404	7122.76
39	RE73-05-58839	1776472.421	1632824.250	7107.92
40	RE73-05-58840	1776490.567	1632833.376	7091.30
	RE73-05-58841	Composite of above 5 samples		
42	RE73-05-58842	1776497.922	1632817.707	7085.07
	RE73-05-58843	Duplicate of RE73-05-58842		
44	RE73-05-58844	1776493.762	1632800.652	7084.96
44A	RE73-05-58844	1776440.800	1632814.873	7133.72
45	RE73-05-58844	1776480.061	1632804.444	7097.41
	RE73-05-58845	Duplicate of RE73-05-58844		
46	RE73-05-58846	1776518.264	1632829.844	7070.50
	RE73-05-58879	Composite of above 5 samples		
A3	Grid Corners	1776491.374	1632810.545	7090.11
A4	Grid Corners	1776512.346	1632817.581	7074.26
A5	Grid Corners	1776536.932	1632826.121	7058.79
B2	Grid Corners	1776463.620	1632834.499	7114.33
B3	Grid Corners	1776486.075	1632840.713	7093.79
B4	Grid Corners	1776507.117	1632847.009	7075.51
B5	Grid Corners	1776531.917	1632854.797	7057.97
C1	Grid Corners	1776436.050	1632855.871	7135.45
C2	Grid Corners	1776456.421	1632863.008	7116.98
C3	Grid Corners	1776479.451	1632869.848	7095.63
C4	Grid Corners	1776501.133	1632876.856	7076.81
C5	Grid Corners	1776525.647	1632884.379	7059.44
D3	Grid Corners	1776467.186	1632895.594	7088.91
D4	Grid Corners	1776493.276	1632905.170	7070.35
	RE73-05-58877	Trip Blank		
	RE73-05-58878	Trip Blank		
	RE73-05-58920	Auger rinsate		
	RE73-05-58921	Trowel rinsate		
	RE73-05-58923	Auger rinsate		
	RE73-05-58924	Trowel rinsate		

Table 2
Field Screening Results
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Date	Sample ID	Mode	Ag	As	Cd	Co	Cr	Cu	Mn	Ni
19-Apr-05	RE-73-05-55825	Soil	839.22	122.34	-31.35	1767.98	1809.52	2878.92	5342.24	-148.57
19-Apr-05	RE-73-05-58826	Soil	337.91	209.62	-17.35	825.17	1200.46	2570.44	5444.26	-12.84
19-Apr-05	RE-73-05-58827	Soil	392.44	105.54	-49.84	654.52	876.04	1007.31	1887.85	157.6
19-Apr-05	RE-73-05-58828	Soil	474.27	152.58	10.77	1197.94	1359.96	2499.57	4045	126.73
19-Apr-05	RE-73-05-58829	Soil	506.76	171.03	-73.9	1140.53	963.16	1953.71	5887.61	-16.63
19-Apr-05	RE-73-05-58830	Soil	315.94	147.75	-60.37	770.57	848.37	1589.79	3588.96	188.67
19-Apr-05	RE-73-05-58831	Soil	630.66	152.14	58.26	1851.03	1431.86	3030.35	4020.55	154.22
19-Apr-05	RE-73-05-58832	Soil	434.5	109.88	-65.93	642	1483.69	1597.12	2708.36	294.72
19-Apr-05	RE-73-05-58833	Soil	697.88	116.54	-22.12	774.55	1302.5	1350.28	3973.98	228.84
19-Apr-05	RE-73-05-58834	Soil	374.37	185.64	-32.28	808.14	980.02	3199.66	2700.21	100.52
19-Apr-05	RE-73-05-58836	Soil	1021.59	168.27	-25.96	1622.89	2281.96	1728.77	5876.85	-432.01
19-Apr-05	RE-73-05-58837	Soil	1014.33	44.66	-74.48	-3457.68	3030.52	-211.07	15205.4	-3740.28
19-Apr-05	RE-73-05-58838	Soil	913.36	164.68	8.97	572.84	1328.23	1700.16	3316.86	62.82
19-Apr-05	RE-73-05-58839	Soil	400.82	143.92	81.43	563.26	1061.24	2237.75	2965.3	196.16
19-Apr-05	RE-73-05-58840	Soil	473.61	116.77	-57.23	375.71	750.24	1805.06	2416.87	416.43
20-Apr-05	RE-73-05-58842	Soil	116.05	41.99	-43.7	592.16	721.39	3180.61	2716.86	322.54
20-Apr-05	RE-73-05-58844	Soil	849.37	96.12	29.89	2036.7	1500.07	1166.91	5787.14	-310.65
20-Apr-05	RE-73-05-58846	Soil	401	197.75	7.77	1982.44	1461.83	2084.91	4581.69	34.93
20-Apr-05	RE-73-05-58879	Soil	644.62	108.14	13.41	1470.13	1136.23	1156.62	2944.93	134.1
21-Apr-05	42105.01	Soil	-57.3	3.48	50.53	269.31	93.06	33.2	484.79	20.52
21-Apr-05	42105.02	Soil	159.2	1.56	-4.9	324.26	214.29	71.41	805.11	101.42
21-Apr-05	42105.03	Soil	-60.25	6.68	-43.43	78.38	167.6	17.17	752.64	-32.53
21-Apr-05	42105.04	Soil	-86.01	-1.73	-51.83	15.28	127.5	11.84	620.8	-16.8
21-Apr-05	42105.05	Soil	62.87	0.67	-1.01	198.93	46.72	20.42	434.14	46.76
21-Apr-05	42105.06	Soil	21.42	0.38	5.03	183.53	159.63	14.84	620.49	24.57
21-Apr-05	42105.07	Soil	85.02	1.79	-91.58	177.05	84.5	43.86	751.95	72.66

Table 2
Field Screening Results
Results of Incinerator Ash Ch
Corrective Action for SWMU

Date	Sample ID	Pb	Sb	Se	V	Zn	Hg
19-Apr-05	RE-73-05-55825	2261.78	-85.4	12.87	7118.36	6418.27	-45.11
19-Apr-05	RE-73-05-58826	2818.99	93.32	0.44	1826.62	7098.81	-31.87
19-Apr-05	RE-73-05-58827	1172.61	19.96	2.43	2443.14	3044.76	14.51
19-Apr-05	RE-73-05-58828	2341.11	43.24	0.73	2448.68	6101.23	-39.85
19-Apr-05	RE-73-05-58829	1890.45	-77.68	9.84	3580.5	5253.93	51.08
19-Apr-05	RE-73-05-58830	1865.44	22.07	3.51	2571.47	5354.48	33.19
19-Apr-05	RE-73-05-58831	2892.42	-17.21	7.76	3024.68	9533.17	34.48
19-Apr-05	RE-73-05-58832	2020.58	55.39	11.36	2342.78	5486.3	116.61
19-Apr-05	RE-73-05-58833	1968.66	-49.97	9.86	3625.08	4515.64	108.15
19-Apr-05	RE-73-05-58834	2365.59	102.8	-3.21	1837.38	5938.16	1.18
19-Apr-05	RE-73-05-58836	2805.62	-68.15	1.08	3685.55	3658.85	84.31
19-Apr-05	RE-73-05-58837	1893.15	178.29	-16.94	1781.12	911.39	-21.72
19-Apr-05	RE-73-05-58838	2146.29	-0.42	7.85	4272.29	10013.47	18.32
19-Apr-05	RE-73-05-58839	2027.99	87.85	-0.83	3374.21	15046.07	37.51
19-Apr-05	RE-73-05-58840	1200.76	-79.38	14.34	2856.29	5928.67	80.55
20-Apr-05	RE-73-05-58842	4629.82	-55.21	-11.71	1582.53	8540.69	-91.1
20-Apr-05	RE-73-05-58844	1664.05	75.92	6.28	4318.11	3467.66	54.2
20-Apr-05	RE-73-05-58846	1947.92	30.34	-1.11	4131.58	4160.99	-51.37
20-Apr-05	RE-73-05-58879	1692.42	27.54	1.87	3032.11	3646.13	-45.77
21-Apr-05	42105.01	43.7	24.28	0.61	130.78	68.31	8.19
21-Apr-05	42105.02	56.68	-36.74	7.29	953.93	175.51	23.03
21-Apr-05	42105.03	24.1	-34.19	6.14	20.47	47.35	9.7
21-Apr-05	42105.04	101.99	60.68	-3.08	109.79	111.6	7.03
21-Apr-05	42105.05	34.88	-55.09	3.86	509.13	53.22	10.22
21-Apr-05	42105.06	34.54	28.87	-0.42	422.64	53.5	5.15
21-Apr-05	42105.07	40.63	-32.56	3.8	595.4	64.48	23.23

Table 3
Laboratory Analyses and Frequency
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

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

Table 4
Laboratory Results – Organic Compounds
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Sample Name:	RE73-05-58829		RE73-05-58835		RE73-05-58841		RE73-05-58878		RE73-05-58879	
Matrix:	Ash		Ash		Ash		Ash		Ash	
Sample Date:	4/19/05		4/19/05		4/19/05		4/20/05		4/20/05	
Units:	(ug/kg)		(ug/kg)		(ug/kg)		(ug/kg)		(ug/kg)	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
VOCs										
Bromomethane	3.5	13	4.7	12	2.4	13	ND	10	3	11
Acetone	ND	25	ND	25	ND	25	26	20	ND	22
Methylene Chloride	11	6.3	12	6.2	6.6	6.3	14	5	31	5.5
Carbon Disulfide	ND	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
2-Butanone (MEK)	ND	25	ND	25	ND	25	3.9	20	ND	22
Chloroform	ND	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
Trichloroethene	0.71	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
Bromodichloromethane	ND	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
Toluene	ND	6.3	0.99	6.2	ND	6.3	ND	5	ND	5.5
Chlorodibromomethane	ND	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
Xylenes (total)	ND	6.3	ND	6.2		6.3	ND	5	3.7	5.5
1,2,4-Trimethylbenzene	0.79	6.3	ND	6.2	ND	6.3	ND	5	ND	5.5
p-Isopropyltoluene	17	6.3	ND	6.2	1.3	6.3	ND	5	ND	5.5
1,3-Dichlorobenzene	ND	6.3	2.1	6.2	ND	6.3	ND	5	ND	5.5
1,4-Dichlorobenzene	ND	6.3	ND	6.2	ND	6.3	ND	5	2.5	5.5
1,2-Dichlorobenzene	ND	6.3	2.6	6.2	ND	6.3	ND	5	ND	5.5
SVOCs										
1,3-Dichlorobenzene	160	410	ND	410	ND	410			ND	360
1,4-Dichlorobenzene	170	410	ND	410	ND	410			ND	360
Benzyl alcohol	ND	410	ND	410	ND	410			ND	360
1,2-Dichlorobenzene	150	410	ND	410	ND	410			ND	360
Nitrobenzene	210	410	ND	410	ND	410			ND	360
2-Nitrophenol	180	410	ND	410	ND	410			ND	360
Benzoic Acid	830	2000	490	2000	ND	2000			ND	1700
1,2,4-Trichlorobenzene	180	410	ND	410	ND	410			ND	360
Naphthalene	130	410	ND	410	ND	410			ND	360
Hexachlorobutadiene	140	410	ND	410	ND	410			ND	360
2-Methylnaphthalene	120	410	ND	410	ND	410			ND	360
2,4,6-Tricblorophenol	130	410	ND	410	ND	410			ND	360
2-Chloronaphthalene	140	410	ND	410	ND	410			ND	360
Acenaphthylene	150	410	ND	410	ND	410			ND	360
Acenaphthene	130	410	ND	410	ND	410			ND	360
Dibenz(a,h)anthracene	86	410	ND	410	ND	410			ND	360
Dibenzofuran	140	410	ND	410	ND	410			ND	360
Fluorene	150	410	ND	410	ND	410			ND	360
4-Chlorophenyl phenyl ether	190	410	ND	410	ND	410			ND	360
N-Nitrosodiphenylamine	190	410	ND	410	ND	410			ND	360
Pyrene	470	410	110	410	320	410			ND	360
4-Bromophenyl phenyl ether	190	410	ND	410	ND	410			ND	360
Hexachlorobenzene	450	410	110	410	ND	410			ND	360
Pentachlorophenol	180	2000	ND	2000	ND	2000			ND	1700
Phenanthrene	150	410	ND	410	200	410			ND	360
Anthracene	140	410	ND	410	ND	410			ND	360
Fluoranthene	140	410	ND	410	300	410			ND	360
Benzo(a)anthracene	150	410	ND	410	150	410			ND	360
Chrysene	160	410	ND	410	150	410			ND	360
Bis(2-ethylhexyl)phthalate	88	410	97	410	98	410			330	360
Benzo(b)fluoranthene	180	410	ND	410	120	410			ND	360
Benzo(k)fluoranthene	150	410	ND	410	120	410			ND	360
Benzo(a)pyrene	540	410	ND	410	110	410			ND	360
Indeno(1,2,3-cd)pyrene	530	410	ND	410	ND	410			ND	360
Benzo(ghi)perylene	130	410	340	410	ND	410			ND	360
Di-n-butyl phthalate	500	830	ND	820	ND	830			ND	360
Benzo(ghi)perylene	420	830	ND	820	ND	830			ND	360
PCBs										
Aroclor 1254	ND	41	58	41	96	41			380	36
Dioxins/Furans										
TEQ	0.0612		0.0742		0.0768				0.0353	

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Table 4
Laboratory Results – Organic Compounds
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Sample Name:	RE73-05-58923		RE73-05-58924		Min	Max	TCLP	Pass/Fail
Matrix:	Water		Water				(ug/L)	
Sample Date:	4/20/05		4/20/05					
Units:	ug/L		ug/L					
	Result	RL	Result	RL				
VOCs								
Bromomethane	ND	2	ND	10	2.4	4.7		NA
Acetone	ND	10	3.4	50	3.4	26		NA
Methylene Chloride	5.5	5	6	5	5.5	31		NA
Carbon Disulfide	2.2	1	ND	5	2.2	2.2		NA
2-Butanone (MEK)	ND	5	ND	25	3.9	3.9	200000	Pass
Chloroform	2.1	1	2.5	5	2.1	2.5	6000	Pass
Trichloroethene	ND	1	ND	5	0.71	0.71	500	Pass
Bromodichloromethane	0.34	1	ND	5	0.34	0.34		NA
Toluene	0.27	1	ND	5	0.27	0.99		NA
Chlorodibromomethane	0.19	1	1.9	5	0.19	1.9		NA
Xylenes (total)	ND	1	ND	5	3.7	3.7		NA
1,2,4-Trimethylbenzene	ND	1	ND	5	0.79	0.79		NA
p-Isopropyltoluene	ND	1	ND	1	1.3	17		NA
1,3-Dichlorobenzene	ND	1	ND	5	2.1	2.1		NA
1,4-Dichlorobenzene	0.14	1	ND	5	0.14	2.5	7500	Pass
1,2-Dichlorobenzene	ND	1	ND	5	2.6	2.6		NA
SVOCs								
1,3-Dichlorobenzene	ND	10	ND	10	160	160		NA
1,4-Dichlorobenzene	ND	10	ND	10	170	170	7500	Pass
Benzyl alcohol	ND	10	3.1	10	3.1	3.1		NA
1,2-Dichlorobenzene	ND	10	ND	10	150	150		NA
Nitrobenzene	ND	10	ND	10	210	210	2000	Pass
2-Nitrophenol	ND	10	ND	10	180	180		NA
Benzoic Acid	ND	20	ND	20	490	830		NA
1,2,4-Trichlorobenzene	ND	10	ND	10	180	180		NA
Naphthalene	ND	10	ND	10	130	130		NA
Hexachlorobutadiene	ND	10	ND	10	140	140	500	Pass
2-Methylnaphthalene	ND	10	ND	10	120	120		NA
2,4,6-Trichlorophenol	ND	10	ND	10	130	130	2000	Pass
2-Chloronaphthalene	ND	10	ND	10	140	140		NA
Acenaphthylene	ND	10	ND	10	150	150		NA
Acenaphthene	ND	10	ND	10	130	130		NA
Dibenz(a,h)anthracene	ND	10	ND	10	86	86		NA
Dibenzofuran	ND	10	ND	10	140	140		NA
Fluorene	ND	10	ND	10	150	150		NA
4-Chlorophenyl phenyl ether	ND	10	ND	10	190	190		NA
N-Nitrosodiphenylamine	ND	10	ND	10	190	190		NA
Pyrene	ND	10	ND	10	110	470		NA
4-Bromophenyl phenyl ether	ND	10	ND	10	190	190		NA
Hexachlorobenzene	ND	10	ND	10	110	450	130	Pass
Pentachlorophenol	ND	50	ND	50	180	180	100000	Pass
Phenanthrene	ND	10	ND	10	150	200		NA
Anthracene	ND	10	ND	10	140	140		NA
Fluoranthene	ND	10	ND	10	140	300		NA
Benzo(a)anthracene	ND	10	ND	10	150	150		NA
Chrysene	ND	10	ND	10	150	160		NA
Bis(2-ethylhexyl)phthalate	ND	10	ND	10	88	330		NA
Benzo(b)fluoranthene	ND	10	ND	10	120	180		NA
Benzo(k)fluoranthene	ND	10	ND	10	120	150		NA
Benzo(a)pyrene	ND	10	ND	10	110	540		NA
Indeno(1,2,3-cd)pyrene	ND	10	ND	10	530	530		NA
Benzo(ghi)perylene	ND	10	ND	10	130	340		NA
Di-n-butyl phthalate	ND	10	ND	10	500	500		NA
Benzo(ghi)perylene	ND	10	ND	10	420	420		NA
PCBs								
Aroclor 1254	ND	1	ND	1	58	380		NA
Dioxins/Furans								
TEQ					0.0353	0.0768		NA

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Table 5
Laboratory Results - Metals
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Total Metals	(mg/kg)	Silver Result	RL	Arsenic Result	RL	Barium Result	RL	Beryllium Result	RL	Cadmium Result	RL
Previous Maximum		*448*		*90*		*6280*				*42.9*	
RE-73-05-58824	4/18/05	17.5	0.52	42	0.52	1170	5.2	0.27	0.26	16.9	0.65
RE-73-05-58825	4/19/05	190	0.53	29.6	0.53	5030	5.3	0.21	0.27	12.4	0.66
RE-73-05-58826	4/19/05	54.9	0.53	22.7	0.53	1490	5.3	0.34	0.27	19.7	0.66
RE-73-05-58827	4/19/05	118	0.48	33.6	0.48	4150	4.8	0.37	0.24	9	0.6
RE-73-05-58828	4/19/05	37.2	0.49	39.3	0.49	1550	4.9	2.4	0.24	48.3	0.61
RE-73-05-58829	4/19/05										
RE-73-05-58830	4/19/05	54	0.51	26.1	0.51	1980	5.1	0.39	0.25	18.2	0.63
RE-73-05-58831	4/19/05	49.5	0.53	19	0.53	1880	5.3	0.28	0.27	78.5	0.66
RE-73-05-58832	4/19/05	35.6	0.53	20.5	0.53	1580	5.3	0.28	0.27	14.9	0.67
RE-73-05-58833	4/19/05	119	0.48	26.8	0.48	2660	4.8	1.2	0.24	7.7	0.6
RE-73-05-58834	4/19/05	56.9	0.53	26.3	0.53	1000	5.3	0.74	0.27	15.4	0.66
RE-73-05-58835	4/19/05										
RE-73-05-58836	4/19/05	21.2	0.45	66.4	0.45	643	4.5	0.11	0.22	4.1	0.56
RE-73-05-58837	4/19/05	15.4	0.47	133	0.47	575	4.7	0.089	0.23	2.8	0.59
RE-73-05-58838	4/19/05	95.7	0.54	19.5	0.54	2600	5.4	0.33	0.27	67.5	0.67
RE-73-05-58839	4/19/05	125	0.53	76	0.53	2870	5.3	0.33	0.27	16.4	0.67
RE-73-05-58840	4/19/05	187	0.47	22.1	0.47	3490	4.7	0.2	0.23	16.5	0.59
RE-73-05-58841	4/19/05										
RE-73-05-58842	4/20/05	63	0.5	29.8	0.5	1790	5	0.33	0.25	17.7	0.63
RE-73-05-58843	4/20/05	59.6	0.5	56.4	0.5	1710	5	0.26	0.25	16.8	0.62
RE-73-05-58844	4/20/05	73.3	0.56	45.1	0.56	1990	5.6	0.25	0.28	5.9	0.69
RE-73-05-58845	4/20/05	78.2	0.53	138	0.53	1940	5.3	0.25	0.27	6	0.67
RE-73-05-58846	4/20/05	102	0.51	21	0.51	3330	5.1	0.17	0.25	7.2	0.63
RE-73-05-58879	4/20/05										
	Min	15.4		19		575		0.089		2.8	
	Max	190		138		5030		2.4		78.5	
	Mean	77.65		44.66		2171.4		0.43995		20.095	
TCLP Metals	(mg/L)										
Previous Maximum		*ND*		*ND*		*1.43*				*0.151*	
RE-73-05-58824	4/18/05	ND	0.05	ND	0.5	0.884	0.5			0.18	0.025
RE-73-05-58825	4/19/05	ND	0.05	ND	0.5	1.65	0.5			0.0912	0.025
RE-73-05-58826	4/19/05	ND	0.05	ND	0.5	1.44	0.5			0.105	0.025
RE-73-05-58827	4/19/05	ND	0.05	ND	0.5	2.4	0.5			0.0406	0.025
RE-73-05-58828	4/19/05	ND	0.05	ND	0.5	1.43	0.5			0.133	0.025
RE-73-05-58829	4/19/05										
RE-73-05-58830	4/19/05	ND	0.05	ND	0.5	3.84	0.5			1.73	0.25
RE-73-05-58831	4/19/05	ND	0.05	ND	0.5	1.18	0.5			0.134	0.025
RE-73-05-58832	4/19/05	ND	0.05	ND	0.5	1.32	0.5			0.0403	0.025
RE-73-05-58833	4/19/05	ND	0.05	ND	0.5	0.939	0.5			0.0205	0.025
RE-73-05-58834	4/19/05	ND	0.05	ND	0.5	1.06	0.5			0.0316	0.025
RE-73-05-58835	4/19/05										
RE-73-05-58836	4/19/05	ND	0.05	ND	0.5	1.76	0.5			0.0117	0.025
RE-73-05-58837	4/19/05	ND	0.05	ND	0.5	1.62	0.5			0.0112	0.025
RE-73-05-58838	4/19/05	ND	0.05	ND	0.5	1.79	0.5			0.16	0.025
RE-73-05-58839	4/19/05	ND	0.05	ND	0.5	1.59	0.5			0.095	0.025
RE-73-05-58840	4/19/05	ND	0.05	ND	0.5	0.786	0.5			0.0739	0.025
RE-73-05-58841	4/19/05										
RE-73-05-58842	4/20/05	ND	0.05	ND	0.5	2.33	0.5			0.0719	0.025
RE-73-05-58843	4/20/05	ND	0.05	ND	0.5	1.45	0.5			0.0632	0.025
RE-73-05-58844	4/20/05	ND	0.05	ND	0.5	1.97	0.5			0.0214	0.025
RE-73-05-58845	4/20/05	ND	0.05	ND	0.5	2.48	0.5			0.0184	0.025
RE-73-05-58846	4/20/05	ND	0.05	ND	0.5	1.7	0.5			0.0481	0.025
RE-73-05-58879	4/20/05										
	Count	20		20		20				20	
	Detects>ND	0		0		20				20	
	Min	0		0		0.786				0.0112	
	Max	0		0		3.84				1.73	
	Mean	0		0		1.68095				0.15405	
	Std. Dev.	0		0		0.698909487				0.374374789	
	TINV (0.2, n-1)	1.327728114		1.327728114		1.327728114				1.327728114	
	UCL90	0		0		1.888448561				0.265197769	
	Federal Regulatory Level	5		5		100				1	
	Pass/Fail	Pass		Pass		Pass				Pass	

Innovative Technical Solutions, Inc.

Table 5
Laboratory Results - Metals
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Total Metals	(mg/kg)	Cobalt Result	RL	Chromium Result	RL	Copper Result	RL	Manganese Result	RL	Nickel Result	RL
Previous Maximum		*37.8*		*133*		*6320*		*1960*		*236*	
RE-73-05-58824	4/18/05	16.2	1.3	102	1.3	1620	2.6	1520	2.6	203	0.52
RE-73-05-58825	4/19/05	17.9	1.3	74	1.3	993	2.7	1270	2.7	96.3	0.53
RE-73-05-58826	4/19/05	13.8	1.3	77	1.3	1670	2.7	1230	2.7	79.7	0.53
RE-73-05-58827	4/19/05	11.3	1.2	61.3	1.2	1270	1.2	895	2.4	43.7	0.48
RE-73-05-58828	4/19/05	18.3	1.2	85.9	1.2	219000	24.3	21800	2.4	146	0.49
RE-73-05-58829	4/19/05										
RE-73-05-58830	4/19/05	40.3	1.3	154	1.3	1330	2.5	2190	2.5	633	0.51
RE-73-05-58831	4/19/05	15.1	1.3	88.5	1.3	4130	3.3	1330	2.7	125	0.53
RE-73-05-58832	4/19/05	13.2	1.3	66.8	1.3	1930	1.3	1380	2.7	131	0.53
RE-73-05-58833	4/19/05	17.3	1.2	107	1.2	1190	1.2	1750	2.4	115	0.48
RE-73-05-58834	4/19/05	17.7	1.3	81.8	1.3	31500	3.3	2540	2.7	295	0.53
RE-73-05-58835	4/19/05										
RE-73-05-58836	4/19/05	41.9	1.1	104	1.1	815	1.1	2050	2.2	220	0.45
RE-73-05-58837	4/19/05	49.7	1.2	94.4	1.2	490	1.2	2330	2.3	219	0.47
RE-73-05-58838	4/19/05	10.1	1.3	54.1	1.3	3260	6.7	859	2.7	77	0.54
RE-73-05-58839	4/19/05	14.8	1.3	68.7	1.3	3820	13.3	2810	2.7	98.6	0.53
RE-73-05-58840	4/19/05	14.4	1.2	85	1.2	1040	1.2	1050	2.3	215	0.47
RE-73-05-58841	4/19/05										
RE-73-05-58842	4/20/05	16.4	1.3	85.9	1.3	2710	6.3	1580	2.5	234	0.5
RE-73-05-58843	4/20/05	16.8	1.2	72.2	1.2	2360	1.2	1770	2.5	189	0.5
RE-73-05-58844	4/20/05	16.5	1.4	67.7	1.4	536	1.4	974	2.8	115	0.56
RE-73-05-58845	4/20/05	40.2	1.3	116	1.3	1640	1.3	2010	2.7	215	0.53
RE-73-05-58846	4/20/05	18.6	1.3	66.5	1.3	2750	1.3	1130	2.5	792	0.51
RE-73-05-58879	4/20/05										
	Min	10.1		54.1		490		859		43.7	
	Max	49.7		154		219000		21800		792	
	Mean	21.025		85.64		14202.7		2623.4		212.115	

TCLP Metals	(mg/L)		
Previous Maximum		*0.033*	
RE-73-05-58824	4/18/05	ND	0.05
RE-73-05-58825	4/19/05	ND	0.05
RE-73-05-58826	4/19/05	ND	0.05
RE-73-05-58827	4/19/05	ND	0.05
RE-73-05-58828	4/19/05	ND	0.05
RE-73-05-58829	4/19/05		
RE-73-05-58830	4/19/05	ND	0.05
RE-73-05-58831	4/19/05	ND	0.05
RE-73-05-58832	4/19/05	ND	0.05
RE-73-05-58833	4/19/05	ND	0.05
RE-73-05-58834	4/19/05	ND	0.05
RE-73-05-58835	4/19/05		
RE-73-05-58836	4/19/05	ND	0.05
RE-73-05-58837	4/19/05	ND	0.05
RE-73-05-58838	4/19/05	ND	0.05
RE-73-05-58839	4/19/05	ND	0.05
RE-73-05-58840	4/19/05	ND	0.05
RE-73-05-58841	4/19/05		
RE-73-05-58842	4/20/05	ND	0.05
RE-73-05-58843	4/20/05	ND	0.05
RE-73-05-58844	4/20/05	ND	0.05
RE-73-05-58845	4/20/05	ND	0.05
RE-73-05-58846	4/20/05	ND	0.05
RE-73-05-58879	4/20/05		
	Count	20	
	Detects>ND	0	
	Min	0	
	Max	0	
	Mean	0	
	Std. Dev.	0	
	TINV (0.2, n-1)	1.327728114	
	UCL90	0	
	Federal Regulatory Level	5	
	Pass/Fail	Pass	

Innovative Technical Solutions, Inc.

Table 5
Laboratory Results - Metals
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Total Metals	(mg/kg)	Lead Result	RL	Antimony Result	RL	Selenium Result	RL	Thallium Result	RL	Vanadium Result	RL
Previous Maximum		*13100*		*159*		*3.8*		*10.6*		*65*	
RE-73-05-58824	4/18/05	3330	1.6	33.4	0.52	1.1	0.52	0.54	0.26	16.1	2.6
RE-73-05-58825	4/19/05	6650	1.6	52.1	0.53	1.6	0.53	ND	0.27	12.8	2.7
RE-73-05-58826	4/19/05	6700	1.6	48.4	0.53	1.1	0.53	ND	0.27	15.3	2.7
RE-73-05-58827	4/19/05	2400	0.72	32.8	0.48	0.89	0.48	ND	0.24	14.1	2.4
RE-73-05-58828	4/19/05	2460	0.73	27.8	0.49	0.92	0.49	ND	0.24	24.7	2.4
RE-73-05-58829	4/19/05										
RE-73-05-58830	4/19/05	6110	1.5	73.1	0.51	0.81	0.51	ND	0.25	20.9	2.5
RE-73-05-58831	4/19/05	3950	0.79	27.8	0.53	1.7	0.53	ND	0.27	17.2	2.7
RE-73-05-58832	4/19/05	2390	0.8	29.1	0.53	0.68	0.53	ND	0.27	17.1	2.7
RE-73-05-58833	4/19/05	2500	0.72	29.8	0.48	0.57	0.48	ND	0.24	12.9	2.4
RE-73-05-58834	4/19/05	8770	2	123	0.53	2	0.53	ND	0.27	12.6	2.7
RE-73-05-58835	4/19/05										
RE-73-05-58836	4/19/05	2840	0.67	36.2	0.45	0.45	0.45	ND	0.22	3.8	2.2
RE-73-05-58837	4/19/05	4310	0.7	24.7	0.47	0.64	0.47	ND	0.23	4.1	2.3
RE-73-05-58838	4/19/05	13700	4	116	0.54	1.2	0.54	ND	0.27	14.5	2.7
RE-73-05-58839	4/19/05	33000	8	543	0.53	1.7	0.53	ND	0.27	15.1	2.7
RE-73-05-58840	4/19/05	1950	0.7	19.9	0.47	0.94	0.47	ND	0.23	14.1	2.3
RE-73-05-58841	4/19/05										
RE-73-05-58842	4/20/05	3430	3.8	32.6	0.5	2.2	0.5	ND	0.25	16.6	2.5
RE-73-05-58843	4/20/05	2220	0.74	27.3	0.5	1.6	0.5	0.31	0.25	15.3	2.5
RE-73-05-58844	4/20/05	2990	0.83	17.2	0.56	0.93	0.56	ND	0.28	10.1	2.8
RE-73-05-58845	4/20/05	3690	0.8	64.7	0.53	0.55	0.53	ND	0.27	8.6	2.7
RE-73-05-58846	4/20/05	1740	0.76	29.8	0.51	0.85	0.51	ND	0.25	14.8	2.5
RE-73-05-58879	4/20/05										
	Min	1740		17.2		0.45		0.31		3.8	
	Max	33000		543		2.2		0.54		24.7	
	Mean	5756.5		69.435		1.1215		0.425		14.035	

TCLP Metals	(mg/L)				
Previous Maximum		*4.1*		*ND*	
RE-73-05-58824	4/18/05	3.14	0.25	ND	0.5
RE-73-05-58825	4/19/05	0.786	0.25	ND	0.5
RE-73-05-58826	4/19/05	2.39	0.25	ND	0.5
RE-73-05-58827	4/19/05	6.29	0.25	ND	0.5
RE-73-05-58828	4/19/05	2.56	0.25	ND	0.5
RE-73-05-58829	4/19/05				
RE-73-05-58830	4/19/05	3.33	0.25	ND	0.5
RE-73-05-58831	4/19/05	4.37	0.25	ND	0.5
RE-73-05-58832	4/19/05	1.08	0.25	ND	0.5
RE-73-05-58833	4/19/05	0.633	0.25	ND	0.5
RE-73-05-58834	4/19/05	0.63	0.25	ND	0.5
RE-73-05-58835	4/19/05				
RE-73-05-58836	4/19/05	0.792	0.25	ND	0.5
RE-73-05-58837	4/19/05	0.316	0.25	ND	0.5
RE-73-05-58838	4/19/05	2.47	0.25	ND	0.5
RE-73-05-58839	4/19/05	1.47	0.25	ND	0.5
RE-73-05-58840	4/19/05	1.44	0.25	ND	0.5
RE-73-05-58841	4/19/05				
RE-73-05-58842	4/20/05	0.817	0.25	ND	0.5
RE-73-05-58843	4/20/05	0.779	0.25	ND	0.5
RE-73-05-58844	4/20/05	0.96	0.25	ND	0.5
RE-73-05-58845	4/20/05	0.638	0.25	ND	0.5
RE-73-05-58846	4/20/05	1.33	0.25	ND	0.5
RE-73-05-58879	4/20/05				
	Count	20		20	
	Detects>ND	20		0	
	Min	0.316		0	
	Max	6.29		0	
	Mean	1.81105		0	
	Std. Dev.	1.526836029		0	
	TINV (0.2, n-1)	1.327728114		1.327728114	
	UCL90	2.264350871		0	
	Federal Regulatory Level	5		1	
	Pass/Fail	Pass		Pass	

Innovative Technical Solutions, Inc.

Table 5
Laboratory Results - Metals
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Total Metals	(mg/kg)	Zinc Result	RL	Mercury Result	RL
Previous Maximum		*7170*		*19*	
RE-73-05-58824	4/18/05	8220	13.1	0.62	0.044
RE-73-05-58825	4/19/05	3020	13.3		
RE-73-05-58826	4/19/05	4360	2.7	0.7	0.044
RE-73-05-58827	4/19/05	4450	2.4	0.9	0.04
RE-73-05-58828	4/19/05	11300	12.2	0.92	0.041
RE-73-05-58829	4/19/05				
RE-73-05-58830	4/19/05	4880	2.5	1.6	0.042
RE-73-05-58831	4/19/05	43000	26.5	1.4	0.044
RE-73-05-58832	4/19/05	3940	2.7	1.7	0.044
RE-73-05-58833	4/19/05	3760	2.4	2.1	0.08
RE-73-05-58834	4/19/05	9830	13.3	1.6	0.044
RE-73-05-58835	4/19/05				
RE-73-05-58836	4/19/05	939	55.9	0.71	0.037
RE-73-05-58837	4/19/05	823	58.6	0.28	0.039
RE-73-05-58838	4/19/05	4630	2.7	0.56	0.045
RE-73-05-58839	4/19/05	4370	2.7	1.2	0.044
RE-73-05-58840	4/19/05	5500	2.3	0.6	0.039
RE-73-05-58841	4/19/05				
RE-73-05-58842	4/20/05	6460	12.6	0.79	0.042
RE-73-05-58843	4/20/05	6120	2.5	1.5	0.041
RE-73-05-58844	4/20/05	2040	2.8	0.7	0.046
RE-73-05-58845	4/20/05	1710	66.7	0.5	0.045
RE-73-05-58846	4/20/05	2190	2.5	0.33	0.042
RE-73-05-58879	4/20/05				
	Min	823		0.28	
	Max	43000		2.1	
	Mean	6577.1		0.984736842	

TCLP Metals	(mg/L)				
Previous Maximum					
RE-73-05-58824	4/18/05	37.4	0.1	ND	0.01
RE-73-05-58825	4/19/05	19.4	0.1	ND	0.01
RE-73-05-58826	4/19/05	39.1	0.1	ND	0.01
RE-73-05-58827	4/19/05	19.2	0.1	ND	0.01
RE-73-05-58828	4/19/05	40.5	0.1	ND	0.01
RE-73-05-58829	4/19/05				
RE-73-05-58830	4/19/05	35.1	0.1	ND	0.01
RE-73-05-58831	4/19/05	42.4	0.1	ND	0.01
RE-73-05-58832	4/19/05	30.3	0.1	ND	0.01
RE-73-05-58833	4/19/05	24.9	0.1	ND	0.01
RE-73-05-58834	4/19/05	57.2	0.5	ND	0.01
RE-73-05-58835	4/19/05				
RE-73-05-58836	4/19/05	5.1	0.1	ND	0.01
RE-73-05-58837	4/19/05	8.5	0.1	ND	0.01
RE-73-05-58838	4/19/05	36.7	0.1	ND	0.01
RE-73-05-58839	4/19/05	33.7	0.1	ND	0.01
RE-73-05-58840	4/19/05	67.5	0.5	ND	0.01
RE-73-05-58841	4/19/05				
RE-73-05-58842	4/20/05	30.6	0.1	ND	0.01
RE-73-05-58843	4/20/05	42.5	0.1	ND	0.01
RE-73-05-58844	4/20/05	12.5	0.1	0.00037	0.01
RE-73-05-58845	4/20/05	10.2	0.1	ND	0.01
RE-73-05-58846	4/20/05	22	0.1	ND	0.01
RE-73-05-58879	4/20/05				
	Count	20		20	
	Detects>ND	20		1	
	Min	5.1		0.00037	
	Max	67.5		0.00037	
	Mean	30.74		0.00037	
	Std. Dev.	16.02230025		0	
	TINV (0.2, n-1)	1.327728114		1.327728114	
	UCL90	35.49684521		0.00037	
	Federal Regulatory Level			0.2	
	Pass/Fail	Fail		Pass	

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Table 5
Laboratory Results - Metals
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Total Metals	(mg/kg)	pH	Flash Point	Paint Filter Test	% Moisture Result	% Moisture RL	Reactive Cyanide Result	Reactive Cyanide RL	Reactive Sulfide Result	Reactive Sulfide RL	Bulk Density (g/cm3) Dry	Bulk Density (g/cm3) Wet
Previous Maximum												
RE-73-05-58824	4/18/05											
RE-73-05-58825	4/19/05											
RE-73-05-58826	4/19/05											
RE-73-05-58827	4/19/05											
RE-73-05-58828	4/19/05											
RE-73-05-58829	4/19/05	8	>60	Pass	23.5	0.1	0.052	0.065	ND	5.8	0.74	0.99
RE-73-05-58830	4/19/05											
RE-73-05-58831	4/19/05											
RE-73-05-58832	4/19/05											
RE-73-05-58833	4/19/05											
RE-73-05-58834	4/19/05											
RE-73-05-58835	4/19/05	8	>60	Pass	23.8	0.1	0.092	0.066	ND	5.8	0.66	0.91
RE-73-05-58836	4/19/05											
RE-73-05-58837	4/19/05											
RE-73-05-58838	4/19/05											
RE-73-05-58839	4/19/05											
RE-73-05-58840	4/19/05											
RE-73-05-58841	4/19/05	8.1	>60	Pass	19.6	0.1	0.062	0.062	ND	5.5	0.86	1.04
RE-73-05-58842	4/20/05											
RE-73-05-58843	4/20/05											
RE-73-05-58844	4/20/05											
RE-73-05-58845	4/20/05											
RE-73-05-58846	4/20/05											
RE-73-05-58879	4/20/05	8.3	>60	Pass	22.3	0.1	0.14	0.064	ND	5.7		
	Min											
	Max											
	Mean											

TCLP Metals	(mg/L)
Previous Maximum	
RE-73-05-58824	4/18/05
RE-73-05-58825	4/19/05
RE-73-05-58826	4/19/05
RE-73-05-58827	4/19/05
RE-73-05-58828	4/19/05
RE-73-05-58829	4/19/05
RE-73-05-58830	4/19/05
RE-73-05-58831	4/19/05
RE-73-05-58832	4/19/05
RE-73-05-58833	4/19/05
RE-73-05-58834	4/19/05
RE-73-05-58835	4/19/05
RE-73-05-58836	4/19/05
RE-73-05-58837	4/19/05
RE-73-05-58838	4/19/05
RE-73-05-58839	4/19/05
RE-73-05-58840	4/19/05
RE-73-05-58841	4/19/05
RE-73-05-58842	4/20/05
RE-73-05-58843	4/20/05
RE-73-05-58844	4/20/05
RE-73-05-58845	4/20/05
RE-73-05-58846	4/20/05
RE-73-05-58879	4/20/05
	Count
	Detects>ND
	Min
	Max
	Mean
	Std. Dev.
	TINV (0.2, n-1)
	UCL90
	Federal Regulatory Level
	Pass/Fail

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Table 6
Laboratory Results - Radionuclides
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Sample ID		**Am-241**		**U-234**		**U-235**		**U-238**	
Units in pCi/g	Location	Result	MDC	Result	MDC	Result	MDC	Result	MDC
RE-73-05-58842/43	B3	0.036	0.015	9.090	0.030	0.360	0.021	7.160	0.010
RE-73-05-58844/45	Ash	0.029	0.010	1.700	0.020	0.081	0.025	1.360	0.017
RE-73-05-58846	B4	0.012	0.023	3.290	0.020	0.157	0.025	2.770	0.017
RE73-05-58824	C3 East	0.035	0.029	8.410	0.050	0.400	0.023	7.640	0.030
RE73-05-58825	C3 West	0.014	0.027	12.400	0.040	0.458	0.047	5.780	0.040
RE73-05-58826	C2 East	0.024	0.016	8.220	0.044	0.475	0.041	7.010	0.020
RE73-05-58827	C2 West	0.010	0.019	9.970	0.030	0.494	0.023	6.970	0.040
RE73-05-58828	C1	0.037	0.019	5.230	0.030	0.267	0.052	3.310	0.050
RE73-05-58830	D2	0.023	0.019	5.540	0.030	0.264	0.022	4.990	0.040
RE73-05-58831	D3	0.009	0.018	20.000	0.020	1.060	0.040	18.700	0.040
RE73-05-58832	D3	0.003	0.006	3.540	0.040	0.193	0.039	2.610	0.040
RE73-05-58833	E3	0.010	0.020	1.590	0.040	0.057	0.041	1.240	0.020
RE73-05-58834	E3	0.020	0.039	1.730	0.040	0.092	0.025	1.150	0.050
RE73-05-58836	D4	0.014	0.027	2.240	0.030	0.106	0.043	1.930	0.050
RE73-05-58837	C4	0.011	0.021	1.680	0.040	0.089	0.024	1.450	0.020
RE73-05-58838	B1	0.011	0.022	37.300	0.200	2.020	0.110	31.200	0.200
RE73-05-58839	B2	0.019	0.038	7.400	0.040	0.340	0.050	4.840	0.030
RE73-05-58840	B3	0.019	0.037	3.030	0.060	0.194	0.056	2.420	0.050
Primary Emission		Alpha		Alpha		Alpha		Alpha	
Count		18		18		18		18	
Detects >MDC		6		18.000		18		18.000	
Mean		0.018		7.909		0.395		6.252	
Min		0.003		1.590		0.057		1.150	
Max		0.037		37.300		2.020		31.200	
Std. Dev.		0.010		8.748		0.470		7.478	
TINV (0.10,n-1)		1.740		1.740		1.740		1.740	
UCL95		0.023		11.496		0.588		9.318	
Background (ITTL)									
BV		0.013		2.59		0.2		2.29	
Detects >BV		6		13		10		13	
Mean/BV		1.42		3.05		1.97		2.73	
UCL95/BV		1.74		4.44		2.94		4.07	
1999 Report Comparison									
UCL-95		0.16		7.2		0.4		5.2	
Max		1.33		17.1		0.97		15.9	
UCL95/'99 UCL95		0.14		1.60		1.47		1.79	

Table 6
Laboratory Results - Radionuclides
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Sample ID		**Pu-238**		**Pu-239**		**Ra-226**		**Ra-224**	
Units in pCi/g	Location	Result	MDC	Result	MDC	Result	MDC	Result	MDC
RE-73-05-58842/43	B3	0.017	0.034	1.070	0.020	6.240	1.100	2.440	1.600
RE-73-05-58844/45	Ash	0.017	0.034	0.143	0.027	1.950	0.940	2.190	1.400
RE-73-05-58846	B4	0.017	0.034	0.296	0.027	2.060	0.830	0.700	1.400
RE73-05-58824	C3 East	0.015	0.030	0.360	0.014	4.740	0.800	2.900	1.600
RE73-05-58825	C3 West	0.015	0.030	2.340	0.030	4.910	1.900	0.550	1.100
RE73-05-58826	C2 East	0.010	0.020	0.475	0.017	6.210	1.300	2.040	1.800
RE73-05-58827	C2 West	0.010	0.020	0.544	0.006	6.910	2.400	5.400	2.300
RE73-05-58828	C1	0.022	0.044	1.680	0.023	6.650	2.200	2.340	1.600
RE73-05-58830	D2	0.010	0.020	0.375	0.016	3.360	1.100	0.700	1.400
RE73-05-58831	D3	0.010	0.020	0.310	0.006	8.120	2.600	2.300	1.600
RE73-05-58832	D3	0.010	0.020	0.236	0.014	2.810	0.940	2.110	1.500
RE73-05-58833	E3	0.015	0.030	0.219	0.018	3.970	1.100	2.040	1.700
RE73-05-58834	E3	0.017	0.033	0.186	0.007	0.650	1.300	1.990	1.500
RE73-05-58836	D4	0.015	0.030	0.104	0.017	1.900	0.810	1.150	1.100
RE73-05-58837	C4	0.010	0.020	0.100	0.006	1.370	0.580	1.130	0.940
RE73-05-58838	B1	0.010	0.020	0.848	0.013	25.200	4.700	0.900	1.800
RE73-05-58839	B2	0.010	0.019	0.455	0.011	4.390	0.990	2.490	1.600
RE73-05-58840	B3	0.010	0.02	0.842	0.006	1.640	1.4	0.700	1.400
Primary Emission		Alpha		Alpha		Alpha		Alpha	
Count		18		18		18		18	
Detects >MDC		0		18.000		17		13	
Mean		0.013		0.588		5.171		1.893	
Min		0.010		0.100		0.650		0.550	
Max		0.022		2.340		25.200		5.400	
Std. Dev.		0.004		0.595		5.459		1.156	
TINV (0.10,n-1)		1.740		1.740		1.740		1.740	
UCL95		0.015		0.832		7.409		2.367	
Background (UTL)									
BV		0.023		0.054		2.59		2.33	
Detects >BV		0		18		12		5	
Mean/BV		0.58		10.89		2.00			
UCL95/BV		0.64		15.40		2.86			
1999 Report Comparison									
UCL-95		0.005		1.3		5.3			
Max		0.066		2.82		11.1			
UCL95/'99 UCL95		2.96		0.64		1.40			

Table 6
Laboratory Results - Radionuclides
Results of Incinerator Ash Characterization
Corrective Action for SWMU 73-002

Sample ID		Th-234		Cs-137	
Units in pCi/g	Location	Result	MDC	Result	MDC
RE-73-05-58842/43	B3	5.050	1.000	0.048	0.095
RE-73-05-58844/45	Ash	0.600	1.200	0.138	0.060
RE-73-05-58846	B4	1.340	0.670	0.030	0.060
RE73-05-58824	C3 East	3.870	0.890	0.039	0.077
RE73-05-58825	C3 West	2.390	0.700	0.050	0.100
RE73-05-58826	C2 East	4.330	1.000	0.055	0.110
RE73-05-58827	C2 West	5.490	1.200	0.070	0.140
RE73-05-58828	C1	5.220	0.930	0.050	0.100
RE73-05-58830	D2	2.200	0.930	0.060	0.120
RE73-05-58831	D3	7.500	1.100	0.045	0.089
RE73-05-58832	D3	1.790	0.860	0.036	0.071
RE73-05-58833	E3	2.970	1.000	0.046	0.092
RE73-05-58834	E3	0.550	1.100	0.045	0.090
RE73-05-58836	D4	1.060	0.670	0.092	0.056
RE73-05-58837	C4	1.000	0.520	0.025	0.050
RE73-05-58838	B1	21.100	1.500	0.060	0.120
RE73-05-58839	B2	2.490	1.000	0.048	0.095
RE73-05-58840	B3	1.160	0.78	0.060	0.12
Primary Emission		Alpha		Beta	
Count		18		18	
Detects >MDC		16		2	
Mean		3.895		0.055	
Min		0.550		0.025	
Max		21.100		0.138	
Std. Dev.		4.726		0.026	
TINV (0.10,n-1)		1.740		1.740	
UCL95		5.833		0.066	
Background (ITL)					
BV		2.29		1.65	
Detects >BV		10		0	
Mean/BV				0.03	
UCL95/BV				0.04	
1999 Report Comparison					
UCL-95				0.49	
Max				1.51	
UCL95/'99 UCL95				0.13	

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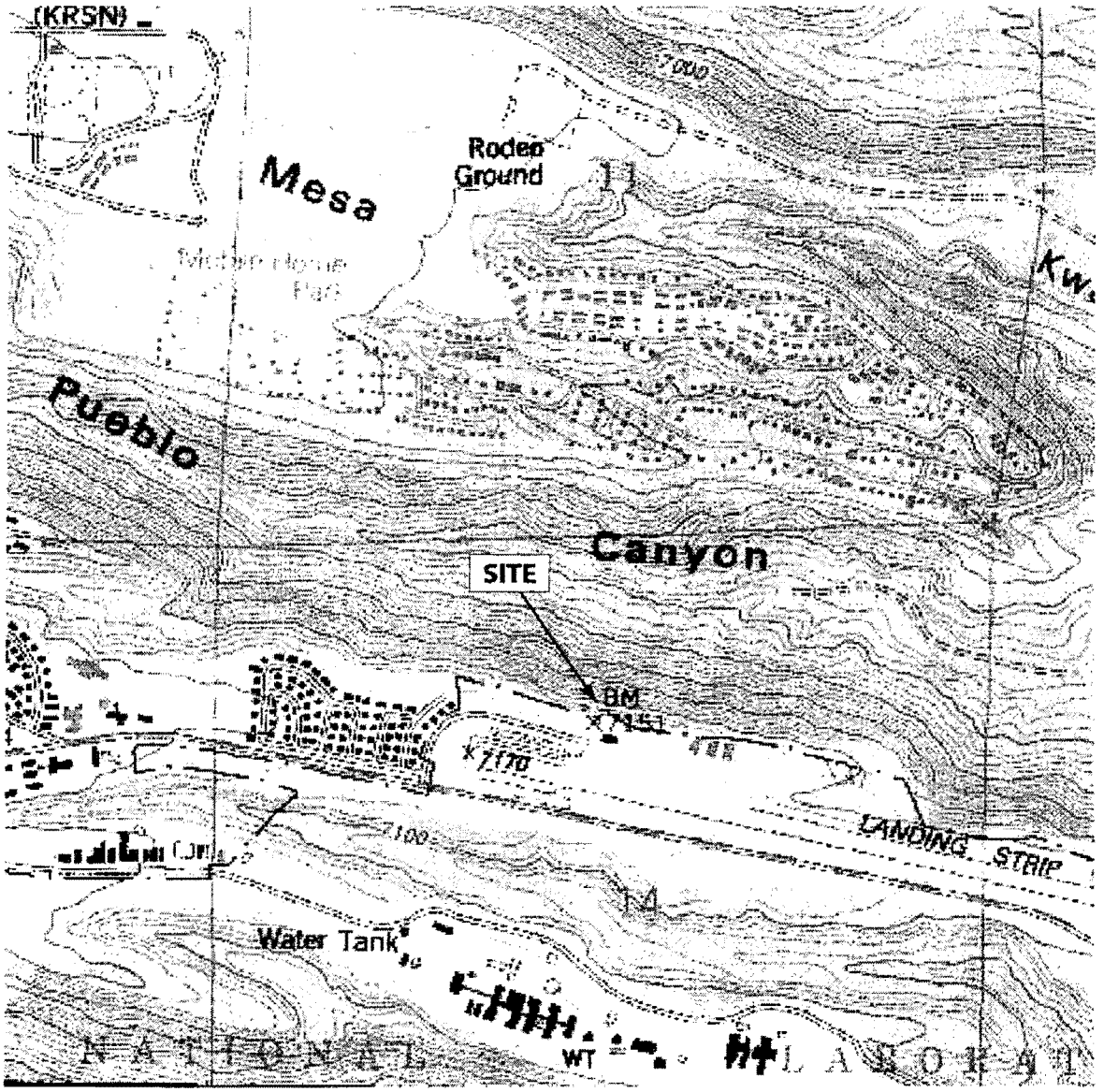


N

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

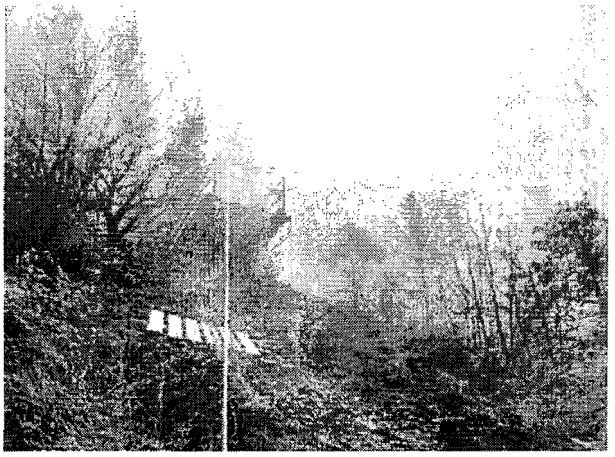


Photo 1. Concrete walkway extending over ash pile.

Photo 2. Establishing grid points.

Photo 3. Sampler in climbing harness.

Photo 4. Field compositing ash samples.

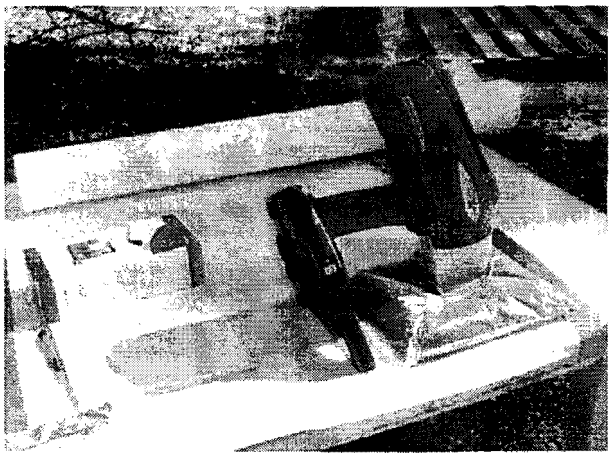
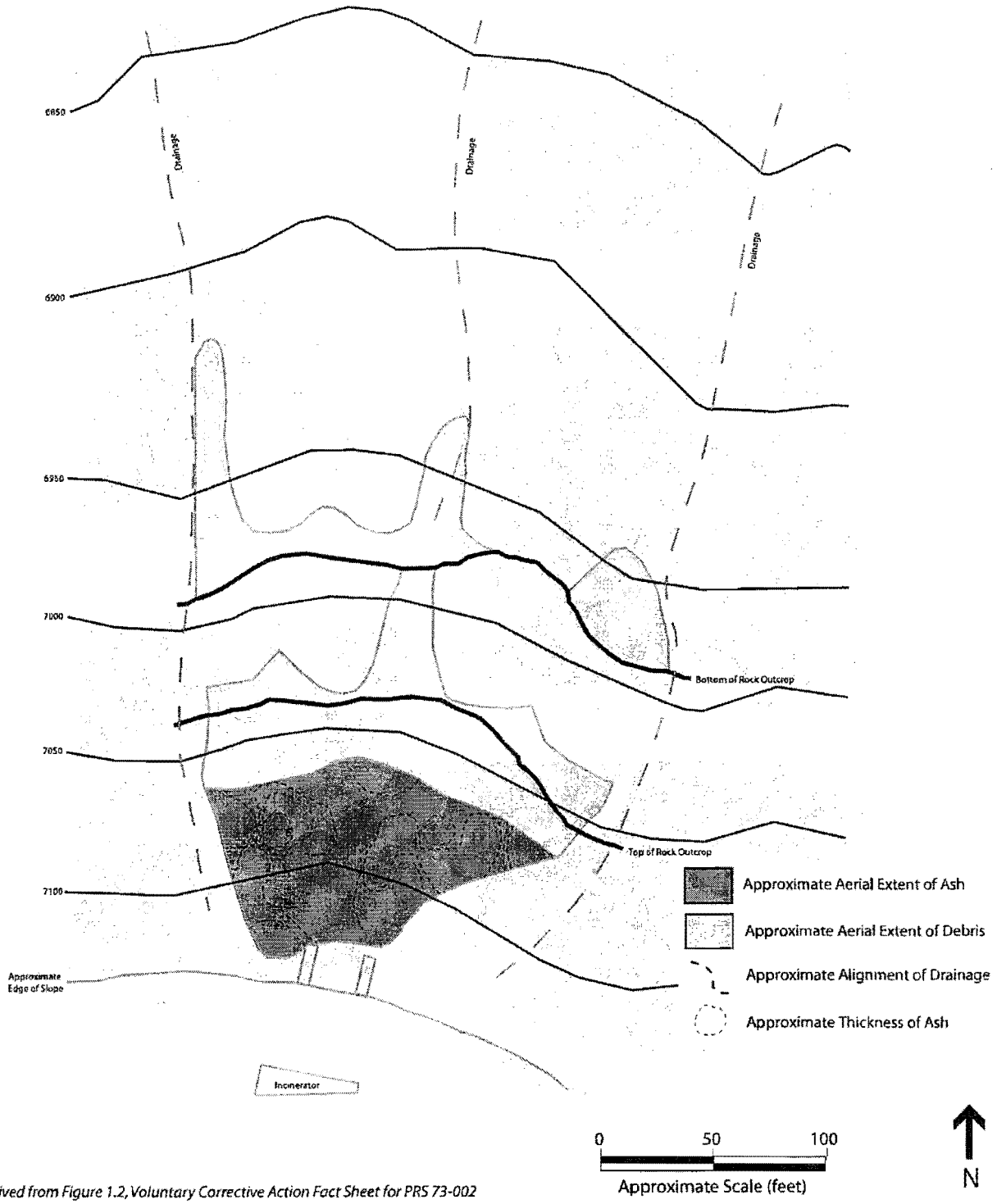


Photo 5. Field screening using portable XRF machine.

04-400-12\LANL\Graphics\Waste Characterization Workplan\Fig 1 - Distribution of Ash.ai

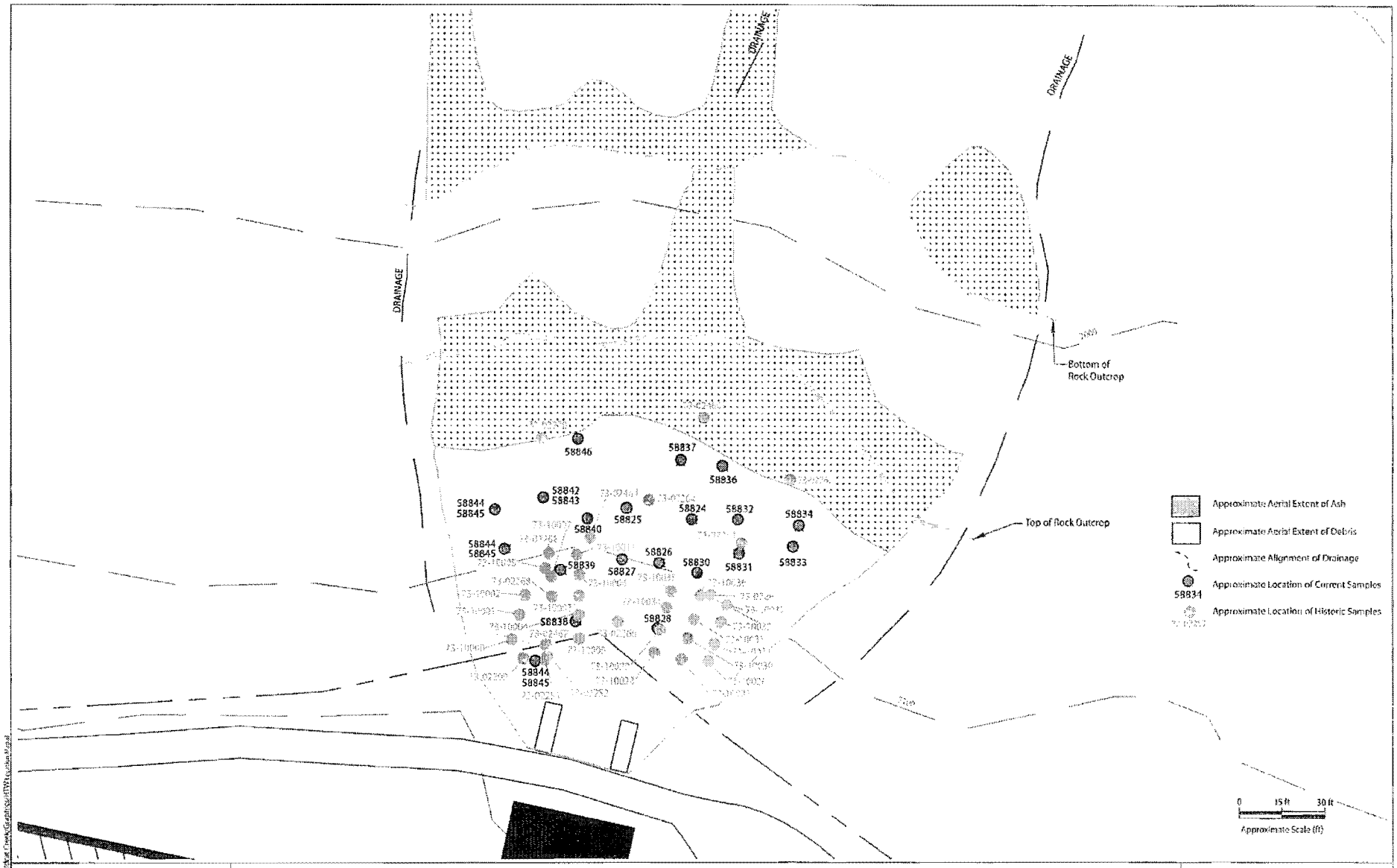
Innovative Technical Solutions, Inc.	U.S. Army Corps of Engineers, Sacramento District Los Alamos National Laboratory, U.S. Department of Energy SWMU 73-002, Los Alamos National Laboratory, New Mexico	Figure 2 Photographs of Field Sampling Activities



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

Innovative Technical Solutions, Inc.	**U.S. Army Corps of Engineers, Sacramento District** **Los Alamos National Laboratory, U.S. Department of Energy** **SWMU 73-002, Los Alamos National Laboratory, New Mexico**	**Figure 3** **Approximate Thickness of Ash**

04-400.12\LANL\Graphics\Waste Characterization of Ash\Fig 4 - Approximate Locations of Ash Samples.ai



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 4
Approximate Locations of Ash Samples - Current and Historic