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The Characterization of Biotic and Abiotic Media Upgradient and Downgradient of the Los Alamos Canyon Weir

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Cover: The Los Alamos Canyon low-head weir (downgradient side) near the northeastern boundary of Los Alamos National Laboratory and the junction of NM 4 and NM 502.

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The Characterization of Biotic and
Abiotic Media Upgradient and Downgradient
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P.R. Fresquez

THE CHARACTERIZATION OF BIOTIC AND ABIOTIC MEDIA UPGRADIENT AND DOWNGRADIENT OF THE LOS ALAMOS CANYON WEIR

P.R. Fresquez

ABSTRACT

As per the Mitigation Action Plan for the Special Environmental Analysis of the actions taken in response to the Cerro Grande Fire, sediments, vegetation, and small mammals were collected directly up- and downgradient of the Los Alamos Canyon weir, a low-head sediment control structure located on the northeastern boundary of Los Alamos National Laboratory, to determine contaminant impacts, if any. All radionuclides (^3H , ^{137}Cs , ^{238}Pu , $^{239,240}\text{Pu}$, ^{90}Sr , ^{241}Am , ^{234}U , ^{235}U and ^{238}U) and trace elements (Ag, As, Ba, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, and Tl) in these media were low and most were below regional upper level background concentrations (mean plus three sigma). The very few constituents that were above regional background concentrations were far below screening levels (set from State and Federal standards) for the protection of the human food chain and the terrestrial environment.

I. INTRODUCTION

In May of 2000, a prescribed burn at Bandelier National Monument went out of control and burned nearly 50,000 acres of Federal and Pueblo lands, including approximately 7,500 acres on Los Alamos National Laboratory (LANL) property. The lack of vegetative cover in the wake of the Cerro Grande Fire created concerns regarding increased sediment (and potential contaminant) transport from LANL to offsite locations. As a preventive measure, the U.S. Army Corp of Engineers constructed a low-head weir in Los Alamos Canyon (LAC) to prevent sediment transport past the northeastern boundary of LANL. The weir consists of a gabion rock-filled structure (Figure 1) that lies across the streambed in LAC near the junction of NM 4 and NM 502.

As part of the Special Environmental Analysis (SEA) of actions taken in response to the Cerro Grande Fire at LANL (USDOE 2000), the Department of Energy (DOE) National Nuclear

Figure 1. The LAC low-head weir (upgradient side) near the northeastern boundary of LANL and the junction of NM 4 and NM 502.

Security Administration identified mitigation that must be implemented under the Mitigation Action Plan as an extension of the fire suppression, erosion, and flood control actions. One of the tasks identified in the SEA, Section 2.1.7, “Mitigation Action for Soil, Surface and Ground Water, and Biota,” mandates the monitoring of soil, surface and ground water, and biota at areas of silt or water retention behind flood control structures, within silt retention basins, and within sediment traps to determine if there is an increase in contaminant concentrations in these areas.

The objective of this study was to determine the contaminant concentrations of sediment, vegetation, and small mammals in the areas up- and downgradient of the LAC weir.

II. METHODS AND MATERIALS

a. Sediment Sampling

Ten sediment sub-samples each were collected in early June of 2005 with a Teflon scoop at the 0- to 15-cm (0- to 6-in.) depth at two sites: one directly upgradient and another one directly downgradient of the LAC weir. The sub-samples were mixed thoroughly in a three-gallon Ziploc® bag and placed into pre-labeled 500-mL polypropylene bottles to form two composite samples. All bottles were fitted with chain-of-custody tape, placed into individual Ziploc® plastic bags, transported in an ice chest cooled to approximately 4 °C, and submitted under full chain-of-custody to Paragon Analytics, Inc., for the analysis of radionuclides (³H, ¹³⁷Cs, ²³⁸Pu, ^{239,240}Pu, ⁹⁰Sr, ²⁴¹Am, ²³⁴U, ²³⁵U, and ²³⁸U) and other trace elements (Ag, As, Ba, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, and Tl).

Tritium was analyzed by liquid scintillation; ¹³⁷Cs by gamma spectroscopy; ⁹⁰Sr by gas flow proportional counting; and ²⁴¹Am, Pu isotopes, and U isotopes by alpha spectroscopy. Results are reported in pCi/mL (of soil moisture) for ³H and in pCi/g dry soil for all the other radioisotopes. See Nyhan et al. (2002) for a detailed description of total propagated analytical uncertainty (TPU) associated with radiological data. The samples for trace elements were prepared for analysis based on SW-846. For the analysis of Ba, Be, Cr, Cu, and Ni, the samples were digested following method 3050B and analyzed by trace inductively coupled plasma (ICP) by method 6010B. Antimony, Ar, Cd, Pb, Se, Ag, and Tl were analyzed using method SW6020A on an ICP mass spectrometer. Mercury was analyzed by cold vapor atomic absorption after being digested by method 7471A. They are reported on a µg/g (ppm) dry weight basis.

b. Vegetation Sampling

Vegetation samples were collected from understory (grasses and forbs) materials at the same two sites that the sediment samples were collected. Samples consisted of about 1.4 kg (3 lb) of fresh, composited material and were double bagged in labeled Ziploc® plastic bags before transport to the laboratory at Technical Area 21 in an ice chest. At the laboratory, each unwashed sample was divided into three sub-samples for preparation and analyses of ³H, other radionuclides, and trace elements.

Sub-samples for ^3H analysis were placed in an apparatus to collect distillate water (Salazar 1984). Vegetation sub-samples for trace element analysis were dried at 70 °C for 48 h then ground in a Wiley mill equipped with a 40-mm screen. The remaining portion of each sub-sample was placed in 1-L glass beakers and ashed to 500 °C, pulverized and homogenized after ashing, transferred to labeled 500-mL polypropylene bottles, and, with the distillate and ground tissue samples, submitted under full chain-of-custody to Paragon Analytics, Inc. Vegetation samples were analyzed for the same radionuclides and trace elements analyzed for the sediments. Results were reported in pCi/mL of tissue moisture for ^3H and pCi/g of ash for the other radionuclides. Trace elements are reported in $\mu\text{g/g}$ dry.

c. Small Mammal Sampling

Rodent sampling took place in late June of 2005. Approximately 50 snap traps within a 5-by 10-m grid were established above and below the LAC weir. Snap traps were baited and set in late afternoon and checked in the early morning. The rodents captured, approximately 22 above and 11 below the LAC weir, were mostly deer mice of the genus *Peromyscus*. Procedures for handling and field processing of small mammals with respect to potential infection of hanta virus are given in Mills et al. (1995) and Biggs and Bennett (1995).

At the laboratory, the whole samples were placed into 1-L glass beakers and heated to collect distillate water for ^3H analysis (Salazar 1984). After the collection of sufficient sample, the beaker contents were ashed to 500 °C. The sample ash was pulverized and homogenized, placed into 500-mL polypropylene bottles, and submitted under full chain-of-custody to Paragon Analytics, Inc., for the analysis of the same radionuclides as those accomplished for the sediment and vegetation samples. Results for ^3H are reported in pCi/mL and the other radionuclides are reported on a pCi per gram ash weight basis (pCi/g ash).

d. Determining the Composition of Uranium

To determine the source of U in sediments, vegetation, and small mammals at the 99% confidence level, the U isotopic distribution of ^{234}U and ^{238}U , which for naturally occurring U is one, was assessed using the following steps: (1) the difference between ^{234}U and ^{238}U was calculated, (2) the squares of their uncertainties were summed and then the square root of this

number was taken, (3) the ^{234}U and ^{238}U difference was divided by the pooled square root, (4) if the result was greater than 3, then it was observed whether the ^{234}U value or the ^{238}U value was larger, (5) if the ^{234}U value was larger, then excess enriched U was indicated. Conversely, if the ^{238}U value was larger, then excess depleted U was indicated.

e. Sediment, Plant, and Small Mammal Standards

To evaluate impacts from radionuclides and nonradionuclides, the analytical results of sediment, plant, and small mammal samples collected up- and downgradient from the LAC weir are first compared to Regional Statistical Reference Levels (RSRLs). RSRLs are the upper-level background concentrations (mean plus three standard deviations) for radionuclides and nonradionuclides calculated from data collected from regional locations away from the influence of LANL over at least the past five years and represent natural and fallout sources. Where the levels exceed RSRLs, the concentrations are then compared to the screening levels (SLs) (i.e., an investigative action level). For radionuclides in sediments, the SLs were developed by the Environmental Restoration Project at LANL on the basis of a conservative (e.g., residential) 15-mrem protective dose limit (ER 2002). For nonradionuclides in sediments, the SLs are based on the New Mexico Environment Department/LANL Order on Consent for residential lands because of the proximity of the LAC weir to offsite lands at the 10^{-5} risk (NMED/LANL 2005). For radionuclides in vegetation and small mammals, the SLs were developed by the Meteorology and Air Quality Group dose assessment team at LANL at 10% of the standard. For nonradionuclides in vegetation and small mammals, the SLs are based on toxicity reference values (TRVs) (LANL 2004). TRVs are the highest level of a stressor evaluated in a toxicity test or biological field survey that causes no statistically significant difference in effect compared with controls or a reference site.

Finally, if a contaminant exceeds the SL then it is compared to the standard. For radionuclides in sediments, the measured concentrations are used to calculate a per-person dose with the help of the RESRAD computer model (Yu et al. 1995). The calculated dose is based on a residential scenario and assumes soil ingestion, inhalation of suspended dust, and ingestion of homegrown fruits and vegetables as the primary exposure pathways for one or more radionuclides. The unit conversions, input parameters, model and parameter assumptions, and

the uncertainty analysis that are used can be found in Fresquez et al. (1996). This calculated per-person dose is compared to the 100-mrem/yr DOE standard. For radionuclides in vegetation and small mammals, the measured concentrations are used to calculate a dose according to USDOE (2002) and then they are compared to the 1 rad/d dose standard for terrestrial plants and the 0.1 rad/d dose standard for terrestrial animals. Table 1 summarizes the levels and/or standards used to evaluate the sediment, vegetation, and small mammal monitoring program at LANL.

Table 1. Application of Soil, Vegetation, and Small Mammal Standards and Other Reference Levels to the LAC Weir Monitoring Data

Media	Constituent	Standard	Screening Level	Background
Sediment	Radionuclides	100 mrem/y	15 mrem/y	RSRL
	Nonradionuclides		10 ⁻⁵ risk (residential)	RSRL
Vegetation	Radionuclides	1 rad/d	0.1 rad/d	RSRL
	Nonradionuclides		TRVs	RSRL
Small Mammals	Radionuclides	0.1 rad/d	0.01 rad/d	RSRL
	Nonradionuclides		TRVs	RSRL

III. RESULTS

a. Sediments

Results of radionuclides in sediments collected up- and downgradient of the LAC weir are shown in Table 2. (Note: The analytical reports for individual sample assays are attached as Appendices.)

The concentrations of ³H, ⁹⁰Sr, ²³⁸Pu, and U isotopes in sediments were either below detection levels (i.e., results are lower than three times the TPU level; this is the 99% confidence level) or below RSRLs. All of the uranium was of natural origin. Radionuclides that were above the RSRLs included concentrations of ¹³⁷Cs, ^{239,240}Pu, and ²⁴¹Am in sediments from both sample locations. Although the concentrations of these radionuclides were above RSRLs, they were far below SLs and are of no concern. These results are similar to those data reported by Gallaher et al. (2005) for the LAC at NM 4 sediment sampling station, which is located approximately 91 m (100 yards) above the weir.

Table 2. Radionuclide Concentrations (Analytical Uncertainty at Three Sigma) in Sediment Collected Upgradient (UG) and Downgradient (DG) of the LAC Weir in 2005 (Note: Bold values are greater than both the TPU and RSRL.)

Location	³ H (pCi/mL)	⁹⁰ Sr (pCi/g dry)	¹³⁷ Cs (pCi/g dry)	²³⁸ Pu (pCi/g dry)	^{239,240} Pu (pCi/g dry)	²⁴¹ Am (pCi/g dry)	²³⁴ U (pCi/g dry)	²³⁵ U (pCi/g dry)	²³⁸ U (pCi/g dry)
UG	0.13 (0.41)	0.13 (0.26)	0.62 (0.17)	0.0092 (0.013)	0.18 (0.066)	0.090 (0.042)	0.84 (0.21)	0.050 (0.023)	0.82 (0.21)
DG	0.21 (0.42)	0.14 (0.23)	0.70 (0.20)	0.010 (0.011)	0.25 (0.083)	0.13 (0.056)	0.83 (0.21)	0.064 (0.029)	0.82 (0.21)
RSRL ^a	1.3	1.0	0.57	0.010	0.018	0.057	1.8	0.077	1.6
SL ^b	6,400	5.7	5.3	49	44	39	63	17	86

^aRegional Statistical Reference Level is the mean plus three standard deviations from McLin and Lyons (2002).

^bScreening Level is based on a 15-mrem dose from ER (2001).

Most trace elements in sediment samples collected up- and downgradient of the LAC weir were below RSRLs (Table 3). The only metal that was above the RSRL was Cd in sediments from both sites. The highest level (2.3 µg/g), however, was far below the SL of 74 µg/g and is of no concern.

b. Vegetation Samples

Results of radionuclide concentrations in understory vegetation collected up- and downgradient of the LAC weir can be found in Table 4. There were no differences in any of the radionuclides in vegetation collected between up- and downgradient areas. And most radionuclides, with the exception of ^{90}Sr and ^{241}Am , in all vegetation regardless of where it was collected were either nondetectable or within RSRLs. Concentrations of ^{90}Sr and ^{241}Am in plants from both areas were just above RSRLs but far below SLs. The source of U in vegetation from all sites, as per ^{234}U and ^{238}U ratios, was of natural origin.

Results of the trace element concentrations in understory vegetation collected up- and downgradient of the LAC weir can be found in Table 5. In general, most trace elements (12 out of 13) in vegetation collected upgradient of the LAC weir are in slightly higher concentrations than in plants collected downgradient of the weir. However, all trace element concentrations, including Cd, in vegetation collected from both sites were well below RSRLs.

c. Small Mammal Samples

Results of radionuclide concentrations in small mammals collected up- and downgradient of the LAC weir can be found in Table 6. Concentrations of all radionuclides in small mammal whole body tissues were similar between sites. A comparison of radionuclides in small mammals collected up- and downgradient of the LAC weir with background levels show that $^{239,240}\text{Pu}$, ^{241}Am , ^{234}U , and ^{238}U were in slightly higher concentrations than the RSRLs. Concentrations of ^{90}Sr in small mammals collected downgradient of the LAC weir were also at levels just above the RSRL. All concentrations of radionuclides, however, were far below SLs and are of no concern. The concentrations of $^{239,240}\text{Pu}$ and ^{241}Am , in particular, in whole body burdens of the mice collected at the LAC weir appear to be more correlated to the sediment data than to the plant data, suggesting that these radionuclides were more associated with external contamination (pelt) rather than internal (carcass) contamination. Higher concentrations of radionuclides have been

Table 3. Total Trace Element Concentrations (µg/g dry) in Sediments Collected Upgradient (UG) and Downgradient (DG) of the LAC Weir in 2005 (Note: Bold values are greater than both the reporting limit and RSRL.)

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
UG	0.10	0.57	21	0.28	0.81	1.7	1.7	0.0051	1.4	7.2	0.057	0.050	0.041
DG	0.28	0.90	50	0.50	2.3	4.7	4.2	0.020	3.7	14	0.13	0.073	0.10
RL ^a	0.006	0.11	0.11	0.056	0.017	0.28	0.11	0.012	0.28	0.028	0.017	0.056	0.011
RSRL ^b	1	4.7	151	1.6	0.40	12	12	0.10	11	23	0.83	0.30	0.73
SL ^c	391	3.9	5,450	156	74	234	3,130	24	1,560	400	31	391	5.2

^aReporting Level from Paragon Analytics, Inc.

^bRegional Statistical Reference Level is the mean plus three standard deviations from Rytí et al. (1998).

^cScreening Level is based on 10⁻⁵ risk (residential) (NMED/LANL 2005).

Table 4. Radionuclide Concentrations (Analytical Uncertainty at Three Sigma) in Native Understory Vegetation Collected Upgradient (UG) and Downgradient (DG) of the LAC Weir in 2005 (Note: Bold values are greater than both the TPU and RSRL values.)

Location	³ H (pCi/mL)	⁹⁰ Sr (pCi/g ash)	¹³⁷ Cs (pCi/g ash)	²³⁸ Pu (pCi/g ash)	^{239,240} Pu (pCi/g ash)	²⁴¹ Am (pCi/g ash)	²³⁴ U (pCi/g ash)	²³⁵ U (pCi/g ash)	²³⁸ U (pCi/g ash)
UG	-0.11 (0.53)	6.0 (3.2)	0.39 (0.83)	-0.0006 (0.0083)	0.017 (0.017)	0.018 (0.017)	0.044 (0.018)	0.0023 (0.0050)	0.043 (0.017)
DG	-0.01 (0.50)	6.1 (3.2)	0.26 (0.83)	0.0007 (0.0071)	0.015 (0.014)	0.014 (0.012)	0.044 (0.017)	0.0021 (0.0054)	0.031 (0.014)
RSRL ^a	3.6	5.0	0.63	0.0049	0.015	0.0093	1.3	0.052	1.1

^aRegional Statistical Reference Level is the mean plus three standard deviations from Fresquez and Gonzales (2004).

Table 5. Total Trace Element Concentrations (µg/g dry) in Native Understory Vegetation Collected Upgradient (UG) and Downgradient (DG) of the LAC Weir in 2005 (Bold values are greater than both the reporting limit and RSRLs.)

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
UG	0.97	0.095	19	0.0035	0.55	0.47	5.5	0.0070	0.46	0.67	0.027	0.083	0.069
DG	0.18	0.063	7.8	0.0012	0.18	0.24	3.9	0.0046	0.25	0.91	0.026	0.081	0.0075
RL^a	0.005	0.10	0.10	0.05	0.015	0.25	0.10	0.010	0.25	0.025	0.015	0.050	0.010
RSRL^b	1.5	0.34	100	0.14	0.72	0.96	15	0.12	7.5	4.3	12	0.32	0.34

^aReporting Level from Paragon Analytics, Inc.

^bRegional Statistical Reference Level is the mean plus three standard deviations from Fresquez et al. (2001).

Table 6. Radionuclide Concentrations (Analytical Uncertainty at Three Sigma) in Small Mammal Whole Body Tissue Collected Upgradient (UG) and Downgradient (DG) of the LAC Weir in 2005 (Note: Bold values are greater than both the TPU and RSRL values.)

Location	³ H (pCi/mL)	⁹⁰ Sr (pCi/g ash)	¹³⁷ Cs (pCi/g ash)	²³⁸ Pu (pCi/g ash)	^{239,240} Pu (pCi/g ash)	²⁴¹ Am (pCi/g ash)	²³⁴ U (pCi/g ash)	²³⁵ U (pCi/g ash)	²³⁸ U (pCi/g ash)
UG	-0.10 (0.50)	2.4 (0.84)	0.67 (0.86)	0.0020 (0.0072)	0.033 (0.021)	0.023 (0.017)	0.101 (0.032)	0.0054 (0.0062)	0.104 (0.032)
DG	0.33 (0.53)	2.7 (0.96)	-0.21 (0.80)	0.0007 (0.0072)	0.034 (0.021)	0.024 (0.017)	0.12 (0.038)	0.0089 (0.0092)	0.11 (0.035)
RSRL ^a	0.57	2.4	1.0	0.0043	0.0072	0.0054	0.078	0.0098	0.084

^aRegional Statistical Reference Level is the mean plus three standard deviations from Fresquez et al. (2005).

reported in pelts than in the carcasses of rodents in Mortandad Canyon (Bennett et al. 1996) and at Area G (Bennett et al. 1997).

IV. CONCLUSIONS

All concentrations of radionuclides and metals in sediments, vegetation, and small mammals collected up- and downgradient of the LAC weir were very low and mostly below background concentrations and do not pose any significant human health or environmental hazards.

ACKNOWLEDGMENTS

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APPENDIX A

ANALYTICAL DATA REPORTS OF RADIONUCLIDE CONCENTRATIONS IN SEDIMENTS COLLECTED AT THE LAC WEIR DURING 2005

Environmental Surveillance Team Chain of Custody Record

Creation Date: 6/2/2005

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Tritium Analysis By Liquid Scintillation Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Soils Sampling LA Canyon Weir
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507124

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Reported on: Monday, October 17, 2005
1:38:54 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507124-1	98.554	Sample	H-3	0.13 +/- 0.27	0.45	pCi/ml	SOIL	3H050727-3	10/15/05	U
0507124-2	98.555	Sample	H-3	0.21 +/- 0.28	0.45	pCi/ml	SOIL	3H050727-3	10/15/05	U

18

Comments:

Data Package ID: H30507124-1

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Strontium-90 Analysis by GFPC Sample Results Summary

Client Name: ESH20_LANL

Client Project Name: Soils Sampling LA Canyon Weir

Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics

PAI Work Order: 0507124

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Reported on: Friday, October 07, 2005

3:55:06 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507124-1	98.554	Sample	Sr-90	0.13 +/- 0.17	0.36	pCi/g	SOIL	SR050823-1	8/26/2005	U
0507124-2	98.555	Sample	Sr-90	0.14 +/- 0.15	0.31	pCi/g	SOIL	SR050823-1	8/26/2005	U

Comments:

Data Package ID: SR0507124-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Friday, October 07, 2005

Paragon Analytics
LIMS Version: 5.241A

0000003

Gamma Spectroscopy Results

PAI 713 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507124

Client Name: ESH20_LANL

ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.554
Lab ID: 0507124-1

Library: USGS.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 8
Date Collected: 02-Jun-05
Date Prepared: 03-Aug-05
Date Analyzed: 26-Aug-05

Prep Batch: GS050803-1
QCBatchID: GS050803-1-1
Run ID: GS050803-1A
Count Time: 83.33334 minutes
Report Basis: Dry Weight

Final Aliquot: 360 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 051421d04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.62 +/- 0.11	0.09	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0507124-1

Date Printed: Monday, October 10, 2005

Paragon Analytics
LIMS Version: 5.242A

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Gamma Spectroscopy Results

PAI 713 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0507124
Client Name: ESH20_LANL
ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.554
Lab ID: 0507124-1DUP

Library: USGS.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 8
Date Collected: 02-Jun-05
Date Prepared: 03-Aug-05
Date Analyzed: 27-Aug-05

Prep Batch: GS050803-1
QCBatchID: GS050803-1-1
Run ID: GS050803-1A
Count Time: 60 minutes
Report Basis: Dry Weight

Final Aliquot: 360 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 051244d06

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.58 +/- 0.11	0.08	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: GSS0507124-1

Gamma Spectroscopy Results

PAI 713 Rev 8
Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0507124
Client Name: ESH20_LANL
ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.555
Lab ID: 0507124-2

Library: USGS.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 8
Date Collected: 02-Jun-05
Date Prepared: 03-Aug-05
Date Analyzed: 26-Aug-05

Prep Batch: GS050803-1
QCBatchID: GS050803-1-1
Run ID: GS050803-1A
Count Time: 83.33334 minutes
Report Basis: Dry Weight

Final Aliquot: 319 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 051124d07

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.70 +/- 0.13	0.10	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0507124-1

Date Printed: Monday, October 10, 2005

Paragon Analytics
LIMS Version: 5.242A

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000012

Isotopic Plutonium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
 Client Project Name: Soils Sampling LA Canyon Weir
 Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
 PAI Work Order: 0507124

Page: 1 of 1
 Reported on: Sunday, September 11, 2005
 1:53:08 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507124-1	98.554	Sample	Pu-238	0.0092 +/- 0.0085	0.0124	pCi/g	SOIL	AS050803-4	8/10/05	U
0507124-1	98.554	Sample	Pu-239/240	0.184 +/- 0.044	0.015	pCi/g	SOIL	AS050803-4	8/10/05	
0507124-2	98.555	Sample	Pu-238	0.0101 +/- 0.0076	0.0077	pCi/g	SOIL	AS050803-4	8/10/05	LT
0507124-2	98.555	Sample	Pu-239/240	0.254 +/- 0.055	0.003	pCi/g	SOIL	AS050803-4	8/10/05	

23

Comments:

Data Package ID: PU0507124-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- MDC - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
 LIMS Version: 5.228A

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Isotopic Americium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Soils Sampling LA Canyon Weir
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507124

Page: 1 of 1
Reported on: Sunday, September 11, 2005
1:44:48 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507124-1	98.554	Sample	Am-241	0.090 +/- 0.028	0.010	pCi/g	SOIL	AS050803-4	8/10/05	
0507124-2	98.555	Sample	Am-241	0.128 +/- 0.037	0.014	pCi/g	SOIL	AS050803-4	8/10/05	

24

Comments:

Data Package ID: AM0507124-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
LIMS Version: 5.228A

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00003

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Soils Sampling LA Canyon Weir
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507124

Page: 1 of 1
Reported on: Sunday, September 11, 2005
2:01:31 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507124-1	98.554	Sample	U-234	0.84 +/- 0.14	0.01	pCi/g	SOIL	AS050803-4	8/21/05	
0507124-1	98.554	Sample	U-235	0.050 +/- 0.015	0.006	pCi/g	SOIL	AS050803-4	8/21/05	LT
0507124-1	98.554	Sample	U-238	0.82 +/- 0.13	0.01	pCi/g	SOIL	AS050803-4	8/21/05	
0507124-2	98.555	Sample	U-234	0.83 +/- 0.13	0.01	pCi/g	SOIL	AS050803-4	8/21/05	
0507124-2	98.555	Sample	U-235	0.064 +/- 0.019	0.007	pCi/g	SOIL	AS050803-4	8/21/05	LT
0507124-2	98.555	Sample	U-238	0.82 +/- 0.13	0.01	pCi/g	SOIL	AS050803-4	8/21/05	

25

Comments:

Data Package ID: U0507124-1

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
LIMS Version: 5.228A

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APPENDIX B

ANALYTICAL DATA REPORTS OF TRACE ELEMENT CONCENTRATIONS IN SEDIMENTS COLLECTED AROUND THE LAC WEIR DURING 2005

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507124

Client Name: ESH20_LANL

ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.554

Lab ID: 0507124-1

Sample Matrix: SOIL

% Moisture: 10.4

Date Collected: 02-Jun-05

Date Extracted: 28-Jul-05

Date Analyzed: 01-Aug-05

Prep Method: SW3050B

Prep Batch: IP050728-1

QC Batch ID: IP050728-1-1

Run ID: it050801-1a2

Cleanup: NONE

Basis: Dry Weight

Sample Aliquot: 1 g

Final Volume: 50 ml

Result Units: mg/kg

Clean DF: 1

File Name: TS50801

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	21	0.11	0.007		
7440-41-7	BERYLLIUM	1	0.28	0.056	0.0014		E
7440-47-3	CHROMIUM	1	1.7	0.28	0.038		N
7440-50-8	COPPER	1	1.7	0.11	0.032		
7440-02-0	NICKEL	1	1.4	0.28	0.047		

Data Package ID: it0507124-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

Page 1 of 2

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507124

Client Name: ESH20_LANL

ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.555
Lab ID: 0507124-2

Sample Matrix: SOIL
% Moisture: 28.6
Date Collected: 02-Jun-05
Date Extracted: 28-Jul-05
Date Analyzed: 01-Aug-05
Prep Method: SW3050B

Prep Batch: IP050728-1
QCBatchID: IP050728-1-1
Run ID: it050801-1a2
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: mg/kg
Clean DF: 1
File Name: TS50801

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	50	0.14	0.0088		
7440-41-7	BERYLLIUM	1	0.5	0.07	0.0017		
7440-47-3	CHROMIUM	1	4.7	0.35	0.047		
7440-50-8	COPPER	1	4.2	0.14	0.04		
7440-02-0	NICKEL	1	3.7	0.35	0.059		

Data Package ID: it0507124-1

Date Printed: Monday, August 29, 2005

Paragon Analytics
LIMS Version: 5.218A

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Total ICPMS Metals

Method SW6020A

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507124

Client Name: ESH20_LANL

ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.554
Lab ID: 0507124-1

Sample Matrix: SOIL
% Moisture: 10.4
Date Collected: 02-Jun-05
Date Extracted: 28-Jul-05
Date Analyzed: 09-Aug-05
Prep Method: SW3050B

Prep Batch: IP050728-1
QCBatchID: IP050728-1-2
Run ID: IM050809-1A3
Cleanup: NONE
Basis: Dry Weight

Sample Aliquot: 1 g
Final Volume: 50 ml
Result Units: ug/kg
Clean DF: 1
File Name: 09AUG05A

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	57	17	2.2		N
7440-38-2	ARSENIC	10	570	110	6.9		E
7440-43-9	CADMIUM	10	810	17	1.4		E*
7439-92-1	LEAD	10	7200	28	1.5		N
7782-49-2	SELENIUM	10	50	56	22	B	
7440-22-4	SILVER	10	100	5.6	0.5		E*
7440-28-0	THALLIUM	10	41	11	1.6		

Data Package ID: im0507124-1

Date Printed: Monday, August 29, 2005

Paragon Analytics
LIMS Version: 5.218A

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Total ICPMS Metals

Method SW6020A

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507124

Client Name: ESH20_LANL

ClientProject ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Field ID: 98.555
Lab ID: 0507124-2

Sample Matrix: SOIL

% Moisture: 28.6

Date Collected: 02-Jun-05

Date Extracted: 28-Jul-05

Date Analyzed: 09-Aug-05

Prep Method: SW3050B

Prep Batch: IP050728-1

QCBatchID: IP050728-1-2

Run ID: IM050809-1A3

Cleanup: NONE

Basis: Dry Weight

Sample Aliquot: 1 g

Final Volume: 50 ml

Result Units: ug/kg

Clean DF: 1

File Name: 09AUG05A

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	130	21	2.7		
7440-38-2	ARSENIC	10	900	140	8.7		
7440-43-9	CADMIUM	10	2300	21	1.8		
7439-92-1	LEAD	10	14000	35	1.9		
7782-49-2	SELENIUM	10	73	70	28		
7440-22-4	SILVER	10	280	7	0.62		
7440-28-0	THALLIUM	10	100	14	2		

Data Package ID: im0507124-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

Page 2 of 2

Total MERCURY

Method SW7471

Sample Results

Lab Name: Paragon Analytics

Client Name: ESH20_LANL

Client Project ID: Soils Sampling LA Canyon Weir 7H0200 WE72 4300 4315

Work Order Number: 0507124

Final Volume: 100 ml

Reporting Basis: Dry Weight

Matrix: SOIL

Result Units: mg/kg

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	IDL	Flag	Sample Aliquot
98.554	0507124-1	6/2/2005	8/1/2005	08/02/2005	10.4	1	0.0051	0.011	0.0011	B	0.6 g
98.555	0507124-2	6/2/2005	8/1/2005	08/02/2005	28.6	1	0.02	0.014	0.0013		0.6 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: hg0507124-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

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APPENDIX C

ANALYTICAL DATA REPORTS OF RADIONUCLIDE CONCENTRATIONS IN UNDERSTORY VEGETATION AT THE LAC WEIR DURING 2005

0507120

LOS ALAMOS NATIONAL LABORATORY - ENVIRONMENTAL STEWARDSHIP - METEOROLOGY AIR QUALITY

Environmental Surveillance Team Chain of Custody Record

Chain of Custody Number: 97

Creation Date: 6/2/2005

Project Contact: Phil Fresquez Contact Phone: (505) 667-0815			Project Name: Native Vegetation Sampling Los Alamos Canyon Weir		Cost Center: 7H0200 Program Code: WE72 Cost Account: 4300/4315		
USI	Date Collected	Time Collected	Location Name	Number of Samples	Analysis Requested	Remarks	Field ID
552	6/2/2005	1:30	606-9401	241	AM, ~~ISORU~~ ISORU, ISOU Sr, Pb, Cd, Cu, Ni, Ti	up stream LA Canyon weir	.01
553	6/2/2005	1:30	606-9402	241	TOTAL U, CS-137 Pb	down stream LA Canyon weir	.02
							.03
							.04
							.05
							.06
							.07
							.08
							.09
							.10

Relinquished by (print and sign) Louis Varon J. R. Received by (print and sign) Phil Fresquez	Date 7/14/2005 Time 11:00 0930	Relinquished by (print and sign) Received by (print and sign)	Date Time
Samplers (print names and initials) Louis Varon J. R.	DETECTION LEVEL MAX 3H = 700 PCi/mL	DETECTION LEVEL MDC (MEMES) Ag = 0.5, Cr = 0.5, Cu = 0.5, Hg = 0.01, Ni = 1, Pb = 0.15 As = 0.5, Ba = 0.2, Be = 0.2, Cd = 0.25	DETECTION LEVEL MDC Am = 0.02 PCi/g, Cs = 1 PCi/g, Pu = 0.02 PCi/g, U = 0.01 PCi/g, Sr = 0.02 PCi/g

Strontium-90 Analysis by GFPC Sample Results Summary

Client Name: ESH20_LANL

Client Project Name: Native Vegetation Sampling; LA Canyon Weir

Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics

PAI Work Order: 0507120

Page: 1 of 1

Reported on: Monday, October 10, 2005 3:38:32 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507120-1	97.552	Sample	Sr-90	6.0 +/- 1.4	0	pCi/g	ASH	SR050819-1	8/29/2005	
0507120-4	97.553	Sample	Sr-90	6.1 +/- 1.4	0	pCi/g	ASH	SR050819-1	8/29/2005	

Comments:

Data Package ID: SR0507120-1

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

000003

Tritium Analysis By Liquid Scintillation Sample Results Summary

Client Name: ESH20_LANL   Laboratory Name: Paragon Analytics   Page: 1 of 1
 Client Project Name: Native Vegetation Sampling; LA Canyon Weir   PAI Work Order: 0507120   Reported on: Friday, September 30, 2005
 Client Project Number: 7H0200 WE72 4300 4315   10:42:06 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507120-2	97.552	Sample	H-3	-0.11 +/- 0.35	0.58	pCi/ml	WATER	3H050727-1	9/26/2005	U
0507120-5	97.553	Sample	H-3	-0.01 +/- 0.33	0.56	pCi/ml	WATER	3H050727-1	9/27/2005	U

39

Comments:

Data Package ID: H30507120-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BOL - Below Detection Limit

Date Printed: Friday, September 30, 2005

Paragon Analytics
 LIMS Version: 5.238A

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000003

Gamma Spectroscopy Results

PAI 713 Rev 8
Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0507120
Client Name: ESH20_LANL
ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 4

Field ID: 97.552
Lab ID: 0507120-1

Library: USGS.LIB

Sample Matrix: ASH
Prep SOP: PAI 739 Rev 8

Date Collected: 02-Jun-05

Date Prepared: 27-Jul-05

Date Analyzed: 11-Aug-05

Prep Batch: GS050726-1

QCBatchID: GS050726-1-1

Run ID: GS050726-1A

Count Time: 60 minutes

Report Basis: As Received

Final Aliquot: 10.0 g

Prep Basis: As Received

Moisture(%): NA

Result Units: pCi/g

File Name: 051685d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.39 +/- 0.55	0.91	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSA0507120-1

Gamma Spectroscopy Results

PAI 713 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0507120

Client Name: ESH20_LANL

ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 4

Field ID: 97.552

Lab ID: 0507120-1DUP

Library: USGS.LIB

Sample Matrix: ASH

Prep SOP: PAI 739 Rev 8

Date Collected: 02-Jun-05

Date Prepared: 27-Jul-05

Date Analyzed: 11-Aug-05

Prep Batch: GS050726-1

QCBatchID: GS050726-1-1

Run ID: GS050726-1A

Count Time: 60 minutes

Report Basis: As Received

Final Aliquot: 10.0 g

Prep Basis: As Received

Moisture(%): NA

Result Units: pCi/g

File Name: 051213d10

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.78 +/- 0.55	0.85	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halfives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSA0507120-1

Gamma Spectroscopy Results

PAI 713 Rev 8
Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0507120
Client Name: ESH20_LANL
ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 4

Field ID: 97.553	Sample Matrix: ASH	Prep Batch: GS050726-1	Final Aliquot: 10.2 g
Lab ID: 0507120-4	Prep SOP: PAI 739 Rev 8	QCBatchID: GS050726-1-1	Prep Basis: As Received
Library: USGS.LIB	Date Collected: 02-Jun-05	Run ID: GS050726-1A	Moisture(%): NA
	Date Prepared: 27-Jul-05	Count Time: 75 minutes	Result Units: pCi/g
	Date Analyzed: 11-Aug-05	Report Basis: As Received	File Name: 051212d10

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.26 +/- 0.55	0.93	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSA0507120-1

Isotopic Plutonium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
 Client Project Name: Native Vegetation Sampling; LA Canyon Weir
 Client Project Number: 7H0200 WE72 4300 4315
 Laboratory Name: Paragon Analytics
 PAI Work Order: 0507120
 Reported on: Sunday, September 11, 2005
 12:36:02 PM
 Page: 1 of 1

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507120-1	97.552	Sample	Pu-238	-0.0006 +/- 0.0055	0.0084	pCi/g	ASH	AS050810-2	8/18/05	U
0507120-1	97.552	Sample	Pu-239/240	0.017 +/- 0.011	0.008	pCi/g	ASH	AS050810-2	8/18/05	LT
0507120-4	97.553	Sample	Pu-238	0.0007 +/- 0.0047	0.0072	pCi/g	ASH	AS050810-2	8/18/05	U
0507120-4	97.553	Sample	Pu-239/240	0.0146 +/- 0.0091	0.0072	pCi/g	ASH	AS050810-2	8/18/05	LT

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Comments:

Data Package ID: PU0507120-1

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
 LT - Result is less than Requested MDC, greater than sample specific MDC.
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
 Y2 - Chemical Yield outside default limits.
 M - The requested MDC was not met.
 M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
 MDC - Minimum Detectable Concentration (see PAI SOP 709)
 BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
 LIMS Version: 5.228A

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Isotopic Americium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Native Vegetation Sampling; LA Canyon Weir
Client Project Number: 7H0200 WE72 4300 4315
Laboratory Name: Paragon Analytics
PAI Work Order: 0507120
Page: 1 of 1
Reported on: Sunday, September 11, 2005
1:25:48 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507120-1	97.552	Sample	Am-241	0.018 +/- 0.011	0.014	pCi/g	ASH	AS050823-2	8/26/05	LT
0507120-4	97.553	Sample	Am-241	0.0135 +/- 0.0081	0.0031	pCi/g	ASH	AS050823-2	8/26/05	LT

Comments:

Data Package ID: AM0507120-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
LIMS Version: 5.228A

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000004

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL   Laboratory Name: Paragon Analytics   Page: 1 of 1
 Client Project Name: Native Vegetation Sampling; LA Canyon Weir   PAI Work Order: 0507120   Reported on: Sunday, September 11, 2005
 Client Project Number: 7H0200 WE72 4300 4315   12:29:14 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507120-1	97.552	Sample	U-234	0.044 +/- 0.012	0.004	pCi/g	ASH	AS050810-2	8/22/05	
0507120-1	97.552	Sample	U-235	0.0023 +/- 0.0033	0.0055	pCi/g	ASH	AS050810-2	8/22/05	U
0507120-1	97.552	Sample	U-238	0.043 +/- 0.011	0.004	pCi/g	ASH	AS050810-2	8/22/05	
0507120-4	97.553	Sample	U-234	0.044 +/- 0.011	0.006	pCi/g	ASH	AS050810-2	8/22/05	
0507120-4	97.553	Sample	U-235	0.0021 +/- 0.0036	0.0062	pCi/g	ASH	AS050810-2	8/22/05	U
0507120-4	97.553	Sample	U-238	0.0313 +/- 0.0092	0.0053	pCi/g	ASH	AS050810-2	8/22/05	

45

Comments:

Data Package ID: U0507120-1

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
 LT - Result is less than Requested MDC, greater than sample specific MDC.
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
 Y2 - Chemical Yield outside default limits.
 M - The requested MDC was not met.
 M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
 MDC - Minimum Detectable Concentration (see PAI SOP 709)
 BDL - Below Detection Limit

Date Printed: Sunday, September 11, 2005

Paragon Analytics
 LIMS Version: 5.228A

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APPENDIX D

ANALYTICAL DATA REPORTS OF TRACE ELEMENT CONCENTRATIONS IN UNDERSTORY VEGETATION AT THE LAC WEIR DURING 2005

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507120

Client Name: ESH20_LANL

ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 430

Field ID: 97.552	Sample Matrix: TISSUE	Prep Batch: IP050728-1	Sample Aliquot: 1 g
Lab ID: 0507120-3	% Moisture: N/A	QCBatchID: IP050728-1-1	Final Volume: 50 ml
	Date Collected: 02-Jun-05	Run ID: it050801-1a2	Result Units: mg/kg
	Date Extracted: 28-Jul-05	Cleanup: NONE	Clean DF: 1
	Date Analyzed: 01-Aug-05	Basis: As Received	File Name: TS50801
	Prep Method: SW3050B		

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	19	0.1	0.0062		
7440-41-7	BERYLLIUM	1	0.0035	0.05	0.0012	B	
7440-47-3	CHROMIUM	1	0.47	0.25	0.034		
7440-50-8	COPPER	1	5.5	0.1	0.028		
7440-02-0	NICKEL	1	0.46	0.25	0.042		

Data Package ID: it0507120-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

Page 1 of 2

Total ICP Metals

Method SW6010B

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507120

Client Name: ESH20_LANL

ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 430

Field ID: 97.553
Lab ID: 0507120-6

Sample Matrix: TISSUE

% Moisture: N/A

Date Collected: 02-Jun-05

Date Extracted: 28-Jul-05

Date Analyzed: 01-Aug-05

Prep Method: SW3050B

Prep Batch: IP050728-1

QCBatchID: IP050728-1-1

Run ID: it050801-1a2

Cleanup: NONE

Basis: As Received

Sample Aliquot: 1 g

Final Volume: 50 ml

Result Units: mg/kg

Clean DF: 1

File Name: TS50801

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	7.8	0.1	0.0062		
7440-41-7	BERYLLIUM	1	0.0012	0.05	0.0012	U	
7440-47-3	CHROMIUM	1	0.24	0.25	0.034	B	
7440-50-8	COPPER	1	3.9	0.1	0.028		
7440-02-0	NICKEL	1	0.25	0.25	0.042	B	

Data Package ID: it0507120-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

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Total ICPMS Metals

Method SW6020A

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507120

Client Name: ESH20_LANL

ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 430

Field ID: 97.552
Lab ID: 0507120-3

Sample Matrix: TISSUE

% Moisture: N/A

Date Collected: 02-Jun-05

Date Extracted: 28-Jul-05

Date Analyzed: 09-Aug-05

Prep Method: SW3050B

Prep Batch: IP050728-1

QCBatchID: IP050728-1-2

Run ID: IM050809-1A3

Cleanup: NONE

Basis: As Received

Sample Aliquot: 1 g

Final Volume: 50 ml

Result Units: ug/kg

Clean DF: 1

File Name: 09AUG05A

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	27	15	1.9		
7440-38-2	ARSENIC	10	95	100	6.2	B	
7440-43-9	CADMIUM	10	550	15	1.3		
7439-92-1	LEAD	10	670	25	1.4		
7782-49-2	SELENIUM	10	83	50	20		
7440-22-4	SILVER	10	97	5	0.44		
7440-28-0	THALLIUM	10	69	10	1.4		

Data Package ID: *im0507120-1*

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

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Total ICPMS Metals

Method SW6020A

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0507120

Client Name: ESH20_LANL

ClientProject ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 430

Field ID: 97.553
Lab ID: 0507120-6

Sample Matrix: TISSUE

% Moisture: N/A

Date Collected: 02-Jun-05

Date Extracted: 28-Jul-05

Date Analyzed: 09-Aug-05

Prep Method: SW3050B

Prep Batch: IP050728-1

QCBatchID: IP050728-1-2

Run ID: IM050809-1A3

Cleanup: NONE

Basis: As Received

Sample Aliquot: 1 g

Final Volume: 50 ml

Result Units: ug/kg

Clean DF: 1

File Name: 09AUG05A

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	26	15	1.9		
7440-38-2	ARSENIC	10	63	100	6.2	B	
7440-43-9	CADMIUM	10	180	15	1.3		
7439-92-1	LEAD	10	910	25	1.4		
7782-49-2	SELENIUM	10	81	50	20		
7440-22-4	SILVER	10	18	5	0.44		
7440-28-0	THALLIUM	10	7.5	10	1.4	B	

Data Package ID: im0507120-1

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

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Total MERCURY

Method SW7471

Sample Results

Lab Name: Paragon Analytics

Client Name: ESH20_LANL

Client Project ID: Native Vegetation Sampling; LA Canyon Weir 7H0200 WE72 4300 4315

Work Order Number: 0507120

Final Volume: 100 ml

Reporting Basis: As Received

Matrix: TISSUE

Result Units: mg/kg

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	IDL	Flag	Sample Aliquot
97.552	0507120-3	6/2/2005	7/27/2005	07/28/2005	N/A	1	0.007	0.01	0.00095	B	0.6 g
97.553	0507120-6	6/2/2005	7/27/2005	07/28/2005	N/A	1	0.0046	0.01	0.00095	B	0.6 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *hg0507120-1*

Date Printed: Monday, August 29, 2005

Paragon Analytics

LIMS Version: 5.218A

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APPENDIX E

ANALYTICAL DATA REPORTS OF RADIONUCLIDE CONCENTRATIONS IN SMALL MAMMAL WHOLE BODY BURDENS AT THE LAC WEIR DURING 2005

Environmental Surveillance Team Chain of Custody Record

Creation Date: 6/2/2005

Chain of Custody Number: 99

Project Contact: Phil Fresquez Contact Phone: (505) 667-0815			Project Name: SMALL HAMMERS		Cost Center: Program Code: Cost Account:	
USI	Date Collected	Time Collected	Location Name	Number of Samples	Analysis Requested	Remarks
556	6/28/05	7:30 AM	99.01	1	Am ISOPU, ISOU, Sr ⁹⁰	LA were upper 28 mice
557	6/29/05	7:30 AM	99.02	1	Total U, Cs-137	LA were lower 11 mice
					3H	
					Ag, As, Ba, Be, Cd, Cr, Cu Hg, Ni, Pb, Sb, Se, Ti	Detection Level MDC Am = 0.02 pCi/g Pu = 0.02 pCi/g Cs-137 U = 0.01 pCi/g Pr = 0.06 pCi/g
Relinquished by (print and sign) Rhonda Robinson Date 6/30/05 Time 3:00 Received by (print and sign) Louis Ward Jr Date 7/14/05 Time 13:16 hrs Relinquished by (print and sign) Rhonda Robinson Date 7/14/05 Time 13:16 hrs Received by (print and sign) Louis Ward Jr Date 7/14/05 Time 13:16 hrs						
Detectors (print names and initials) Rhonda Robinson, Sherri Sherwood, MRC Comments 4 beakers upstream 6/29/05 2 beakers downstream 7/14/05						

Tritium Analysis By Liquid Scintillation Sample Results Summary

Client Name: ESH20_LANL

Client Project Name: Small Mammals

Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics

PAI Work Order: 0507125

Page: 1 of 1

Reported on: Friday, September 30, 2005

10:44:09 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507125-2	99.556	Sample	H-3	-0.10 +/- 0.33	0.56	pCi/ml	WATER	3H050727-1	9/27/2005	U
0507125-4	99.557	Sample	H-3	0.33 +/- 0.35	0.56	pCi/ml	WATER	3H050727-1	9/27/2005	U

Comments:

Data Package ID: H30507125-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Friday, September 30, 2005

Paragon Analytics
LIMS Version: 5.238A

Strontium-90 Analysis by GFPC Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Small Mammals
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507125

Page: 1 of 1
Reported on: Monday, October 10, 2005
3:52:50 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507125-1	99.556	Sample	Sr-90	2.39 +/- 0.56	0.04	pCi/g	ASH	SR050819-1	8/29/2005	
0507125-3	99.557	Sample	Sr-90	2.72 +/- 0.64	0.05	pCi/g	ASH	SR050819-1	8/29/2005	

Comments:

Data Package ID: SR0507125-1

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Gamma Spectroscopy Results

PAI 713 Rev 8
Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0507125
Client Name: ESH20_LANL
ClientProject ID: Small Mammals 7H0200 WE72 4300 4315

Field ID: 99.556
Lab ID: 0507125-1

Library: USGS.LIB

Sample Matrix: ASH
Prep SOP: PAI 739 Rev 8
Date Collected: 28-Jun-05
Date Prepared: 27-Jul-05
Date Analyzed: 11-Aug-05

Prep Batch: GS050726-1
QCBatchID: GS050726-1-1
Run ID: GS050726-1A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 10.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 051686d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.67 +/- 0.57	0.90	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSA0507125-1

Gamma Spectroscopy Results

PAI 713 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0507125

Client Name: ESH20_LANL

ClientProject ID: Small Mammals 7H0200 WE72 4300 4315

Field ID: 99.556

Lab ID: 0507125-1DUP

Library: USGS.LIB

Sample Matrix: ASH

Prep SOP: PAI 739 Rev 8

Date Collected: 28-Jun-05

Date Prepared: 27-Jul-05

Date Analyzed: 11-Aug-05

Prep Batch: GS050726-1

QCBatchID: GS050726-1-1

Run ID: GS050726-1A

Count Time: 60 minutes

Report Basis: As Received

Final Aliquot: 10.0 g

Prep Basis: As Received

Moisture(%): NA

Result Units: pCi/g

File Name: 051687d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	0.41 +/- 0.51	0.83	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halfives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSA0507125-1

Gamma Spectroscopy Results

PAI 713 Rev 8
Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0507125
Client Name: ESH20_LANL
ClientProject ID: Small Mammals 7H0200 WE72 4300 4315

Field ID: 99.557	Sample Matrix: ASH	Prep Batch: GS050726-1	Final Aliquot: 10.1 g
Lab ID: 0507125-3	Prep SOP: PAI 739 Rev 8	QCBatchID: GS050726-1-1	Prep Basis: As Received
Library: USGS.LIB	Date Collected: 29-Jun-05	Run ID: GS050726-1A	Moisture(%): NA
	Date Prepared: 27-Jul-05	Count Time: 70 minutes	Result Units: pCi/g
	Date Analyzed: 11-Aug-05	Report Basis: As Received	File Name: 051215d10

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10045-97-3	Cs-137	-0.21 +/- 0.53	0.95	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSA0507125-1

Isotopic Plutonium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL   Laboratory Name: Paragon Analytics   Page: 1 of 1
 Client Project Name: Small Mammals   PAI Work Order: 0507125   Reported on: Sunday, September 11, 2005
 Client Project Number: 7H0200 WE72 4300 4315   2:33:07 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507125-1	99.556	Sample	Pu-238	0.0020 +/- 0.0048	0.0073	pCi/g	ASH	AS050810-2	8/18/05	U
0507125-1	99.556	Sample	Pu-239/240	0.033 +/- 0.014	0.003	pCi/g	ASH	AS050810-2	8/18/05	
0507125-3	99.557	Sample	Pu-238	0.0007 +/- 0.0048	0.0073	pCi/g	ASH	AS050810-2	8/18/05	U
0507125-3	99.557	Sample	Pu-239/240	0.034 +/- 0.014	0.003	pCi/g	ASH	AS050810-2	8/18/05	

63

Comments:

Data Package ID: PU0507125-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

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Isotopic Americium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Small Mammals
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507125

Page: 1 of 1
Reported on: Sunday, September 11, 2005
2:44:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507125-1	99.556	Sample	Am-241	0.023 +/- 0.011	0.003	pCi/g	ASH	AS050823-2	8/26/05	
0507125-3	99.557	Sample	Am-241	0.024 +/- 0.011	0.003	pCi/g	ASH	AS050823-2	8/26/05	

64

Comments:

Data Package ID: AM0507125-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

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Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: ESH20_LANL
Client Project Name: Small Mammals
Client Project Number: 7H0200 WE72 4300 4315

Laboratory Name: Paragon Analytics
PAI Work Order: 0507125

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Reported on: Sunday, September 11, 2005
2:42:00 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0507125-1	99.556	Sample	U-234	0.101 +/- 0.021	0.004	pCi/g	ASH	AS050810-2	8/22/05	
0507125-1	99.556	Sample	U-235	0.0054 +/- 0.0041	0.0050	pCi/g	ASH	AS050810-2	8/22/05	LT
0507125-1	99.556	Sample	U-238	0.104 +/- 0.021	0.005	pCi/g	ASH	AS050810-2	8/22/05	
0507125-3	99.557	Sample	U-234	0.120 +/- 0.025	0.005	pCi/g	ASH	AS050810-2	8/22/05	
0507125-3	99.557	Sample	U-235	0.0089 +/- 0.0061	0.0076	pCi/g	ASH	AS050810-2	8/22/05	LT
0507125-3	99.557	Sample	U-238	0.113 +/- 0.023	0.006	pCi/g	ASH	AS050810-2	8/22/05	

65

Comments:

Data Package ID: U0507125-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

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